

External Representations Reconsidered: Against the Reification of Cognitive Extensions

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Abstract

Attempts to account for the significance of materiality for cognition should pay special attention to the vehicle in which meaning and information are embedded. Distributed cognition pays surprisingly little attention to conceptualizing the distinction between transitory and durable representations. I use the example of David Kirsh's research to argue that the bias toward defining cognitive extensions in terms of stable objects existing in space leads to their reification. The aim of this paper is to indicate the sources of reification and argue that implicit ambiguity emerges toward external representations due to an over-reified view of cognitive extensions.

Keywords: external representations; cognitive extensions; cognitive artifacts; distributed cognition; reification; transient representations; durable representations.

Introduction

One of the most important questions for the framework of distributed cognition is how material objects in the external world affect the human mind. Bridging the gap between materiality and cognition becomes therefore one of the most fundamental challenges faced by the framework of distributed cognition. To tackle this problem the concept of functional coupling between the external world and the organism is introduced (Clark, 2008; Clark & Chalmers, 1998). Debate on the nature and conditions of this coupling dominates the current discussion of the extended and distributed mind. In this context, another question arises: "what are the paradigmatic external entities to enter into that coupling?" (Greif, 2015, p. 1). To answer this question, distributed cognition usually employs examples such

as maps, diagrams, notes etc., usually called external representations, cognitive artifacts or material symbols. Generally speaking, different props and tools can be called cognitive extensions. In this investigation I will consider which features of cognitive extensions are assumed to be the most significant.

First, I will use research by David Kirsh as a representative sample of research on the external scaffoldings in order to exhibit the way distributed cognition conceptualizes extensions of the mind. Then, by extracting the basic features of external representations, I will illustrate that Kirsh's understanding of cognitive extensions is over-reified. This means that the implicit conceptual schema applied to distinguish between internal and external representations presumes cognitive extensions to be persistent objects with spatial dimensions that are tangible and visually accessible. Next, to justify the claim that Kirsh's investigations are not an isolated case of reification, I will introduce the concept of cognitive artifacts as used by Lambros Malafouris and the notion of material linguistic signs applied by Andy Clark. Last, I will indicate the conceptual sources of the reified view of cognitive extensions. The general aim of this paper is to highlight the fact that the criteria (such as durability, spatial extendedness, independence) used for drawing a distinction between internal and external representations are imperfect because they hinder conceptualization of another important distinction between transient and durable extensions. Although the division between transitory and stable extensions is not completely neglected in distributed cognition, neither is it seriously examined.

2. Kirsh on External Representations

In a 2010 paper, D. Kirsh summarizes the research conducted in the framework of distributed cognition regarding the features and functions of external representations. He aptly indicates that "All too often, the extraordinary value of externalization and interaction is reduced to a boring claim about external memory" (Kirsh, 2010, p. 445). According to Kirsh, research regarding external representations tends to limit the functions of cognitive tools to mere extensions of internal memory. Instead he shows that there is more to external representations than mere quantitative changes in the subjects' memory load. While trying to avoid simplistic appeals to external representations, he distinguishes seven closely related ways in which external representations enhance cognition.

The first and most general function of external representations is their potential to strengthen human cognitive faculties by delegating some computations necessary for task performance to the external world. This enables humans to save their limited computational powers (Clark, 2008; Dennett, 1997; Kirsh, 2009). The process occurs first by virtue of "physical constraint and visual hints" (Kirsh, 2010, p. 443) that guide attention and perception and support working memory. Physical constraints imposed on actions and cognitive processes by external representations limit potential interpretations and—by guiding actions sequentially—reduce the complexity of the task so it can be performed

with greater efficiency and effectiveness. Moreover, external representations save our limited computational resources by “explicitly involving visual and motor cortex” (Kirsh, 2010, p. 443). Visual stimuli can in turn prime specific associations which are otherwise unavailable. When the complexity of the problem increases, making use of visual and motoric stimuli is particularly rewarding and the effort invested in the creation of external representation quickly pays off. Although there are serious doubts whether it is possible to precisely measure the cost of cognition in terms of the internal resources needed to perform a task (Larkin & Simon, 1987; Scaife & Rogers, 1996), it can still be argued that tangible representations enable people to increase the speed and accuracy of their problem solving (efficiency) and deal with more difficult problems (effectiveness). Studies performed on players of Tetris, the tower of Hanoi problem, tic tac toe and the game of fifteen clearly show that it is possible to quantitatively measure the increase in both effectiveness and efficiency of performance (Kirsh, 2009; Kirsh & Maglio, 1994; Zhang, 1997). Therefore, the claim that extensions of the mind allow the costs of cognition to be reduced is not merely a figure of speech but should be read literally.

