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Extended knowledge, reliabilism and cognitive enhancement strategies

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ABSTRACT

What is extended knowledge and what criteria should it meet? How does the category of cognitive enhancement influence its conceptualisation? Undoubtedly, the history of humanity involves a desire to exceed limits and overcome biological boundaries. As evidenced by research on the extended mind, human cognitive processes are largely dependent on the use of technological supports. The complementary concept of cognitive enhancement involves different strategies, from technological and behavioural to biochemical ones. Through their use, the conditions in which information is acquired are transformed, which entails the modelling of knowledge creation and acquisition processes. The aim of the article is to analyse and then unify diverse approaches pursued within reliabilist accounts of knowledge, concepts of the extended mind, cognitive enhancement and extended epistemology. Critical comments will also be considered, especially those concerning the concept of the extended mind and extended knowledge. This basis will be useful to define the essential criteria which, in the author's opinion, should be met by extended knowledge.

KEYWORDS

extended mind; cognitive artifacts; extended epistemology; social epistemology; amalgamated mind; process reliabilism; virtue reliabilism

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INTRODUCTION

Classic epistemological inquiries try to answer questions concerning the criteria to be met by knowledge. What does it mean that a given person knows something? In Plato's dialogue titled *Theaetetus*, we are introduced to the classic view of this concept, i.e. the proposal to define knowledge as a justified true belief (Plato, 2014). However, as Edmund Gettier has clearly demonstrated, the conditions required by the classical concept of knowledge are insufficient (Gettier, 1963). The above resulted in an extensive revision of the classical concept of knowledge, which initiated an interesting discussion lasting to this day. The problem posed by Gettier opens new avenues of research, which is reflected in the attempt to solve the problem of knowledge within externalist, including possibly the most influential one — Alvin Goldman's reliabilism.

The above mentioned discussion also resulted in research carried out in the field of extended epistemology. The concept of the extended mind (EM) as defined by Andy Clark and David Chalmers occupies a special place here. According to them, the mind should be understood as a dynamic system in which human cognitive operations involve permanent and inseparable feedback loops that in various ways overcome the boundaries set by the brain, body and the world (Clark, 2008). Some of these feedback loops are irreplaceable, as clearly evidenced by research on complex operations of broadly understood cognitive systems, where we encounter the phenomenon of distributed cognition (Hutchins, 1995). The concepts of the extended mind are also developed by the advocates of cognitive integration, such as Mark Rowlands, who presents the concept of the amalgamated mind and Richard Menary, who highlights the role of cognitive norms in extended cognitive systems. As our cognition goes beyond the boundaries of the brain and is related to the activity of the embodied subject, knowledge creation processes are therefore also dependent on a range of environmental variables, including mainly the use of cognitive artifacts.[1]

When attempting to describe extended knowledge, it is necessary to make reference to the closely related concept of cognitive enhancement (CE), which includes a variety of strategies to enhance and extend cognitive processes, from biochemical and behavioural strategies to the dimension of physical enhancement (Dresler *et al.*, 2019). They clearly correspond with the problem of extended knowledge.

The aim of the article is to analyse and then unify diverse approaches pursued within reliabilist accounts of knowledge, concepts of the extended mind, cognitive enhancement and extended epistemology. Critical comments will also be considered, especially those concerning the concept of the extended mind and extended knowledge. This basis will be useful to define the essential

[1] The general definition of a cognitive artifact refers to physical objects made by humans in order to support, enhance and improve cognition (Hutchins, 1999: 126).

criteria which, in the author's opinion, should be met by extended knowledge. This will result in a model of knowledge where extended knowledge is one of the significant and integral dimensions of knowledge, and which emerges from a variety of cognitive extension and enhancement strategies.

