

What Cognition Does for Wikis

Rut Jesus

Center for Philosophy of Nature and Science Studies
University of Copenhagen, Denmark

vulpeto@nbi.dk

ABSTRACT

Theoretical frameworks need to be developed to account for the phenomenon of Wikipedia and writing in Wikis. In this paper, a cognitive framework divides processes into the categories of *Cognition for Planning* and *Cognition for Improvising*. This distinction is applied to Wikipedia to understand the many small and the few big edits by which Wikipedia's articles grow. The paper relates the distinction to Lessig's Read-Only and Read-Write, to Benkler's modularity and granularity of contributions and to Turkle and Papert's bricoleurs and planners. It argues that Wikipedia thrives because it harnesses a *Cognition for Improvising* surplus oriented by kindness and trust towards distant others and proposes that *Cognition for Improvising* is a determinant mode for the success of Wikis and Wikipedia. The theoretical framework can be a starting point for a cognitive discussion of wikis, peer-produced commons and new patterns of collaboration.

Categories and Subject Descriptors

H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces—*Computer-supported cooperative work, Web-based interaction*; K.4.3 [Computers and Society]: Organizational Impacts—*Computer-supported collaborative work*; J.4 [Social and Behavioral Sciences]: Miscellaneous.

General Terms

Algorithms, Design, Human Factors.

Keywords

Wikis, Wikipedia, Collaboration, Theoretical Development, Cognition for Planning, Cognition for Improvising, Cognitive Surplus.

INTRODUCTION

Motivation

It has been repeated that “The problem with Wikipedia is that it only works in practice. In theory, it can never work.” This claim has been made into the zeroeth law of Wikipedia [1]. This phrase can be understood in several ways, and therefore appeals to people from different quadrants. The phrase appeals to those who would argue from a moral point of view and count the number of good-doers and bad-doers in the world, who are surprised that the openness of Wikipedia attracts more people who contribute positively for the project than it attracts people who would destroy its viability. The phrase appeals to those pragmaticists, who like to point out that the success is visible, and that practice is what matters, not theories that utopias are or are not possible. As put by Clay Shirky: Wikipedia's “utility is settled, interesting questions lie elsewhere” [2]. Even if accuracy is being studied and is important to develop tools to help navigate the trustworthiness of the content, it is also a fact that Wikipedia is a top10 website, and is widely used, cited or not. The phrase about Wikipedia working in practice and not in theory also applies to research: it may be the

case that we can see the results of its success but lack accompanying theories to understand why and how Wikipedia works (game theory, for example, accounts for people only behaving by direct self-interest). The thread that will be pursued here is the development of a cognitive distinction to account for the phenomenon of the use of wikis, and, specifically, Wikipedia. Substantial research on Wikipedia has been done in the last few years, and presented in conferences such as WikiSym, but there is a clear lack of philosophical approaches (one issue of *Épisteme* dealt with the epistemology of Wikipedia [3]), and, with very few exceptions (such as the description of bot use to vandal fighting using distributed cognition [4]), cognitive theory has not been involved in Wikipedia research. Moreover, there has been ample discussion about who writes Wikipedia, both in speech and in research papers. Jimmy Wales emphasized the community who makes most of the edits [5], Aaron Swartz emphasized the size of the edits to conclude about the substantial additions by anonymous users [6], and a paper discussed the “Wisdom of the Crowds vs. the Rise of the Bourgeoisie” [7]. In the present paper, the focus is not on *who* writes Wikipedia but on the construction of a cognitive distinction to think about *how* Wikipedia is written – how to account for the many tinkering edits and the fewer substantial additions of content.

