

Association for Information Systems AIS Electronic Library (AISeL)

AMCIS 2012 Proceedings

Proceedings

Technology Affordances: The Case of Wikipedia

Mostafa Mesgari

Concordia University, Montreal, QC, Canada., mostafamm83@gmail.com

Samer Faraj

Desautels Faculty of Management, McGill University, Montreal, QC, Canada., samer.faraj@mcgill.ca

Follow this and additional works at: <http://aisel.aisnet.org/amcis2012>

Recommended Citation

Mesgari, Mostafa and Faraj, Samer, "Technology Affordances: The Case of Wikipedia" (2012). *AMCIS 2012 Proceedings*. 13.
<http://aisel.aisnet.org/amcis2012/proceedings/VirtualCommunities/13>

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2012 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Technology Affordances: The Case of Wikipedia

Mostafa Mesgari

John Molson School of Business
Concordia University
mmesgari@jmsb.concordia.ca

Samer Faraj

Desautels Faculty of Management
McGill University
Samer.faraj@mcgill.ca

ABSTRACT

The affordance perspective to technology research aims to offer a definition of technology that bridges between previous positivist and constructivist perspectives. To study technology from an affordance angle, it needs to be defined and extracted. This study aims to develop a better understanding of technology by conceptualizing and dimensionalizing technology affordances. To demonstrate the practical value of our conceptualization, we empirically identify and define six affordances of Wikipedia as a case.

Keywords

Theory of affordances, Wikipedia, technology affordance

INTRODUCTION

To study technology consequences for organizations, Information Systems (IS) research has adopted variety of perspectives, from technology deterministic views giving primacy to technology materiality to social constructivist ones giving primacy to human agency and social construction of technology. While both seem to capture part of the image, some scholars have adopted integrative approaches like adaptive structuration theory (DeSanctis and Poole, 1994), sociomateriality lens (Orlikowski, 2007), practice lens (Orlikowski, 2000; Barley et al., 2010), and lately the theory of affordances (Hutchby, 2001) to come up with better understanding of the technological phenomena. Through them, affordance theory is the least investigated one coming from ecological psychology field aiming to explain how people perceive their environment in its socio-technical form.

Since the ambiguity of the concept is the main obstacle to further exploit the affordance approach, this study provides a clear and rich definition of the concept around the three proposed dimensions of technical, social, and user aspects. We also demonstrate the practical value of our definition by empirically identifying and defining six Wikipedia affordances.

THEORY OF AFFORDANCES

Gibson (1986) defines affordances as “possibilities of action” provided to the animal or the individual by the environment. Since Gibson was not clear enough about the concept and he had not enough time to finalize his thoughts on the notion of affordance (Jones, 2003), there have been controversies among other affordance researchers. Here we further define affordance based on its four defining characteristics as

1. properties of the individual-environment system,
2. directly perceived,
3. perfectly real and existing independent of its perception,
4. and having multiple dimensions

Each of the four elements of our affordance definition is further elaborated below.

Properties of individual-environment System

Gibson (1986) originally proposes affordances to be nor objective nor subjective, nor as a property of the environment, nor as a property of the agent, but both. However, there has been discussion about the ontological status of affordances. On one hand, there are some (Gaver, 1991; Turvey, 1992; Norman, 1999) who believe in affordances as properties of the environment complemented by the properties of the individual, his/her effectivities, to get actualized.

On the other hand, there are others (Chemero, 2003; Stoffregen, 2003) who convincingly argue that affordances cannot be defined for an environment independent of the agent; thus it is a property of the individual-environment system. Stoffregen

(2003) even goes further and says that there is nothing perceived as the properties of either the individual or the environment, but whatever perceived is the sole affordance of the animal-environment system. While the former approach is more accepted through design scientists, the later has got more credit from social scientists. This would refer to the relative importance of the human agency within different fields.

Direct Perception of Affordances

By proposing the concept of affordance, Gibson was mainly intended to raise the direct perception against the indirect perception which had been the only type of individual understanding from the environment (Jones, 2003). While indirect perception assumes that the object has no inherent meaning within it and meaning is created by the animal, direct perception argues that objects and environments have inherent meaning within themselves which is understood by the animal and get actualized.