CONCEPTS OF THE EXTENDED MIND

The most important factor that sparked the reflection on extended knowledge is the concept of the extended mind presented by Clark and Chalmers. This raises a fundamental question: Where does the mind end and the rest of the world begin (Clark & Chalmers, 1998)? The above dilemma motivates the creators of EM to provide an answer in line with the approach of active externalism.[2] A given cognitive operation often requires the use of external support, which connects to the easily discernible influence of the environment on the cognitive process. Omission of an important external component may result in a significantly lower level of cognitive competence, or even make it impossible to carry out the activity in question.[3] "If we remove the external component the system's behavioural competence will drop, just as it would if we removed part of its brain. Our thesis is that this sort of coupled process counts equally well as a cognitive process, whether or not it is wholly in the head" (Clark & Chalmers, 1998: 8–9). Therefore, the mind is a coupled system that creates itself based on active feedback loops between the brain, the rest of the body and significant elements of the environment operating in the present. At the core of the concept is the parity principle:

> Epistemic action, we suggest, demands spread of epistemic credit. If, as we confront some task, a part of the world functions as a process which, were it done in the head, we would have no hesitation in recognizing as part of the cognitive process, then that part of the world is (so we claim) part of the cognitive process. Cognitive processes ain't (all) in the head! (Clark & Chalmers, 1998: 8).[4]

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[2] Active externalism assumes the active role of the environment in the currently ("here and now") performed cognitive operations. In contrast to Putnam's semantic externalism, where external properties impact the meaning of terms but do not have an active role in the course of cognitive processes. The thesis of active externalism was first formulated by Susan Hurley (Hurley, 1998).

[3] An apt example of this kind of coupling is the use of a car navigation system on a device with network connection in a place unfamiliar to the driver. Information on the route presented on the screen is continuously updated and may be completed with information related to roadworks, accidents, etc. Once the device breaks down, it is easy to observe a decline in driver competence, with the seemingly easy task of reaching the destination becoming significantly harder to perform.

[4] See Putnam's Twin Earth Thought Experiment and his claim that "the meanings just ain't in the head!" (Putnam, 1975: 144).

In support of their thesis, the authors present a widely-commented experiment with a person using a notebook as a cognitive artifact that compensates for the diminished competence in memory processes (due to Alzheimer's). Thanks to the external support in the form of information written down in the notebook, the person affected can direct their actions and easily compensate for the biological memory dysfunction. The mind should not be equated solely with the course of internal cognitive processes. The processes external to the organism are equally important. The equality indicated results from the functional role played by each component. Their material structure or location is insignificant. When comparing the process of recollection based on biological memory and the notebook, we must recognise that, as intended by Clark and Chalmers, both processes are functionally equivalent. In both cases, we are dealing with dispositional beliefs that do not need to be realised at a specific time. They are, however, stored in the memory and activated when the need arises. Taking the parity principle seriously entails the attribution of functional equivalence to biological and artificial components of a coupled cognitive system.

However, accepting the parity principle raises a number of serious dilemmas. Should the content stored on external media also be thought of as dispositional beliefs (assuming that the user has not used them so far)? Should the Web be treated as a repository of dispositional beliefs? In order to avoid possible confusion, Clark and Chalmers define four conditions for external media carrying dispositional beliefs (trust and glue conditions). The notebook is a constantly and easily available information repository, and at the moment of the acquisition of information, the notebook's user automatically endorses it. The conscious endorsement by the user is the reason why this information has been put in the notebook (Clark & Chalmers, 1998: 17).

The account of the extended mind based on the parity principle is not the only attempt to express the assumptions of active externalism. John Sutton indicates concepts that use the complementarity principle:

> in extended cognitive systems, external states and processes need not mimic or replicate the formats, dynamics, or functions of inner states and processes. Rather, different components of the overall (enduring or temporary) system can play quite different roles and have different properties while coupling in collective and complementary contributions to flexible thinking and acting. So "exograms" can be radically unlike engrams even while co-opted for the same purposes, and these differences will often be the focus of complementarity-oriented explanations in the EM framework (Sutton, 2010: 194).[5]

The above principle is not focused on the similarity or functional equality of the elements that make up a cognitive system, but attribute a special role to

[5] Engrams are memory traces located in the brain, while exograms are their external counterparts (Donald, 1991).

a proper integration of structurally and functionally distinct EM components. According to Sutton, the correct description of the mind should take into account the role of tools as well as other people. It is only when these variables are taken into account that the full range of the mind's capabilities is revealed. It is because its complementary model accounts for the permanent external cognitive scaffolding that compensates for the weaknesses of the relatively fragile and unstable biological cognitive abilities of humans.