Cognitive Theory Umbrella

The distinction put forth in this paper between *Cognition for Planning* and *Cognition for Improvising* builds upon the dynamic and ecological views of cognition, which encompass Embodied, Situated and Distributed Cognitions (ESDC), a major trend in cognitive science [8-10]. In the last 15-20 years, these cognitive theories have set the focus on the embodiedness and embeddedness of the cognitive processes. In other words, these theories are not satisfied with the computational and brain-limited cognitivist theories and support, to a greater or lesser degree, that the environment, artifacts, and the body are important parts of the cognitive processes. The Extended Mind hypothesis, put forth by Clark and Chalmers [11] also plays a major role in these discussions, because it questions the philosophical place of the mind, when confronted with the claim that the mind might do more than just sit in the brain and compute purely abstract issues, but supports a stronger ontological claim than the weaker versions of ESDC. In this context, even a theory of cognition being ‘coordinated non-cognition’ [12] has been put forth. There has been a long discussion of what cognition (and cognizing) really means – is thinking purely mental symbol processing, is it problem-solving or is it information-processing involving body and environment? Although it is beyond the scope of this paper to resolve the issue of what cognition really is, taking into account the notion of cognitive artifacts is useful when speaking about wikis. Cognitive artifacts can range from physical objects, to behaviors, to processes that are used to aid, enhance or improve cognition. Some examples are a calendar, a shopping list or a

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computer. Wikis play a role in the cognitive processes of collaboration, and in the case of Wikipedia, a wiki is the mediating technology in the writing of the biggest encyclopedia. The distinction in this paper, between Cognition for Planning and Cognition for Improvising is inspired by ESDC approaches but is also transversal and complementary to those theories as the ESDC theories are mostly concerned with a *spatial* position of cognition, while this distinction is mostly concerned with a *temporal* position of cognition.

Plan

First, I will explain the two relations between Wikis and Cognition (*what cognition does for wikis* and *what wikis do for cognition*) to position this work as part of ‘what cognition does for wikis’. Then, I will construct a conceptual distinction between Cognition for Planning (CfP) and Cognition for Improvising (CfI) and show how it is a useful distinction to better understand Wikipedia. Then, the final argument is put forth where Wikipedia’s success depends on the Cognition for Improvising surplus, a mode of great use in a project that grows incrementally. The theoretical framework proposed here is part of a PhD thesis on cognition and Wikipedia, which includes data harvesting studies on co-authorship networks in Wikipedia (see, for example, Jesus *et al*, 2009 [13]). Although the data was important for the insights created, it is not shown here, to keep focus on developing a concise distinction.

WIKIS AND COGNITION

Wikis and cognition can be implicated in two ways: *what cognition does for wikis*, and *what wikis do for cognition*. Another way to understand the two directions of the implication between wikis and cognition is to consider two hypotheses, called weak and strong in relation to how much they alter our brain:

The Weak Hypothesis: Wikis work because, through them as a tool, particular aspects of human cognition are used. Cognition for Improvising was always “there”, and wikis profit from tapping into it.

The Strong Hypothesis: Not only wikis harness this surplus in Cognition for Improvising, but they also “shape” it. In this hypothesis, human cognition is changed/enhanced/extended by the use of wikis.

In this paper, it is the Weak hypothesis that is dealt with and investigated in greater depth. The Strong Hypothesis is more speculative, and more relevant to the understanding of cognition and to understanding the different cognitive milestones [14] than the Weak Hypothesis, which focuses on what cognitive processes are at play in the use of a wiki, and in the construction of Wikipedia.

COGNITION FOR PLANNING VS. COGNITION FOR IMPROVISING

Cognition for Planning (CfP) is the kind of cognition that we use when we sit down to reflect on an issue and make a decision. Cognition for Improvising (CfI) is the kind of cognition that we use when reaching for a glass of water, where the body ‘knows’ how to make the movements, one after the other to reach the glass of water.

Goal Level: At the extremes, higher level goals can look very different from lower level goals. Many smaller cognitive processes can constitute a bigger goal, in a modular way. Writing

an encyclopedic article is a goal higher than correcting a typo. Cognition for Planning is present when there are higher-level, very well-defined goals, while Cognition for Improvising is present when lower-level, even very low-level goals are the ones at stake. While making a calculation there is the clear goal of getting a result in the end. It involves making a computation in the mind, or using the help of pencil and paper, where several processes are applied (some of which we may not ‘know *how* we are doing them’). These processes constitute the ‘problem-solving’ process. Other cognitive processes can have much lower-level goals, so much at a low-level that they may even not be called ‘goals’, such as saying one word, or moving an arm.