As Gibson (1986) posited, affordances are perceived directly, and through the visual and acoustic information people get from their environment. He controversially claims that affordances are perceived immediately without inferences of norms and values, arguing that norms and values are embedded into the object itself. Some scholars disputed the direct and immediate perception of affordances as it is claimed by Gibson. Greeno (1994) discusses that “it would be inappropriate to consider direct perception of affordances as a defining characteristic”, because in many cases perception of affordances not only needs the visual information about the object, but also requires cognitive processes to classify the object within individually known symbols; thus he regarded it more as cognition than direct perception.

Moreover, Costall (1995) claims that Gibson eliminates any “serious acknowledgment of the social or cultural” from the concept of direct perception, while it contradicts with his definition of affordance as referring to the individual as well as the object. He proposes socializing the affordance concept with a “real social”, but not an indirect one.

Similarly, Heft (2003) proposes to extend the notion of direct perception to include social information as well as the material one; such social meaning is not created within the mind of the individual, but perceived more directly. As far as we are concerned, this does not contradict Gibson’s (1986) theorization of affordances, but highlights his notion of behavior affordances which is not elaborated enough in his work.

Affordance vs. Perceived Affordance

Almost all affordance researchers agree that affordances are real and do exist independent of whether they are perceived by the individual or not (Gibson, 1986; Norman, 1999; Michaels, 2003). However, the two concepts have sometimes been used interchangeably without enough attention to their differences. For example, Norman (1988), in his book, talks about “affordances” of everyday things and how they guide people’s behavior. Later, he (Norman, 1999) revises his misconception of affordance, and asserts that he should have used “perceived affordance” instead of using “affordance” notion in his book, because what affects individual behavior is the perceived affordances of an object, rather than the affordance itself.

Additionally, perceived affordance is different from affordance itself in that the former is highly dependent on the individual goal and motive, while the later exists independent of them. Heft (2003) discusses that the task in hand would affect the affordances perceived from the object. For example, you might not perceive that a chair is climbable unless you need to pick a book from the top of the shelf. Whatever motive or goal you have, the affordance of the object is the same for you at the time, but the perceived affordance of the object might not be.

Multi-dimensionality of Affordances

Affordances are known to be quite complex and having variety of aspects (Heft, 2003; Michaels, 2003). We identify three main dimensions for affordances. Physical and material aspect of affordance has got the most attention. Among many others, Warren (1984) studies whether a stair is climbable by focusing on the height of the stair and the body scale measurements of the individual; its ratio is found to be essential for stair-climbing affordance.

Since affordance is believed to be property of both the environment and the person, there is an individual aspect within it. Some (Turvey, 1992; Michaels, 2003) consider this individual aspect as “effectivities” complementing the affordances of the object and needed for affordances to be actualized. Some others (Chemero, 2003; Stoffregen, 2003) believe in the individual aspect as part of the affordance notion saying that it is meaningless to talk about affordances without considering to whom it refers. Michaels (2003) calls the type of affordances not referring to any specific individual the “generic affordances”.

Besides its material and the individual aspects, affordance is suggested to include social and value aspects as well (Costall, 1995; Heft, 2003; Michaels, 2003). Heft (2003) exemplifies that “pen on the desk may be graspable for me, given its diameter in relation to my grip, but because it is resting on the desk of the president of the college, it is not a pen I ought to pick up”. Yet, he suggests pushing for more direct perceptual explanations to account for these sociocultural aspects of

affordances. As far as I am concerned, this is the underdeveloped part of Gibson’s theorizing; while he affirms that sociality of human being plays a role in shaping affordances, he had not enough time to push this aspect forward.

“The other animals afford, above all, a rich and complex set of interactions, sexual, predatory, nurturing, fighting, playing, cooperating, and communicating. What other persons afford comprises the whole realm of social significance for human beings” (Gibson, 1986).

The three dimensions provided are the aspects which should be accounted for in any rich definition of the affordance concept. Drawing on our affordance definition, we will next provide a rich conceptualization of technology affordance, and compare it with others based on the proposed conceptual area.