Similar views are expressed by Rowlands. The mind is worldly in character. It is a hybrid unit emerging from relations between the organism and the environment. Cognitive relations (and therefore also knowledge creation processes) are often entirely dependent on the manipulation of external environmental elements. The organism recognises the external information-carrying structure and then identifies and assimilates this information through the manipulation of an identified and relevant element of the external environment (Rowlands, 2004).[6] Shifting some of the cognitive burden to elements of the environment results in the reduction of complexity and the level of difficulty of the cognitive task undertaken.

> If we are able to use relevant structures in our environment, then some of the complexity and difficulty of this task might be reduced: we off-load at least some of the task onto the environment around us. Roughly: we get the environment to do some of the work for us; and this reduces the work that we need do (Rowlands, 2010: 16).

Rowlands' views result from the belief that the hybridity of cognitive processes is closely linked to the maximisation of efficiency and the economisation of cognitive processes. From the evolutionary standpoint, the use of environment for cognitive purposes is profitable for the organism.

Therefore, according to Rowlands, an extended cognitive process is information processing founded on the manipulation of an external medium. As a result of such an operation, formerly inaccessible information is accessed and eventually the representational state is observed in the subject. Understood correctly, cognition thus includes a subject component. Rowlands points to this condition as indispensable to avoid the charge known as cognitive bloat.[7] "An adequate criterion of the cognitive will contain an ownership condition: any process that is to count as cognitive must be owned by a cognizing organism or subject" (Rowlands, 2010: 97). According to advocates of cognitive integrationism, cognitive processes belong to the subject in two ways: personal

[6] Relevant, i.e. in this case carrying information important for the cognitive task performed.

[7] The problem arises primarily in relation to the interpretation of EM, centred around the parity principle. How to explain the specific proliferation of dispositional beliefs on the Internet? Does every piece of information on the Web belong to EM? If not, what criteria should be used to identify elements with cognitive status?

and sub-personal. The sub-personal process belongs to the subject by virtue of its contribution to the personal level. What is crucial here, is proper integration of processes from this level, e.g. activation of neurons, as well as computing processes carried out on the external component. In contrast, processes at the personal level should be thought of as activities (what the subject does) and included in the broadly understood category of activity.[8] This thesis illustrates the possibility of a close cooperation between the concepts of extended and embodied cognition as part of the idea of the amalgamated mind. Rowland proposes to put cognition on the foundation of basic ways of dealing with the world, entangled in the intentional orientation towards the world as well as disclosure and discovery. It is related to the subject's discovery of relevant and informative aspects of the environment. Cognition may be extended, as the activity described is not, by its nature, limited solely to the boundaries drawn by the biological organism.

The argumentation of the representatives of cognitive integrationism is completed by Richard Menary, who points at some basic theses, which are the pillars of the proper understanding of EM: theses concerning manipulation, the hybrid nature of the mind, transformation and cognitive norms (Menary, 2006). Like Rowlands, Menary highlights the role of the manipulation of various media and its role in the proper understanding of cognitive integration. Human cognition is based mainly on the skilled use of the external environment. Cognitive tasks may be performed individually or in cooperation with other people. Cognition is hybrid in nature and is based on the integration of internal and external media and processes. The transformation of cognition is possible through learning to use external media. Thanks to this skill, people are engaged in a range of cognitive practices related to the manipulation of an external medium. It is worth stressing that cognitive practices are accompanied by cognitive norms that moderate to a large extent the effective use of acquired skills (Menary, 2010a).

COGNITIVE ENHANCEMENT STRATEGIES

The problem of EM clearly corresponds with CE, which is often brought up as part of a general discussion on transhumanism. According to Nick Bostrom, CE opens up a range of new possibilities for people, which will help liberate them from Plato's cave of "shadows", i.e. biological limitations (Bostrom, 2005). This raises questions as to how the changes such as radical life extension, control of drives and emotions and the resulting expansion of our bodies' capabilities, perception and intellectual capacity will impact the

[8] The subject has epistemic authority over this category of processes, in contrast to the sub-personal level processes, of which the subject is a mere "hostage" (Rowlands, 2010: 155).