Creating sharable objects of thought is the second function of external representations. External representations are commonly used for communication. Therefore, cognitive extensions might be conceived primarily as a means for transmitting ideas from one person to another. The communicative function of external representations may seem quite trivial. It is trivial indeed, but only if communication is conceived in terms of the transmission of information. If, however, communication is understood as a genuine process by which common meanings are created, negotiated and shared among social actors (Garfinkel, 1991; Schutz, 1967), a more profound function of external representations emerges. Kirsh appears to use both understandings of communication when he describes the way external representations help choreographers to communicate their ideas about a dancer’s movements (communication as transmission) and how their ideas are further constructed and elaborated by referring to the external representations the choreographer creates (communication as a construction of common meanings). For example, a choreographer uses a video of a dancer and visual annotations on her moves in order to demonstrate torsion. By making the choreographer’s intentions explicit, the practice of annotating the video helps to share otherwise intangible ideas regarding complex movements. Moreover, the explicitness of representation enables people to discuss different aspects of the dancer’s movements in detail, thus developing new and complex ideas regarding the dance. Kirsh stresses that the external representations perform their functions primarily by virtue of being persistent and extended in space, which in turn enables manual operations and spatial rearrangements (Kirsh, 2010, 2013).

This leads to the third way in which external representations enhance cognition. According to Kirsh, compared to internal representations, the mere material existence of external representations enables new forms of interaction between the representations and their users. Unlike internal representations, they can be manually manipulated, rearranged, juxtaposed or substituted to enable new forms of comparison and analysis. As exhibited in classical research on Tetris players, external representations, by virtue of their tangibility, lower the

cost of cognition (Kirsh & Maglio, 1994). This function of external representations is commonly acknowledged in professional domains of formal sciences (i.e., programming, developing formal proofs; Hutchins, 1995) as well as in everyday practices (i.e., playing scrabble, jigsaw puzzles, tinkering; Kirsh, 1995). Tangibility is closely related to the durability of cognitive extensions due to the fact that both features are grounded in the spatial extendedness of the representations. Stable architectural models are created not only for the sake of communication but, more importantly, they are used to ensure the consistency of the project. Since “inconsistency is physically unrealizable” (Kirsh, 2010, p. 448) the creation of an actual material model grants its self-consistency. Moreover, once the model is created it exists independently of the author. In consequence, for recipients unfamiliar with the authors’ intentions it can reveal new and unanticipated features, as often happens in the case of works of art or literature. The case of ambiguous figures nicely exemplifies this affordance of external representations. Chambers and Reisberg (1985) demonstrated that internal representations are unsuitable for distinguishing competing interpretations of ambiguous figures. Unlike internal representations, a picture of an ambiguous figure and its visual availability affords a special way of looking at the figure that renders the ambiguity explicit. Moreover, the temporal stability of the external representations means that there is extra time to make additional interpretations.

Facilitating re-representation and explicitness are subsequent (the fourth and fifth) consequences of employing external representations in cognition. They correspond nicely with the well-known Herbert Simon hypothesis that “solving a problem simply means representing it so as to make the solution transparent” (Simon, 1996, p. 132). Rendering information explicit by means of re-representation is a strategy commonly used in formal sciences. For example, developing a formal proof largely consists of rearranging and substituting less explicit representations for more explicit ones in order to make the solution directly available (Hutchins, 1995; Kirsh, 2010; Simon, 1996). This function of mathematical notation can be nicely illustrated by tracking the history of scientific inventions. Wojciech Sady (2013), when giving a detailed description of how Max Planck discovered the concept of quanta, argues that the very idea was not created in Max Planck’s head but first appeared on paper as a final solution for a set of equations. Sady argues that Planck did not intend to instigate a scientific revolution, nor was it his genius that enabled him to think beyond the paradigm of his time. Curiously enough, for 12 years after his invention Planck struggled to eliminate the concept of quanta from physics (Sady, 2013, p. 527). Therefore, it can be said that a scientific revolution took place on paper, beyond the awareness of its author and in conflict with the social constraints of his time, through systematic re-representations of the problem.