TECHNOLOGY AFFORDANCE AND ITS DIMENSIONS

Technology researchers have conceptualized technology affordance in variety of ways which would not be consistent with and inclusive of the four aforementioned essential elements of our affordance definition. To address the issue, we build upon the Hutchby’s (2001) ideas of technology affordances in which they are *functional* and *relational* properties of the user-technology system. By functional, we mean something “referring to a special activity, purpose, or task”. In this way, affordances are not necessarily serving actions, but facilitating purposes or tasks too. This is a bit more general definition than that of Michaels (2003) limiting affordances to the action-referential ones. This includes some affordances which might get excluded otherwise; this perspective is more consistent with that of Gibson (1986).

By relational, we mean something "related to a special user or user group". It refers to the individual dimension of the affordance concept. Hutchby also acknowledges the role of the context in which technology is appropriated; this makes his version more social than the others. Moreover, affordances are perfectly *real* and exist independent of their perception. They are shaped not only by the *materiality* of the technology, but also by the *sociality* of the context, or by a fusion of both.

Such definition is advantageous in that it is inclusive of all three dimensions of affordance concept, while this is not the case for most other conceptualizations. To better differentiate our conceptualization of technology affordance from others, we employ the mapping idea used by Burton-Jones and Straub (2006) for system use construct. Figure1 depicts the conceptual area in which technology affordance is defined. This conceptual area includes three main elements of system, user, and the context referring to the three affordance dimensions of material, individual, and the social aspects, respectively.

Norman (1988) and Gaver (1991), the design scientists, are among the first technology researchers using the affordance concept. They assume affordances as designed into the technology and relational to the user. From their point of view, the same materiality would afford a specific user the same, no matter what the context is. In his book, Norman (1999) discusses how the designed affordances of everyday things guide our behavior when using them.

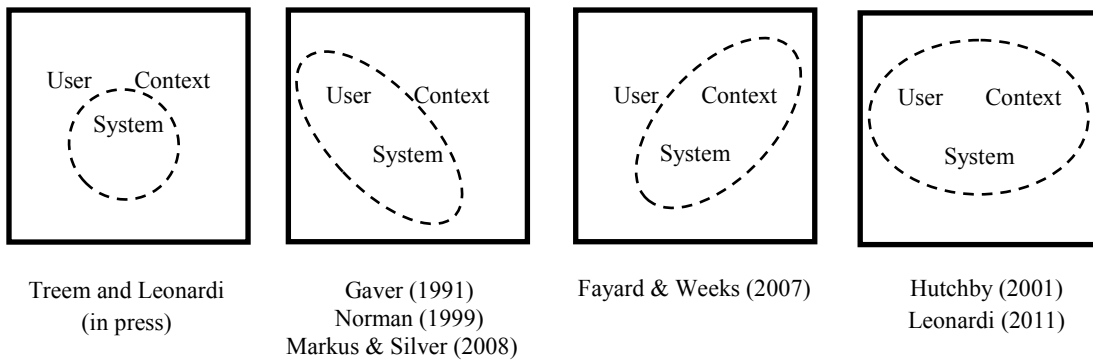


Figure 1. Technology Affordance Conceptualizations

Similar to the design scientists, Markus and Silver (2008) define functional affordances as relationship between technical objects and a specific user group; it is possibilities for goal-oriented action brought to the user by the technical features. Although this is a worthwhile step towards redefining technology for bringing together the individual and material agencies, it overlooks the social aspect of affordances and sticks too much to its materiality.

To define social media and differentiate it from other computer-mediated communication (CMC) technologies, Treem and Leonardi (in press) adopt an affordance perspective close to that of Markus and Silver (2008) in that they both reject the importance of the context. Treem and Leonardi (in press) discuss that affordances of a technology would be the same across different organizational settings, because the materiality of technology limits the interpretations can be formed out of it. Although they acknowledge the relational nature of affordances, they do not incorporate it into their identified affordances.

Fayard and Weeks (2007) propose extending the affordance concept from its ecological origin to include social behaviors. They examine how materiality of a copy room and the sociality of context shape social behavior affordances of the copy room. They do not account for the relational aspect of affordances and how affordances are different for the individuals.