"new standards of technonormativity that could have profound consequences for how subjects and societies will be disciplined and stratified in the future" (Huberman, 2021). These issues are also related to epistemological questions, i.e. issues concerning individual and social cognitive practices as well as knowledge creation and acquisition processes. Intuitions of EM advocates indicate that human cognition is largely based on the role of the manipulation of external media and the proper integration within the cognitive system. Once we agree with this view, the role of external support in the formation of cognition becomes invaluable. The issue of cognitive enhancement clearly corresponds with the problem of extended knowledge. What does this term mean, then, and what possible strategies does it include?

The term CE refers to the "amplification or extension of core capacities of the mind through improvement or augmentation of internal or external information processing systems" (Bostrom & Sandberg, 2009). It is obvious that people extend their cognitive capacities through the use of various strategies. It is largely due to the biological limitations of humans as well as to the demands placed on them by the dynamically changing environment in which they operate.

> An increasingly complex world exerts increasing demands on cognitive functions that evolved for a fundamentally different environment. Daily life in an information society and a post-industrial economy require cognitive skills that have to be acquired through slow, effortful, and expensive processes of education and training. [...] Strategies to improve the acquisition and maintenance of cognitive skills are thus increasingly important on both an individual and societal level (Dresler *et al.*, 2019: 1137).

The concepts of situated, embodied and extended cognition centre around the role of scaffoldings and cognitive artifacts (Heersmink, 2015; Trybulec, 2021). The concept of cognitive enhancement refers to several different strategies that modify the subject's cognitive abilities. Dresler distinguishes three main categories of such operations, i.e. strategies based on biochemical, behavioural and ultimately physical reinforcement (with the use of cognitive artifacts).[9] Biochemical strategies are developed as part of a long tradition, starting with the use of naturally occurring substances (e.g. caffeine, theine or guaranine). The above substances have a positive effect on attentional processes and reduce fatigue, but the effects of their use are short-lived. Due to the above, greater importance is attached to research on the use of advanced neuropharmacology, e.g. the use of Modafinil[10] (Gunia, 2015).

[9] The authors of the cognitive enhancement model also indicate different dimensions of the concept, such as ethical consequences, the level of acceptance of a given type of enhancement, its availability, possible side effects as well as individual and temporal factors (Dresler *et al.*, 2019).

[10] Modafinil, initially used to treat narcolepsy, has proven to be effective in improving alertness, concentration as well as memory and learning processes.

Another strategy described as part of the discussion on CE is the behavioural enhancement strategy. It seems that this type of strategy strongly corresponds with the concept of the embodied mind (Varela, Thompson, & Rosch, 2017) as well as the issue of knowledge-creating social practices (Goldman, 1999) and cognitive norms (Menary, 2010a). Behavioural enhancement takes place through a variety of activities, such as sleep, physical exercises (e.g. dance), meditation (related to mindfulness training) or mnemonic techniques (supporting learning and memory processes). Behavioural strategies have a colossal impact on cognitive processes enhancement within the subject themselves, which in turn affects the course of extended cognition. Importantly, as a result of appropriate training, procedural knowledge increases,[11] which is extremely important for the implementation of cognitive practices within extended cognitive systems.

The classification is completed by the most extensively commented on in the EM field the physical strategy (involving technology and information technology) referring to the enhancement of cognition based on the use of cognitive artifacts and also partly biotechnological methods of brain stimulation.[12] A cognitive artifact is defined as "an artificial device designed to maintain, display, or operate upon information in order to serve a representational function" (Norman, 1991). Edwin Hutchins adds that these are "physical objects made by humans for the purpose of aiding, enhancing, or improving cognition" (Hutchins, 1999: 126). Their capacity to represent is also indicated (Brey, 2005). Based on the basic definitions, several important properties of cognitive artifacts can be identified. They are physically existing objects, created intentionally for a specific purpose, which enhance the human ability to perform cognitive tasks (Trybulec, 2018).[13] Common extensions of this type are smartphones (Drain & Strong, 2015), as well as increasingly widely used AI systems such as the language models named ChatGPT.[14]

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[11] In other words, knowing-how, as opposed to knowing-that, i.e. propositional knowledge. This distinction was created by Gilbert Ryle, who opposed the thesis of intellectualism, according to which every action is preceded by the subject's possession of a particular propositional attitude towards the judgment in question (Ryle, 2009). The process of acquiring procedural knowledge clearly corresponds with the concept of "five stages of skill acquisition" (Dreyfus & Dreyfus, 1998).