Units: The minimum unit of analysis and of processing for Cognition for Planning is bigger than the minimum unit of analysis and of processing for Cognition for Improvising, in terms of time, decision and work. Cognition for Improvising is constituted by many small decisions, as in an improvisational dance, where each small decision brings the opportunity for the next. Cognition for Planning is constituted by greater decisions, like a rehearsed dance that encompasses decisions about the whole structure.

Action vs. Reaction: While Cognition for Planning is what we use in a coordinated effort to produce a specific result, *acting* upon the world (for example, saving food for the winter), Cognition for Improvising is what we use in replying to an immediate disturbance or interaction (for example, ducking if someone shoots), *reacting* to the world. Cognition for Planning allows us to construct futures, and remember pasts, while Cognition for Improvising allows us to deal with the here-and-now challenges.

Relations Between CfP and CfI

Having described the distinction between Cognition for Planning and Cognition for Improvising, it is important to stress that these ‘types’ of cognition can happen in parallel. There may be activities where we use one of these types of cognition, and other activities for which we use the other. Research activity, for example, comprises paper writing, which uses Cognition for Planning, but many of the sources of inspiration come from conversation, which usually uses Cognition for Improvising, as it is a quick exchange of small units of thought, quite reactive to what is going on. Cognition for Planning is a more complex category that includes Cognition for Improvising, thus these two types of cognition are often present simultaneously.

Using more Cognition for Improvising can happen if the cognitive overload is diminished. The notion of cognitive overload goes at least back to Simon [15] in writing “On how to decide what to do”. For example, some tasks take immense cognitive power, such as writing a thesis, where I need to decide what to write about, decide to sit at this precise moment, and also what to write (and much more...). If the tasks can be broken down into parts that are already defined, then, instead of using so much Cognition for Planning, one can use more Cognition for Improvising. A story from *Zen and the Art of Motorcycle Maintenance* [16] may elucidate this: the son is stuck wanting to write a letter to the mother and not knowing where to start. The father suggests that he’d keep it simple – he should first write a list of the things he wants to say and then make the decision of which one to say first.

To both decide what to write and what to write first can be too big a cognitive task, and therefore there is a cognitive overload.

Benkler's Modularity and Granularity Wikipedia as an encyclopedia and text

Breaking a cognitive task into smaller parts, relates to the modularity and granularity concepts proposed by Benkler [17]. "Modularity" describes the extent to which a project can be broken down into smaller components. These components can be produced independently and can later be assembled into a whole. "Granularity" describes the size of the components, in terms of the time and effort that an individual must invest in producing them. When a project has modules of small size, it more easily harnesses Cognition for Improvising. The nature of Wikipedia as both an *encyclopedia* and its support as *text* (in contrast with many FLOSS projects which are *programs* and written in *code*) increases the way by which Cognition for Improvising can be used as Wikipedia is quite modular and very fine-grained: it can be built from many small contributions. An encyclopedia is really a collection of articles; an article is a small module of cognitive 'coherence' (smaller than a book, for example). Moreover, text has a very small granularity, allowing contributions as small as the fixing of a comma or the addition of a reference.