A further example of how cognitive extensions enable explicit representation comes from work in the psychology of education by David Olson, who convincingly demonstrates that certain aspects of language and thought become explicit only through the use of writing. Olson argues that writing should not be conceived as a mere tool for communication or as a reservoir for information. It is rather a technology of thought enabling new attitudes toward language. Writing essentially introduces distance between the speaker and his or her

linguistic productions: it enables the language user to take language “off line” (Olson & Oatley, 2014), creating persistent objects that are to some extent separated from the immediate context of the utterance. What writing does for language is analogical to the function of graphical representation in the case of ambiguous figures. Graphical representations enable subjects to make additional interpretations of the pictures, which are otherwise unavailable. Similarly, by virtue of its stability, writing enables language users to make a clear distinction between what was literally said and how the utterance should be interpreted, i.e., the literal meaning of the speech act can be differentiated from its illocutionary force (Olson, 1994, p. 65–115). Moreover, the process of re-representing language in different media makes certain otherwise intangible aspects of language such as phonemes, words and sentences, explicit, leading to their objectification. Empirical studies confirm that the emergence of the concept of an individual word is tightly coupled with its graphical representation (Homer & Olson, 1999; Olson, 2013; Olson & Astington, 1990).

Building arbitrary complex structures is the sixth way cognitive extensions can impact cognition. As indicated by Kirsh this function can be drawn from already discussed features of external representations: persistence, tangibility and re-representation. The role of external representations for building complex structures is evident in the case of abstract mathematical objects, which are unthinkable without formal notation or complex architectural design.

2.1. Extracting the basic features of cognitive extensions.

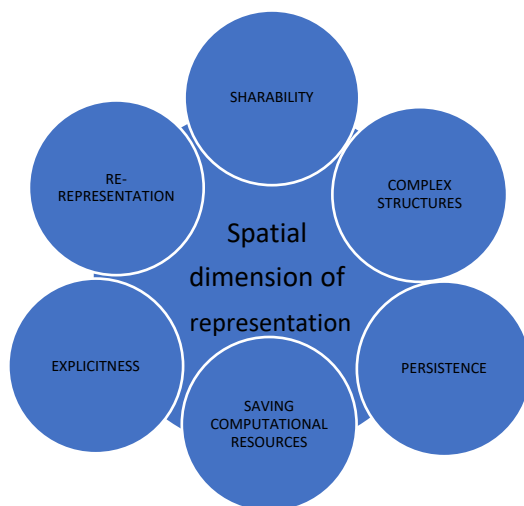


Figure 1. Diagram 1: Spatial extendedness as a key feature of external representations (prepared by the author)

Up to this point¹ saving computational resources, creating shareable objects of thought and persistent referents, enabling re-representation and explicitness and building complex structures have all been claimed to derive from the materiality of external representations. However, the term “materiality” here is specifically understood. According to Kirsh, the material existence of cognitive extensions essentially means that they are extended in space. Therefore, all the enlisted functions of external representations are based upon their spatial extendedness (see diagram 1).

As with any material thing, external representations can be characterized in terms of space and time. The spatial dimension of representations, i.e., extendedness and precise location, provides fulcrums for attention essential for creating sharable objects of thought or constructing complex ideas or models. In addition, when temporal aspects of cognitive extension are concerned, durability comes to the fore. Kirsh stresses that a the “key difference between internal and external representations . . . is their difference in stability and persistence over time” (Kirsh, 2010, p. 447). Furthermore, spatiality and durability go hand with hand with independence from the user. Once created, an external representation can be utilized in the absence of its author and stored and accumulated for other users. These features are crucial in Kirsh’s approach to cognitive extensions for two reasons.