[12] Primarily non-invasive transcranial magnetic stimulation (TMS), which has many positive effects on a range of sensorimotor activities, working memory and procedural learning (Bostrom & Sandberg, 2009: 318).

[13] However, several important problems arise when attempting to conceptualise cognitive artifacts, as reported by Marcin Trybulec. These include, among others, the relationship between the concepts of artifact and cognitive scaffolding, the problem of reification as well as the use of different models involving enhancement or transformation in order to describe the influence of artifacts on human cognition (Trybulec, 2021).

[14] Luciano Floridi and Massimo Chiriatti (Floridi & Chiriatti, 2020) provide an interesting analysis of the functionality and limitations of the GPT-3 chatbot. However, it is important

Richard Heersmink makes an interesting attempt to classify cognitive artifacts. The undertaking is driven by the need to identify non-representational objects that nevertheless have a cognitive function. Consequently, "cognitive artifact is neither defined by intrinsic properties of the artifact nor by the intentions of the designer, but by its function, which is established by the intentions of the user and by how it is used" (Heersmink, 2013). Given that the cognitive function constitutes the demarcation line between a cognitive artifact and other human creations, it should be assumed that any object can perform this function (as long as there is someone who uses it for cognitive purposes).[15] This remark constitutes the source of division between representational and ecological artifacts.

Human cognition is multidimensional and involves multiple CE strategies. These different strategies create a synergic continuum leading to two basic types of cognitive process modification, i.e.:

– improvement of the molecular-neurological basis responsible for cognitive processing;
– provision and then use of external media necessary for completing cognitive tasks (Heersmink, 2017).

CE is thus based on two basic functions: on the one hand, it acts as an enhancer of processes carried out on a biological basis, performing transformations within the molecular-neurological base, and on the other hand, it provides external components that constitute a database of information relevant for the performance of specific cognitive operations. Due to its wide range of applications and the dynamic developments in its field, CE should be part of an in-depth reflection on extended knowledge.

EXTENDED KNOWLEDGE

Aristotle claimed that the quest and thirst for knowledge are in keeping with every person's nature. Alvin Goldman uses this thought as the starting point for the social epistemology project. The search for accurate information has carried humans since the dawn of time, due to their curiosity and practical reasons. According to Goldman, the practice of asking questions is a vital form of communication and social behaviour and constitutes the prototype of cognitive practice leading to knowledge acquisition (Goldman, 1999). As the reflection on EM and CE shows, different strategies may increase the extent of

to bear in mind the continuous improvement of this technology, resulting in new versions of the chatbot, such as GPT-4.

[15] Heersmink provides an example of leaving an object in plain sight in order to remember to return it.

cognitive practices that "track" knowledge and thus be the basis for extended knowledge.[16]

It is clear, however, that not every cognitive practice is also a knowledge--creating practice. This honourable label is only attributed to those practices that meet specific conditions. Edmund Gettier clearly demonstrated that the justification condition required by the classical concept of knowledge is insufficient. According to Goldman, the main condition under which acquired information may become knowledge is the condition of the reliability of the cognitive process. According to Goldman's view, known as process reliabilism, knowledge should be ascribed to the person who believes that p; p is true; the belief that p is a result of a reliable belief formation process. The internalist condition of justification is modified in relation to the classical definition of knowledge and replaced by the externalist condition of process reliability[17] (Goldman, 1986). Process should be understood as:

> a functional operation or procedure, i.e., something that generates a mapping from certain states — "inputs" — into other states — "outputs". The outputs in the present case are states of believing this or that proposition at a given moment. On this interpretation, a process is a type as opposed to a token. This is fully appropriate, since it is only types that have statistical properties such us producing truth 80% of the time; and it is precisely such statistical properties that determine the reliability of a process (Goldman, 1979: 11).