COGNITION FOR IMPROVISING SURPLUS

Below it is argued that Wikipedia's and other wikis' success is partially a result from harnessing a surplus of Cognition for Improvising. Cognition for Improvising is used in very immediate, concrete surroundings, quite often embodied, or in interaction, in conversation, but encyclopedias were still being written using great amounts of Cognition for Planning. Someone would plan the distribution of work, and once given an assignment, a scholar would plan the writing of an encyclopedic article. This work wasn't absolutely individual, the article would be sent to the editors, and comments and corrections would be added. In the end, the editors would also check for style. Nonetheless, most of the cognitive work was being done with great amounts of Cognition for Planning. Cognition for Improvising is a mode that can be used for incremental writing. The use of this mode is independent from ethical and motivational reasons that stimulate people to contribute to Wikipedia. The motivation of belonging to a greater project, the security of the copyleft license, the interest in doing good are all crucial for Wikipedia's success, as well as many architectural decisions of the site and wikis which allow for discussion and negotiation, and the possibility of shaping the meta-level of Wikipedia.

Wikipedia is possible because there is the mode Cognition for Improvisation, which can be used because there is a surplus. Clay Shirky speaks of the "cognitive surplus" [18], in anecdotal form, when in a lecture he tells the story of explaining to a TV-producer the intricacies of making a Wikipedia article, to which he gets the question "But where do people find the time?" His witty answer is, "No one who works in TV gets to ask that question. You know where the time comes from. It comes from the cognitive surplus you've been masking for 50 years." Yochai Benkler, who has analyzed what he calls the "commons-based peer production" from an economic perspective in the book *The Wealth of Networks* (2006) [17], speaks of the difference between market and nonmarket production and describes some of the necessary characteristics of peer-production, in order for it to harness the excess capacity of time and interest in human beings. The

processing, storage, and communications capacity in computers are available to be used for activities whose rewards are not monetary or monetizable, directly or indirectly. Benkler describes extremely succinctly what the processes are by which the harnessing of this excess capacity can be effective:

For this excess capacity to be harnessed and become effective, the information production process must effectively integrate widely dispersed contributions, from many individual human beings and machines. These contributions are diverse in their quality, quantity, and focus, in their timing and geographic location. The great success of the Internet generally, and peer-production processes in particular, has been the adoption of technical and organizational architectures that have allowed them to pool such diverse efforts effectively. The core characteristics underlying the success of these enterprises are their modularity and their capacity to integrate many fine-grained contributions." (*in The Wealth of Networks*, [17])

Kindness-Trust Surplus

People have time, effort and kindness available to do things outside the markets and the quest for survival. Although people's lives are complex, in the normal lives we lead we usually act out of kindness and in ways that build trust to those close to us, and we do fewer acts of kindness for those farther away. We may, though, have a greater potential to do these acts of kindness and of building trust than what is necessary for building the close relationships, and therefore there is a surplus that can be exploited. It is possible to harness this potential because it responds to the human motivation of following 'higher' values, being part of something 'greater than themselves', contributing to the common good, altruism, and engaging in community. This tapping of the 'kindness surplus' is possible because there was an environment that felt trustworthy, safe, useful, and therefore the kindness-trust could be expressed. We were used to rely upon trust and kindness in a small immediate environment; now, with the right values, technologies and affordances, we can harness those capacities to produce something not any longer in the small immediate scale, but at a greater scale. Some internet projects have been more equalitarian, providing a space for trust at a distance, despite their rich-white-western biases. These new peer-production models somehow 'short circuited' these distances, and trust and kindness became visible.

Particular wiki characteristics

Wiki characteristics such as *watch this page*, *recent changes* (especially when wikis are smaller), and *discussion pages* – all support an immediate, reactive, and concrete mode of interaction and contribution, which uses Cognition for Improvisation. Just replying to a point in a discussion or fixing a typo in someone's just added paragraph are behaviors that contribute to the whole. *Watch this page* is an attention-grabber, whereby it is easier to reply to a change that was made, by correcting, improving, or reverting if it was the case of a small mistake, a good addition or an act of vandalism. *Recent changes* was the most important feature of wikis, as Ward Cunningham, their inventor, said, "we knew where the action was taking place" (Cunningham, open Space, WikiSym'09, personal communication). They also pointed the attention to where something was happening. A loose comparison would be to say that there is not a big need for Cognition for Planning if one were to walk by the main square of one's village and suddenly saw a group of people gathered. It would only be natural to join them and improvise a conversation

with a friend or an acquaintance, using Cognition for Improvising. Both *watch this page* and *recent changes* (and similar functions) also play on the stigmergic effect [19] whereby a change (an edit) left in the environment (an article), is a communication device about the possible next change to do. As for *discussion pages*, the implication of Cognition for Improvising is even more direct – engaging in a discussion is interacting back-and-forth, using more of the Cognition for Improvising than the Cognition for Planning.