First, the claim about the specific materiality of cognitive extensions is important because other essential features of extensions can be drawn from their durability and spatiality. Two of them, visual access and tangibility, occupy a special place in Kirsh’s argumentation. If representations are spatial and stable, they can be perceptually grasped through vision. Kirsh (2010) puts it this way: “by operating with external *material*, pen, paper, ruler . . . subjects benefit from physical constraint and visual hints that help cognition” (p. 443). As in the case of the ambiguous figures mentioned above, visual processing gives cognitive access to the specific information necessary to generate competing interpretations of a figure. Moreover, the persistence and stability of cognitive extensions also determine the kind of actions available. Therefore, tangibility or tactility comes to the fore. These characteristics are essential for re-representation, rearrangement and sharing. To use Kirsh’s own words, the specific value of external representations lies in that “They can be operated on in different ways; they can be manually duplicated, and rearranged. They can be shared with other people. Tools can be applied to them. These differences between internal and external representations are incredibly significant” (Kirsh, 2010, p. 446). In sum, Kirsh argues that because external representations are material, they are extended in space (spatiality) and time (durability). Subsequently, considering the materiality of extensions and the construction of the human senses, these physical features grant particular ways of access: tangibility and visibility. This line of thought is exhibited in diagram 2.

¹ The seventh function of external representations discussed by Kirsh is to deliver more natural representations than the internal (e.g., speech acts, gestures, musical performance). I intentionally skip this issue here and introduce it later in order to show that this aspect of external representation does not align with his own conceptual schema.

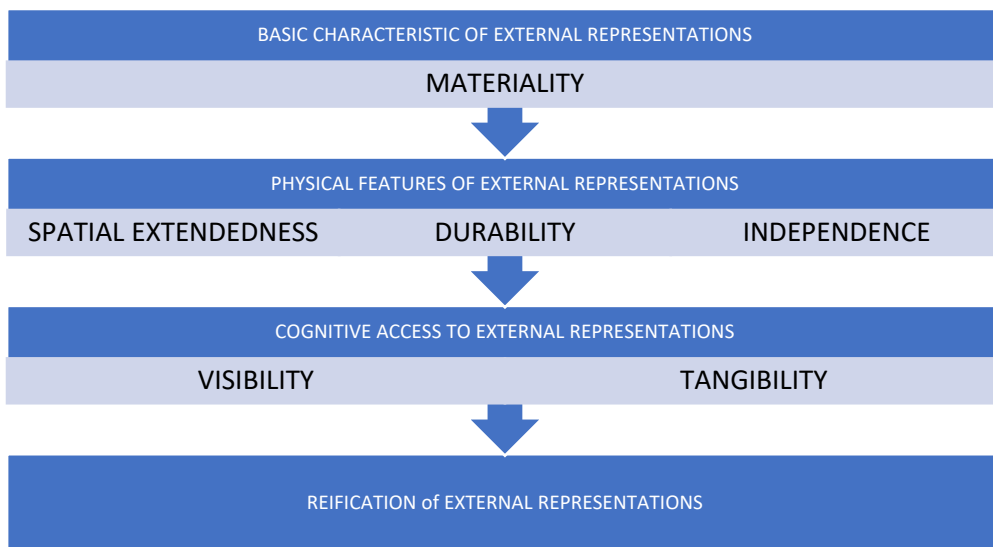


Figure 2. Extracting basic features of material representations (prepared by the author)

2.2. Cognitive Extensions Reified

The second reason that the claim about the materiality of cognitive extension is essential for Kirsh’s argumentation is that it leads to the reification of external representations. Since five enlisted features of external representations are mutually dependent and are collectively the key features that make it possible to draw a distinction between internal and external representations, one can reasonably argue that, according to the conceptual schema applied by Kirsh, all external representations are necessarily spatial, durable, independent of the user, tangible and visually accessible. Reification means that external representation is conceived basically as a solid entity and its essential characteristics consist of durability and spatiality. When discussing the process of creating sharable objects of thought, Kirsh (2010) himself explicitly identifies the process of creating the cognitive extension with reification:

When someone externalizes a structure, they are communicating with themselves, as well as making it possible for others to share with them a common focus. An externalized structure can be shared as an object of thought. **This reification of internal object – this externalization** – has benefits for both parties (p. 444; my emphasis)