Similar to Hutchby (2001), Leonardi (2011) provides one of the richest conceptualizations of technology affordance; he demonstrates that affordances and constraints are provided through complex interaction of technology materiality, human agency, and the contextual procedures. Moreover, he traces the dynamic of affordance changes through interactions of these elements.

Although the definition we provided covers the three dimensions of affordance concept, we acknowledge that the proportional influence of materiality and sociality of the technology and context to shape the affordances would differ based on the system and the context. In other words, affordances of the systems with highly restrictive materiality would be mostly shaped by its features than its context, and the vice versa; thus there is no single best definition for all the systems and contexts. Next, we demonstrate the practical value of our conceptualization using a case study.

THE CASE OF WIKIPEDIA

Wikipedia is a web-based free multi-lingual encyclopedia being developed collaboratively by thousands of volunteer contributors, supported by the non-profit Wikimedia Foundation. Since 2001, Wikipedia has developed in 282 language versions including a total of more than 20 million articles, from which over 3.82 million is in English. It is the largest reference work on the internet and the sixth most visited website by having more than 365 million readers worldwide.

To demonstrate the practical value of our conceptualization for identifying and defining technology affordances, we found Wikipedia a very appropriate case, because it is a very successful technological implementation comprised of both material and social aspects which complicate the affordances of the environment, and requires very rich conceptualization of the technology affordances.

RESEARCH METHOD

Since affordances are action possibilities, they are highly vulnerable to be limited to actions themselves, while they are much different in that actions are part of affordances which are intentionally chosen to be actualized (Michaels 2003). Affordances are much more extended than actions because it includes every possible behavior which may or may not be perceived or actualized. Moreover, as per definition, affordances are functional properties which would support purposes and tasks, in addition to activities. Therefore, we need to be very precise not to limit affordances to actions, but extend it to every potential behavior.

To empirically gather all possibilities of actions, it is suggested to go to users who have had a minimum experience with the technological domain (Heft 2003). Since affordances have social aspects, it requires having enough experience with the technical environment and the context to understand about its affordances.

According to the advice by Fichman and Kane (2009), we made a research project page on Wikimedia Meta-Wiki, describing our study, its objectives, method, and intended contribution to Wikipedia community and research. This gave us the opportunity to be open and upfront with Wikipedia community which is consistent with the community culture, and helped us to attract their trust and cooperation in data gathering process. Using Wikipedia administrator list page and Wikipedia ArbCom (Arbitration Committee) list in two English and Persian Wikipedias, we randomly invited 21 users to participate in our study by having an Internet-based interview. Since Persian and English Wikipedia are in different stages of their lifecycle and development, they may support varied affordances which we do not want to miss. At the time, Persian and English Wikipedia had 21 and 1514 administrators, respectively; they were also including 7 and 15 arbitrators each.

From the 7 Persian Wikipedia users who were invited 5 accepted to participate, while just a single user from the 14 English Wikipedia agreed to participate in our study. As of 23th February 2012, we managed to make appointments and conduct the interviews with 3 of the Persian Wikipedia users, and the other interviews are yet to come. The interviews conducted through Skype, Gtalk, and the like.

The semi-structured interviews took 1.5 to 2 hours each through which we asked them about their activities, purposes, and tasks, and every possibility they have which supports each of them, and how these possibilities have changed. To get them

indirectly to talk about every possibility Wikipedia environment gives them to behave, we also asked them general question like what they like about Wikipedia; it got them to tell us about the possible behaviors they liked doing in Wikipedia. We also asked them to compare these possibilities with those of other language versions of Wikipedia if they ever had such experience.

To analyze the data, all the interviews were recorded into audio files, and coded into every possible action the interviewees were describing. Then actions and behaviors coded grouped into functional groups to emerge into meaningful affordances. Identifying affordances from possible actions coded, we were very cautious about them be both functional and relational, according to our definition. Furthermore, we paid special attention not to include motives, intentions, and consequences of actions as affordances; because they are very close concepts having the potential to be confused with affordances. After categorizing the possible actions coded, six main affordances emerged.

RESEARCH FINDINGS

Here, we define each affordance and depict how elements from different dimensions shape the affordances of the Wikipedia environment. The composing elements of the technical dimension are technical features, those of the social dimension are norms, policies and guidelines; and those of the user dimension are some related user skills, and capabilities shaping each specific affordance.