The distinction between types and tokens leads to the Generality Problem and the following question: Which type of process must be reliable for the resulting belief to be justified? (Conee & Feldman, 1998). According to Goldman, the requirement to identify a specific and relevant process is too demanding.

> There should be no additional requirement — of the sort stipulated by Conee and Feldman — that either the believer in question or the reliability theorist must be able to specify the details of the belief-forming process deployed by the user. It is only required that the user in fact uses such a process (Goldman, 2021: 109).[18]

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[16] In the discussion on extended knowledge, the internalist description of an epistemic subject relating exclusively to a conscious and intentional individual is contested. According to the internalist approach, knowledge is necessarily the result of processes taking place in the brain. This thesis is not accepted within active externalism, which is a consequence of the concept of embodied cognition (Palermos & Pritchard, 2013: 109–110).

[17] See Ziemińska, 2007, for an overview of two ways of understanding the term "internal" — introspective and biological. Goldman is an externalist when it comes to the introspective, non-biological sense of the term "internal".

[18] A number of objections have been raised against process reliabilism. In addition to the Generality Problem, the most popular are the Clairvoyance Problem and the New Evil Demon Problem. As a result of the discussion concerning reliabilism, Goldman gradually modified

Process reliability should be equated with the tendency to form true beliefs, while justification of the belief is one of the functions of reliability. Reliability, and thus justification, are subject to gradation; not every reliable process has the same degree of justification. The subject's belief may be fully justified, justified to a certain extent or slightly justified.[19] Unreliable cognitive processes are based on an over-reliance on emotions, hasty generalisations, wishful thinking or random guesses. Therefore, knowledge cannot be based on cases of epistemic luck. "What do these faulty processes have in common? They share the feature of unreliability: they tend to produce error a large proportion of the time" (Goldman, 1979: 9). Among the reliable ones, Goldman places typical perceptual and memory processes as well as correct reasoning. "Certain (basic) psychological processes, and the instantiation of these processes would result in a truth-ratio of beliefs that meets some specified high threshold (greater than .50)" (Goldman, 1986: 106). The beliefs formed as a result of these processes (including operations and procedures) are generally true.

Attempts are made in the field of extended epistemology to reconcile process reliabilism with active externalism. According to the extended cognition thesis (in its weaker version), cognitive processes go beyond the boundaries of the brain and take place between the brain, the body and the world (Carter *et al.*, 2018).[20] Let us therefore adopt a draft definition of extended knowledge. This type of knowledge is a true belief resulting from a reliable and extended cognitive process. An extended cognitive process may involve different CE strategies (or a set of strategies). Special attention should be drawn to its aspect involving technology and information technology. It is the most transformative aspect when it comes to the knowledge-creating processes, as it supplies completely new tools that drastically alter the area of human cognition.

However, the attempt to transpose process reliabilism to extended epistemology raises a serious objection.[21] There are situations where the condition of process reliability is fulfilled, but knowledge cannot be ascribed to the given person, because the cognitive success does not result from the cognitive ability of the subject who forms the true belief.

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his approach. He introduced the concept of weak justification, which deals with the mentioned problems (Goldman, 1988). Consequently, Goldman directed attention to the social dimension of knowledge. The justification of a belief is determined by what a community (e.g. a group of experts) considers to be reliable (Goldman, 1992).

[19] For example, a belief may be formed based on an inaccurate or careful, methodical observation. This relation also applies to the cases of extended cognition.

[20] The stronger version says that some of the mental states, e.g. beliefs may emerge on the basis of elements of the environment that do not belong to the biological organism. By virtue of functional isomorphism, the external medium is considered as a possible repository of dispositional beliefs, like the brain.

[21] Duncan Pritchard and Spyridon Orestis Palermos use Fuller's charge. According to Fuller, Goldman ignores the issue of humans' conscious nature (Palermos & Pritchard, 2013).

> One of the master intuitions about knowledge which guides contemporary epistemology is the idea that knowledge is the product of cognitive ability. A true belief, no matter what else of epistemic relevance can be offered in its favour (e.g., that it is safe, sensitive, backed by reasons, epistemically blameless, and so on), will not count as a case of knowledge if it is not the product of cognitive ability (Pritchard, 2010: 134).