Taken as a mere description of the facts, the claim that spatial, durable and reified structures are cognitively useful is completely accurate. However, Kirsh (2010) appears to make a stronger point for reification. He suggests that the “**key difference between internal and external representations . . . is their difference in stability and persistence over time**” (p. 447; my emphasis) and “**external representations are extended in space, not just in time . . . they can be manually duplicated, and rearranged. . . . These differences between internal and external representations are incredibly significant**” (p. 446; my

emphasis). In consequence, phenomena that are not spatial and durable can hardly be included in the category of external representations. Moreover, the majority of the examples used to justify claims of the cognitive value of external resources such as diagrams, maps, recipes, videos, Tetris, jigsaw puzzles and mathematical and musical notations suggest that cognitive extensions are equal to visual representations. Generally speaking, the contrast between the internal and external representations applied by Kirsh is symmetrical to the distinction between transient and durable representations. There is an implicit assumption here that all external representations possess a spatial dimension and are therefore more or less durable. If all internal representations are transient, intangible and dependent on the agent, external representations must be durable, tangible and independent. Therefore, in principle, the reified view of cognitive extensions rules out more dynamic and transient representations such as speech acts.

In sum, reified external representations can be described as contrasting internal representations on four levels. Taking the temporal dimension into account, external representations are durable while internal representations are transient. Concerning existence in space, external representations have clear location and form, while internal representations lack concrete spatial location and shape. In terms of the relationship between the creator and his or her creation, cognitive extension is independent, while internal representation is always grounded in the activity of the author. In terms of perceptual access, external representations are visually available, while internal representations are not. Last, in terms of actions, cognitive extensions afford manipulability, while internal representations are intangible. This conceptual schema leads to identification between external and graphical representations. However, not all external representations need to be graphical. If one appreciates the simple fact that transient linguistic productions are among external representations, there appears to be a genuine problem introducing these kinds of phenomena into the classification Kirsh suggests (see Table 1).

Table 1: Levels of description of representations (prepared by the author)

Levels of description	INTERNAL REPRESENTATIONS	EXTERNAL REPRESENTATIONS REIFIED	DYNAMIC EXTERNAL REPRESENTATIONS (SPEECH ACTS)
TIME	Transitive	Durable	Transitive
SPACE	Lack of spatial localization	Concrete localization	Lack of spatial localization
RELATION CREATOR – CREATION	Dependence	Independence	Dependence
PERCEPTUAL ACCESS	Invisible	Vision	Invisible
ACTION AFFORDED	Intangible	Tangible	Intangible

Table 1 shows that there is no room for transient representations in the conceptual schema applied by Kirsh. Orally produced utterances are undoubtedly external representations. However, such productions lack a precise spatial location², durability and independence—they cannot be visually inspected and are intangible. All the listed features are credited by Kirsh as essential characteristics of external representations. Therefore, the attempt to include transient representations results willy-nilly in the actual identification of dynamic linguistic representations with internal representations since both are ascribed with the same features. In this case a tendency to treat transient representations as somehow less material than durable representations can be observed. As indicated by Goran Sonesson (2007) this bias in pure form can be observed among Enlightenment thinkers such as Diderot or Lessing, who viewed spoken language as built from “more subtle material” (Sonesson, 2007, p. 35) than graphical representations. I do not suggest that Kirsh would agree with Lessing or Diderot, but I argue that his conceptual schema implies this way of reasoning. Kirsh’s contrast between internal and external representations is too narrow to account for a whole variety of cognitive extensions because the criterion used to draw this division is too simplistic. In fact, the materiality is undoubtedly a distinctive feature of external representations since there is no information without physical incarnation. However, materiality of representation can hardly be identified solely with spatiality and durability. These features are essential for some class of cognitive extensions (i.e., pictures, diagrams, maps) but other external representations exist without them.