Contribution Affordance

The first and most visible possible action on Wikipedia and every other wiki might be the ability to add, remove, and edit every piece of information on the wiki. Contribution affordance is possibilities for actions serving directly the main purpose of Wikipedia which is developing an encyclopedia. It includes very large range of possible actions such as creating and editing article pages running robots for doing specific edits, developing tools to be used in Wikipedia, changing aspects of Wikipedia interface, etc.

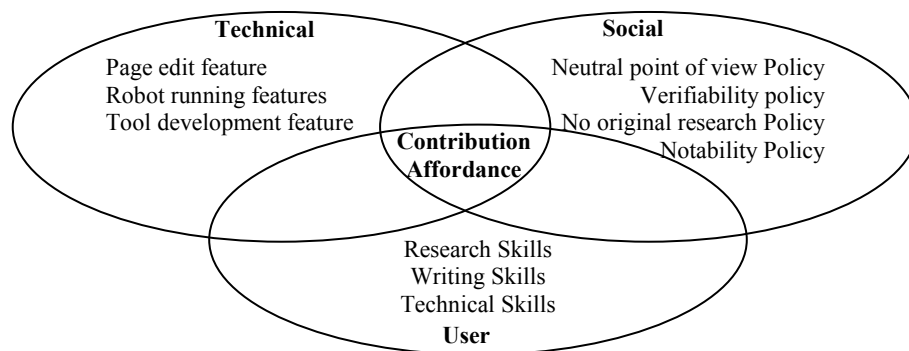


Figure 2. Contribution Affordance

From our point of view, what provides this affordance does not limit to technical features, but extends to social and user dimensions. Figure2 depicts the three main aspects of contribution affordance and some of their elements. From technical aspect, the contribution affordance is enabled by a group of features like page edit tabs, robot running capabilities, and tool development features. At the same time, the contribution affordance of Wikipedia for the user is limited by specific and well defined socially created norms written as policies and guidelines. A Wikipedia user should not add biased material to an article or the material which is original research or does not have verifiable reference, or not notable enough to have an article on Wikipedia; although they are technically doable, such actions are not permitted socially. As one of the interviewees put, notability of a topic is a context-dependent issue limiting contribution activities.

“I don’t think notability is a universal issue, it really depends on the society. We have many topics which are identified as notable in Persian Wikipedia, but not in English Wikipedia, and vice versa.”

From user aspect, contribution affordances are influenced by the user skills and abilities for research and writing. One of the interviewees admits that “what I like about Wikipedia is its scientific environment. You can’t write whatever you want, but you should know how to put it persuasively and be able to prove it with references”. Moreover, the technical contribution activities need technical skills, like programming skills. As one of the interviewees noted, “Previously, you could not add photo if you did not know the syntax needed”.

Control Affordance

Control affordance refers to possibilities for actions serving to observe the changes, others’ behaviors, and their contributions. Control affordance provides variety of possible actions such as watchlisting Wikipedia pages, checking for the previous versions of any page, protecting or unprotecting article pages, blocking or unblocking vandal users, etc. Most administrative possibilities fall into this group of affordances.