According to Pritchard, the reliability condition should be supported with the condition of the cognitive ability use.[22]

Consequently, knowledge should be ascribed to the person who believes that p; p is true; the belief that p is a result of a reliable belief formation process that is adequately integrated into their cognitive character, so that their cognitive success is substantially due to their cognitive ability (Pritchard, 2010). The provided definition ($COGA_{WEAK}$) does not exclude the cases of extended knowledge. Cognitive character should be understood as an integrated, coupled system connecting inner cognitive abilities and procedural knowledge acquired through training or the use of support in the form of external components. Knowledge emerges from "an interplay between manifestations of cognitive ability and extra-agential factors. [...] Knowledge is safe cognitive success that is significantly attributable to the subject's manifestations of relevant cognitive ability" (Pritchard, 2018: 92). One of the pillars of extended knowledge is therefore the condition of epistemic credit.[23]

While using the theoretical background developed for EM, the discussion on extended knowledge should also take into consideration a range of objections directed against EM. The dynamics of change within the information society inspires a reflection on extended knowledge creation processes. "Do I know all the capitals in the world? Do I know the final standings of all European football leagues over the past 24 years? Do I know the birth dates of all past American presidents?" (Bjerring & Pedersen, 2014: 24). If the answer is affirmative, we expose ourselves to the charges of cognitive bloat.[24] Hence

[22] In order to avoid cases where the process is reliable, but knowledge cannot be ascribed to the subject. Pritchard illustrates it with the examples of Temp and BIV (Pritchard, 2010). The above view has been inspired by virtue epistemology. Ernest Sosa's intuition is to understand knowledge as an effect of the cognitive ability of the subject, which leads to the formation of a true belief. Ernest Sosa explains this with the use of an archer metaphor. Beliefs can be evaluated on three levels: accuracy, adroitness and aptness. Accuracy is related to the truth of the given belief; adroitness, in turn, is strongly dependent on the cognitive ability of the subject. Aptness results from a situation in which the accuracy of a belief is an effect of adroitness, i.e. the use of the subject's cognitive ability rather than favourable circumstances (Sosa, 2007: 22–23).

[23] This condition has also been criticised. Krist Vaesen points out that is some cases of extended knowledge the condition of the subject's cognitive ability clearly loses its relevance. In many cases, the most important factor that influences the formation of true beliefs is the external environment, specially designed for this purpose (Vaesen, 2011).

[24] This popular problem related to overextended knowledge is addressed by Gertler and Ludwig (Gertler, 2007; Ludwig, 2015).

the understandable resistance to treating information available on the web as dispositional beliefs (according to Clark and Chalmers' definition). On the other hand, if we assume that the information written down in the notebook plays the role of a dispositional belief, how do we explain the role of easily and permanently accessible information published on reliable websites? It seems that the key difficulty disappears once the concept of dispositional belief is replaced by the concept of information.[25] This is in line with the views presented as part of cognitive integrationism, especially Rowlands' theory, which emphasises the acquisition of information as a result of the manipulation of external media in order to economise cognitive processes.

The critics of EM who try to undermine EK also refer to the coupling--constitution fallacy. According to Fred Adams and Kenneth Aizawa, causal relations should be distinguished from constitutive relations; the causal relation between the object and the process X and Y does not imply that X is part of Y.[26] The critics of EM claim that causal relations between the subject and external media do not have the necessary characteristic of authentic cognitive processes i.e. they do not operate on internal representational states with intrinsic, non-derived content. The symbols with which the user fills the notebook have meaning only by virtue of convention and are therefore derived from pre-established social practices. Biological memory contains non-derived content (Adams & Aizawa, 2001: 55). Similarly, Robert Rupert claims that only something that is part of a permanently integrated cognitive system can be referred to as being *cognitive*. In this case, only an organism that is a permanently integrated structure can be responsible for the constitution of cognitive processes, which cannot be achieved by an unstable, causal coupling within an extended system (Rupert, 2010).