Division of work

These two cognitions also reflect some of the spontaneous division of work that has been seen in Wikipedia. While the addition of a substantive piece of text is something that happens mostly using Cognition for Planning, the small tinkering is done with the Cognition for Improvising. In terms of number of edits there is a clear split where few edits add much previously-thought content, while many edits add a small change that is a quick-reactive contribution. The division between these two groups of edits follows the division between Cognition for Planning and Cognition for Improvising. Bots (small programs that edit systematically) fall out of this distinction, as their ‘behavior’ is mostly syntactic (example: find ‘tpyo’, replace by ‘typo’) and bots do not use the more intricate semantically-rich notions of planning and improvising. Turkle and Papert [20] develop a brilliant distinction between planners and bricoleurs which relates to the distinction proposed here. Cognition for Improvising is certainly more present in bricoleurs’ activities that deal more with the concrete, while Cognition for Planning is used in the abstract thinking of planners. Nonetheless, distinguishing what cognitions are at play in the writing of Wikipedia is more appropriate to do using a temporal distinction of cognition than a personal style of dealing with the world. It is not possible to divide people in using one or the other type of cognition because often both cognitions are used. In this sense, the distinction is more useful to understand *contributions* than *contributors*.

The distinction put forth in this paper, can also be used to understand greater patterns of the information and communication technologies. Lawrence Lessig, the scholar who started Creative Commons and who is the greatest advocate for a review of copyright to increase the freedom, describes, in the book “Remix” [21] two cultures, which are present in the Internet. RO, which stands for Read-Only, applies to sites where one can only consume the information, such as newspapers; and RW, which stands for Read-Write, applies to sites where one can directly interfere, by commenting, changing and engaging, such as blogs and wikis. These two cultures are examples of the two economies that are present, the commercial economy and the sharing economy. These have run in parallel for a long time. Lessig advocates that a change of the law is necessary in order to not criminalize the sharing economy, and shows that there are many possible hybrid models, in which both economies are present, such as Free and Open Source Software. The appeal to the RW culture is derived from the possibility to use the Cognition for Improvising surplus, which allows for a whole segment of remixes to exist and thrive.

CONCLUDING REMARKS

In relation to Wikipedia, it is obvious that both types of cognition are at play. This is true for the writing of Wikipedia articles where some edits are plainly ‘adding information’, making more use of Cognition for Planning, while others are ‘clarify info’ and ‘fix

typo’, making more use of Cognition for Improvising. The massive use of Cognition for Improvising accounts for the many actions in Wikipedia that are ‘bottom-up’, such as the division of work. There is, though, also a hierarchy and a structure of policy, with norms that are top-down (even if mostly arose bottom-up).

To conclude, it is fascinating to see how this separation of big/small goals, planning/improvising, bottom-up/top-down also shows up in the self-reported motivations for contributing, which show the self-awareness for why people contribute. In the Wikipedia-wide survey (Philipp Schmidt, talk at WikiMania’09) – the top two reported self-reported motivations were:

72% I like the idea of sharing knowledge and want to contribute to it
69% I saw an error I wanted to fix

These self-reported motivations show the inclination to the greater utopian hope (represented by the motto “The Free Encyclopedia That Anyone Can Edit” and decisions of non-profit, early GFDL-licensing, late CC-BY-SA-licensing) which include the use of the Kindness-Trust Surplus. But these self-reported motivations also show the inclination to the possible use of the Cognition for Improvising Surplus by simply fixing an error and contributing incrementally.

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