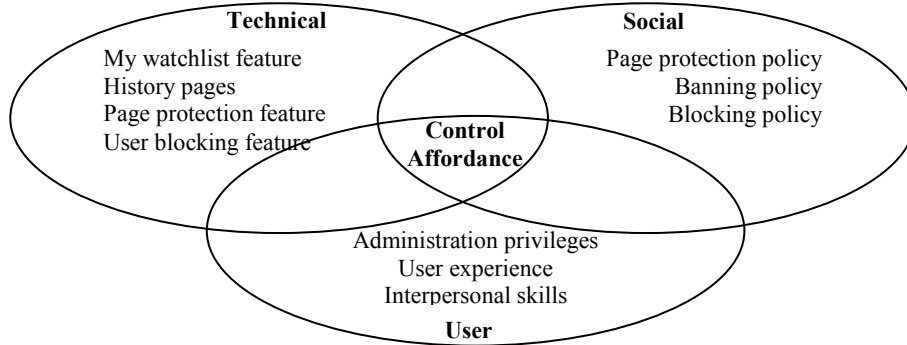


Figure 3. Control Affordance

Technically, control affordances are supported by a group of features like my watchlist, history tab of every article page, and etc. Socially, the control affordances are guided by norms which might change time to time or from one language version to the other. For instance, one of the interviewees says that “previously, admins were intended to block vandals for shorter durations”; he further discusses that administrators usually decide on these issues within a private mailing-list, and as the composition of the administrators changes or the experiences cumulate the kind of punishments changes; thus one might get blocked for an specific behavior within one Wikipedia language but not in the other.

Users are not all provided with equal control affordances. Some control activities, like blocking and unblocking users and pages, are exclusively available to administrators. For nominating oneself for administration an acceptable experience with Wikipedia, good knowledge about its policies and routines, and excellent history of interpersonal interactions are needed.

Management Affordance

Management affordance is the possibilities for actions serving to organize the community and define how the job should be done. While control affordance include administrative day to day activities based on the known policies and guidelines, management affordance enable users to develop new policies, change the current ones, and define how the work processes should be organized around the job. Management affordance includes variety of user behaviors such as policy making, voting for policies, consensus building, summing up the discussions, etc. As one of the interviewees points out, “almost anything in Wikipedia can change as long as there is consensus about the change among the users”.

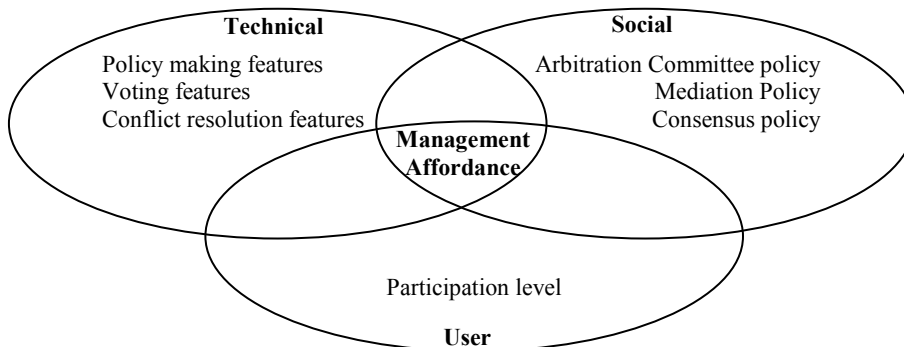


Figure 4. Management Affordance

Management affordance is technically supported by a class of features allowing users to propose and discuss policies and changes, nominate them for voting, and resolving the conflicts. It is also socially bounded by specific norms and guidelines. For instance, every user is technically allowed to edit most of the policy pages, but they are socially required to discuss it with others and build consensus about it before doing any change. An interviewee notes that “for consensus building, votes are not counted, but the rationale users bring counts”.

As one interviewee puts, “Whoever with at least 100 edits has the right to vote”; thus users' managerial possibilities are bounded by their participation level. This makes potential managerial activities differently available to individuals participating in Wikipedia.

Collaboration Affordance

Since there are thousands of users contributing to the same work, collaboration and cooperation of related activities plays a role. Collaboration affordance refers to possibilities for actions serving to cooperate and handle interdependent activities in Wikipedia community. It comprises a large range of possible behaviors such as discussing opinions on article discussion pages, talking to other users or asking for help on the user talk pages, participating in general discussions on village pump which is a public place for announcements or discussions, creating project and portal pages, etc.