3. Are Cognitive Extensions Necessarily Extended in Space?

The answer to the question provided by the title of this section depends on how extendedness is conceived. Interpreted literally in terms of physical features, all external representations (even verbal utterances) cover a degree of area, therefore the answer is affirmative. The answer is different however when spatiality is approached from a phenomenological angle. In typical linguistic interaction the spatial extent of the voice is imperceptible by a standard speaker/listener; for the standard user of transitive acoustic representations their physical spatiality is inaccessible. Therefore, it makes sense to say that in the experience of the user, transient representations are not extended in space. Due to the fact that transient representations have no sharp limits, stable shapes or location, they do not afford the interaction that is typical in case of spatial and durable representations. For instance, speech acts or gestures are not tangible since they are not reified, cannot be easily divorced from their users and are not easily accumulated.

Kirsh is well aware of the significance of transient representations. In fact, the seventh function of external representations, intentionally omitted until now, refers to acoustic and transient representations. According to Kirsh, performing music as opposed to written musical notation delivers more natural encoding of information than musical notation. The

² To be precise, an acoustic representation can be considered spatially extended as each voice emission has some spatial coverage. More on this in the next section.

same applies to speech and gestures which are essential in supporting fast processing of information. Moreover, the basic question Kirsh (2010) asks regarding why people performing cognitive tasks do something more than just “sit still and ‘think’” (p. 441) is about the interaction between the person and the external world and is concerned with the transient representations produced during this interaction. In other papers Kirsh (2013) also analyses the multiple transient representations used in practicing dance (e.g., the practice of marking). Clearly, Kirsh appreciates the role of human extensions without the quality of precise location, durability, tangibility and visuality (Wachowski, 2014).

Why then do I argue that Kirsh neglects transitive representations? My point is that once he defines external representations as stable spatial objects, the introduction of the issue of more plastic representations seems somewhat artificial. If the construction of Kirsh’s (2010) argumentation is considered, it becomes evident that the section on plastic representations functions more as an appendix to discussion of the more profound consequences generated by durable representations. Therefore, it gives the impression that transient representations are somehow accidentally introduced. To use Kirsh’s (2010) own words: “If external manipulability matches the internal requirements for speed, then an external medium has the plasticity to be a **candidate for** thinking in” (p. 451, my emphasis). If this passage is taken literally, plastic representation is actually used or can only be a “candidate for” proper cognitive extension in special cases when specific plasticity and velocity of transformation are required. In fact, plastic representations are the most basic and constantly used instantiations of cognitive extensions (i.e., language, gestures). I do not maintain that transient representations are a blind spot in Kirsh’s research on cognitive extensions. I do however claim that an overemphasis of durability and spatial extendedness give rise to an implicit ambiguity toward cognitive extensions. On the one hand, Kirsh explicitly states that distinctive features of external representations are spatial localization and durability; on the other, he analyzes transient representations. The introduction of transient extensions is necessary in order to complete the picture of external representations with such obvious cases as speech acts. It seems however that plastic representations do not fit his own conceptual schema which identifies external representations with durable representations.

The question arises of whether the bias toward reification of cognitive extensions is characteristic only of Kirsh’s work or is a more widespread tendency. There are many examples of research on transient and intangible representations in distributed cognition, especially in work on situated language and gestures (Becvar, Hollan, & Hutchins, 2008; Cowley & Vallee-Tourangeau, 2013; Hutchins, 2005). There are however some instances of evident bypassing of the role and functions of transient extensions.

3.1. Malafouris and Cognitive Artifacts

In material engagement theory, Lambros Malafouris (2013; Malafouris & Renfrew, 2010) following Kirsh, asks the usually neglected but essential question of how the material properties of external representations influence the way people interact with these

representations. In his attempt to describe the cognitive life of things, one can observe the process of reification of cognitive extensions described above. The predominantly used synonyms for extensions of the mind such as “things,” “objects” and “artifacts” are the first symptom of reification. The next indicator is that Malafouris considers linear B tablets, ancient beads, potter’s wheels and stone tools etc. as paradigmatic instances of cognitive extensions. There is nothing surprising, one may claim, in this process of reification since Malafouris is genuinely an archaeologist who applies a conceptual schema of distributed cognition to reinterpret traditional archaeological research. He cannot help but think about extensions reified, the argument goes, simply because transient artifacts evaporate quickly and are unavailable in an archaeological time scale. This is not the whole picture, however. His investigations regarding the nature and properties of material signs deliver the ultimate indicator of the reification implicit in his thinking about extensions of the mind. In his attempt to criticize the disembodied concept of the sign developed in structural semiotics he characterizes his own concept of the material sign as follows:

The **durable nature of the material sign** clearly contrasts with **the ephemeral nature of the linguistic sign**. A physical sign can be touched, carried, worn, possessed, exchanged, stored, transfigured or destroyed. Things act most powerfully at the non-discursive level, incorporating qualities (such as colors, textures, and smell) that affect human cognition in ways that are rarely explicitly conceptualized. These are **properties not afforded by the nature of the linguistic sign**. (Malafouris, 2013, p. 95; my emphasis)

In this example Malafouris is equating the materiality of representation with its visual and stable character. It is symptomatic of a reified view of extension that visual and tangible qualities are highlighted, while at the same time acoustic properties of linguistic material signs are overlooked. In this regard an opposition emerges between written language, which is understood as fundamentally material, and spoken language, which is conceived as less material. The inheritance of the Enlightenment can be observed here in ascribing materiality only to reified representations. In the passage above, by neglecting transient representations Malafouris implicitly suggests that transitory representations are somehow less material. This becomes clear when considering the sharp opposition between the material sign and the linguistic sign introduced by Malafouris. As in Kirsh’s approach, materiality is identified with stability, visuality and tangibility while plasticity and intangibility is ascribed to the “more ephemeral linguistic sign” (Malafouris, 2013, p. 95) of a supposedly verbal nature.

3.2. Clark and Material Symbols

The second example of a reified view of cognitive extensions is delivered by the work of Andy Clark. In his and David Chalmers’ (1998) argument on extended mind they are almost exclusively concerned with reified representations such as zoids in Tetris or entries in the example of Otto’s notebook. These are only clues for supposing that Clark implicitly reifies cognitive extensions. More data to justify this claim can be found in another paper by Clark (1998) in which he discusses how language as a cognitive tool enhances cognition and claims that

Public language . . . is a species of **external artifact** whose current adaptive value is partially constituted by its role in re-shaping the kinds of computational space that our biological brains must negotiate in order to solve certain types of problems . . . This computational role of language has been somewhat neglected . . . in recent cognitive science . . . it **has had little to say . . . about the special properties of the external media that support linguistic encodings.** (Clark, 1998, p. 162; my emphasis)

Clark is particularly focused on complementing the classical picture of the relation between mind and language by highlighting the significance of the material dimension of representation. Although he distinguishes between transient (verbal) and durable (textual) linguistic representations, this division does not impact on his argumentation. While discussing six ways language enhances human computational powers, he treats both kinds of representations (stable and transitory) as having essentially the same cognitive consequences. Moreover, the examples Clark uses refer mainly to the durable cognitive extensions delivered by the written representation of language. Finally, his investigations into the way language contributes to the development of meta-cognition refer mainly to the process of decontextualizing communication and cognition allowed by linguistic signs. The process of decontextualization is possible because words preserve their literal meaning in different contexts. Although it is not explicitly stated, it can be inferred that while discussing this issue Clark has in mind language reified in its graphical representation since, in primarily oral cultures, spoken language is not as decontextualized as suggested by Clark and the issue of literal meaning does not even arise. As argued in anthropology of communication (Olson, 1994, 2013; Ong, 2002), the idea of stable and literal meaning emerges with the advent of dictionaries and assumes the use of a stable graphical representation of a spoken language. The claim that sentences as semantically and syntactically integrated wholes are the basic units of language processing provides another indicator that while analyzing the cognitive consequences of language, Clark in fact thinks of the cognitive consequences of its stable graphical representation. The thesis that sentences are basic units of language processing is completely accurate in the case of a literate person creating a research article. This picture, however is less justified when informal oral conversation is concerned or even unjustified in the case of pre-literate children or illiterate adults (Homer & Olson, 1999). Sociolinguistics emphasizes that less educated people commonly apply restricted linguistic code which utilizes equivalents of sentences with few words to transfer all necessary meaning. When a great deal of knowledge is shared among members of a well-integrated group, restricted code is especially effective. In these situations, thoughts are not completed in full sentential forms because it is cognitively superfluous. Necessary information is expressed and transferred in spite of the grammatically incomplete structures (Bernstein, 1964). If Clark is concerned with the material dimension of cognitive extensions, his description of how language enhances cognition should be particularly sensitive to the differences between transient and durable linguistic representations. As argued above, the distinction is not unnoticed, but not seriously scrutinized either.