Rowlands refutes these objections by presenting the role of integration in an extended cognitive system. Cognition is based not only on personal processes over which the subject holds epistemic power. There is also a range of sub-personal processes that have a relevant contribution to the cognition of the subject. Sub-personal processes are both processes in the brain and the properly integrated processes distributed between the organism and the artifact. Properly understood integration involves "the meshing of disparate types of process that, precisely because of their disparate character, can enable a cognizing organism to accomplish tasks that it would not be able to achieve by way of either type of process alone" (Rowlands, 2010: 88).

The initial condition for extended knowledge is the acquisition and processing of information by an extended cognitive system. This procedure may

[25] Then, we can also reject the problematic condition of past endorsement — both too restrictive and ineffective (as proven by Jens Bjerring and Nikolaj Pedersen in the Cut and Paste argument).

[26] The objection is addressed by Andy Clark (Clark, 2010: 82–85).

benefit from all of the discussed CE strategies, but a special role should be given to external objects with cognitive functions.[27] Some cases of CE related to biochemical and behavioural strategies transforming biological organisms will not belong to the cases of extended knowledge due to the lack of an external artifact with an additional representational function. It is therefore necessary to consider both the role of the conscious subject in forming a true belief and the role of the external component in providing and maintaining information. This condition becomes clear in the cases of extended perception (e.g. with the use of night vision-devises or remote cameras). Information acquisition involves a coupled system consisting of the subject (which may be subject to cognitive enhancement with the use of biochemical and behavioural strategies) and cognitive artifacts. It is the artifact that is often the most relevant link, due to the aim of the operation that requires the use of external sub-systems. Knowledge can be extended in the sense that the given cognitive process leading to the acquisition of knowledge results from the proper integration and relevant support from cognitive artifacts. It is worth noting that the cases of extended perception do not involve the difficulty of the subject needing to possess dispositional beliefs. However, extended cognition clearly takes place.

Rowlands' assumption that cognitive processes are established on a foundation of basic strategies for coping with the world demonstrates the simultaneously revealing and disclosing nature of cognition. These operations are aimed at an acquisition of information, which often involves the manipulation of the elements of the external environment in a way that the acquisition of information is possible and, at the same time, economical. When it comes to veracity of beliefs, at this level, the role of reliable cognitive practices becomes clear. Reliabilism seems to be the valid approach to explain extended knowledge due to the broad meaning of the term reliability, which should be equated with the tendency to form true beliefs. Reliability of the process is related to the relatively infallible functioning of all the components of an extended cognitive system. At the same time, it seems that the role of cognitive ability postulated by Pritchard should be treated as an auxiliary function of reliability in general (like graded justification or the level of the reliability of external components). In many cases (e.g. extended perception), the acquisition of extended knowledge depends on the functionality offered by the very extensions.

[27] Some cases of CE related to biochemical and behavioural strategies transforming biological organisms will not belong to the cases of extended knowledge due to the lack of an external artifact with an additional representational function.

CONCLUSION

Knowledge can therefore be extended in the sense that a given cognitive process leading to the acquisition of knowledge is the result of a relevant support from external elements that have a cognitive function. By their very nature, knowledge creation processes must be reliable, which is also accompanied by a degree of justification and epistemic credit, as well as the extent and type of cognitive enhancement strategies used on information processing.

In order to illustrate the place of extended knowledge and the relationship between different types of knowledge, I propose an initial three-level model of knowledge. This broadly defined system includes extended knowledge and different, yet complementary dimensions: the dimension of the subject's individual knowledge and knowledge of a social nature. Depending on the importance attributed to the given level, we can distinguish between different kinds of knowledge. For example, cooperation between extended and social knowledge results in the emergence of distributed knowledge. Moreover, in the proposed model, there is a place for extended knowledge in the strong sense (when knowledge is in fact the result of the functionality of a cognitive artifact) and extended knowledge in the weak sense (when knowledge, apart from its role as a cognitive artifact, is to a large extent the result of the subject's cognitive ability). In all the cases of knowledge described, the conclusions of the reliabilist approach, which assumes that the creation and acquisition of knowledge is based on reliable cognitive processes and practices, remain in force.

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