4. Sources of Reification: Does Extension Mean Reification?

Explaining why reified representations such as maps, diagrams and notations are paradigmatic examples of cognitive extensions may be relatively straightforward. The case of durable and spatial representations supports the claim that cognition is fundamentally augmented by external props and tools with strikingly vivid illustrations. Therefore, it can be said that thinking of external representations in terms of independent and tangible objects is dictated by the requirements of the rhetoric which serve to justify the hypothesis of extended and distributed cognition. It seems however that the reasons for reification reach deeper than the instrumental pressures of rhetoric. There are at least three conceptual reasons for the tendency of reification.

First, the relatively common tendency to reify cognitive extensions can be explained by appealing to the notion of extension itself. Basic intuition regarding the concept of extension of mind is grounded in a threefold association. The meaning of the process of extension is associated first with the expression of a mental state and the process of grounding it in a physical vehicle. Furthermore, if something is extended it means that it has a spatial dimension. Last, extension is more or less equivalent to alienation since the extended mental state starts to exist on its own, independent of its creator. As indicated in diagram 2, reification of external representation starts with associating it with independence and spatial extendedness, which in turn are associated with durability. These qualities seem to emerge from the very notion of the term “extension.”

Second, the tendency to reify cognitive extension reveals the application of a kind of Cartesian dichotomy between inside and outside. Kirsh’s claim that spatial location is the key feature for drawing the distinction between internal and external representations is highly Cartesian in spirit. In order to distinguish between internal and external representations he simply uses the same criterion as Descartes to distinguish between *res cogitans* and *res extensa*.

A third reason for reification emerges from the fact that external representations are understood in terms of the product and creation of human actions. There is nothing more natural than thinking of extensions of mind as an outcome of human work—as a kind of artifact. The term artifact however assumes reification since it denotes an object or a thing. Hilpinen (2011) distinguishes two basic ways of understanding the term “artifact.” In a narrow sense, an artifact is a product of intentional human activity, e.g., tools, weapons, clothing. In a broader sense, the term denotes any environmental element restructured by a human being either intentionally or unintentionally (leftovers, by-products, waste etc.). In both cases the artifact refers to durable and spatially extended objects independent of their creators and users. Therefore, if the fundamental ontological opposition between the action and its product is applied to frame discussion of cognitive extensions, the tendency for reification emerges almost automatically.

5. Summary

An analysis of Kirsh's conception of external representations reveals the ambiguity in his analytical schema towards the notion of external representations. On the one hand Kirsh explicitly introduces durability and spatiality as the key criteria for drawing the distinction between external and internal representations. On the other hand, his investigations include ephemeral representations which do not match his own conceptual schema since by definition they are not durable. Due to an overemphasis on durability, independence and spatial extendedness, external representations tend to be conceived as reified. Reification means that cognitive extension is defined in terms of stable, visual and tangible objects. The tendency toward reification is characteristic not only of Kirsh's work; it is widespread among other theories dealing with the question of how material tools impact human cognition. This tendency can be observed in the framework of distributed cognition represented by L. Malaofuris and A. Clark.

More interesting however is the observation that the tendency toward reification in distributed cognition does not emerge solely from such trivial matters as the requirements of argumentation or the vivid illustrations needed to justify the controversial hypothesis of extended mind. It seems that thinking on external representations in terms of stable objects emerges primarily from basic intuition regarding the idea of cognitive extension itself. I have indicated three conceptual sources of the reification.

If the argument developed in this paper is accurate, more detailed and systematic reflection is needed in order to diagnose the undesirable conceptual consequences of reification. The most general implication of the reified view of external representations is that it obstructs the role of more ephemeral cognitive extensions (such as speech acts, gestures) because it implies that stability and spatiality are all that matters in thinking with external props and tools. This is why a tension between a reified and a more processual approach to cognitive extensions emerges. In other words, too much emphasis on artifacts conceived as stable and spatial objects leads to transient extensions of the mind being overlooked.

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