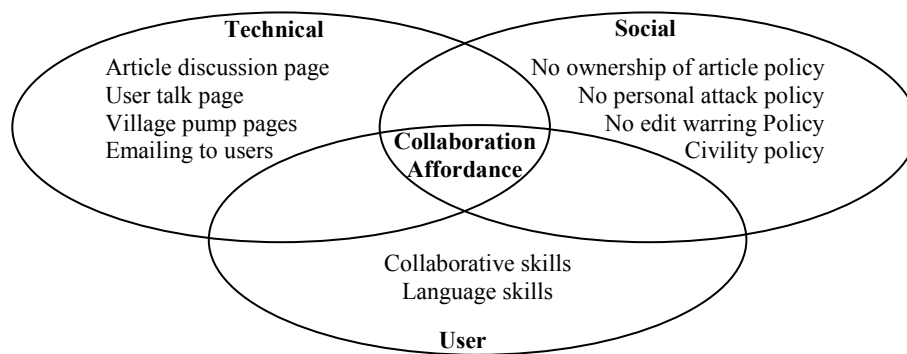


Figure 5. Collaboration Affordance

From a technical aspect, collaboration affordance is provided to users through features like article discussion pages, user talk pages, and village pump page. One of the interviewees highlights the importance of village pump by saying “it is one of the first places I visit every day on Wikipedia to see what is going on, and what would be asked or needed to be done”. Much of the interpersonal collaborations happen on user talk pages which is a special user page that others would write there if needing any help.

At the same time, collaboration affordance of Wikipedia is significantly bounded by very powerful norms governing how to contact others, talk to them, and discuss issues. “Personal attack is absolutely unacceptable; civility and politeness are required in discussions, and users should always assume good faith of others”, one interviewee said. Edit war, undoing other’s edit for three sequential times, is strictly forbidden.

As a Persian Wikipedia user mentioned, “inter-community collaborations always happen in international language, English”; thus he would not be able to cooperate some inter-community interactions unless he knew English.

Self-presentation Affordance

Besides contributing and collaborating within the community, Wikipedia users have the opportunity to present themselves to others. Self-presentation affordance refers to the possibilities for actions serving to create and demonstrate the personal image and identity. Self-presentation activities not only familiarize people with each other, but also facilitate other communication and collaboration activities. Self-presentation affordance enable behaviors like describing the self on the user page specific to the individual, tagging the user page with user categories, adding photo or links to other personal pages, etc.

Since the user page can be programmed, technically, the user can do whatever he/she wants with the user page to represent his/her personality or self-image. However, “there is a guideline defining whatever you can or cannot put on your user page”, as an interviewee said. For instance, users are not allowed to use their user page as a weblog or personal website, or have very extensive Wikipedia unrelated and personal materials. Advertisements and copyright violation materials are not permitted to be included in this page, as well.

Users are not afforded to have a user page unless they are registered with Wikipedia; the IP editors would never have any chance to present themselves on a user page. Users might also need some technical knowledge if they want to highly customize their user page.

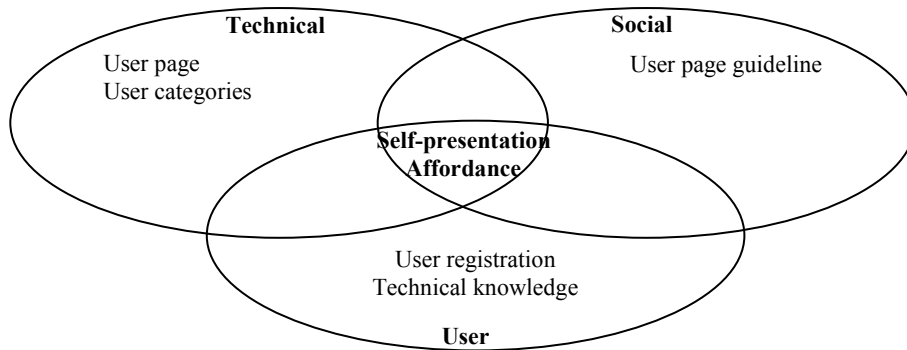


Figure 6. Self-presentation Affordance

Broadcasting Affordance

One of the main possibilities differentiating Wikipedia from most other wikis and communities is that it provides users with thousands or even millions of audience. Broadcasting affordance refers to the possibilities for circulating content or knowledge and sharing it with an appropriate number of audiences. One of the interviewees highlights the importance of Wikipedia’s broadcasting affordance by noting that “a main reason I contribute, here but not in my personal blog, is that there is a huge audience here. Simply put, I write to be read”.

Technically, broadcasting affordance of Wikipedia comes from both its search engine and the third-party search engines like Google, and Yahoo! Also, Wikipedia pages have lots of links to each other made by robots and it improves the search engine ranking of Wikipedia pages.

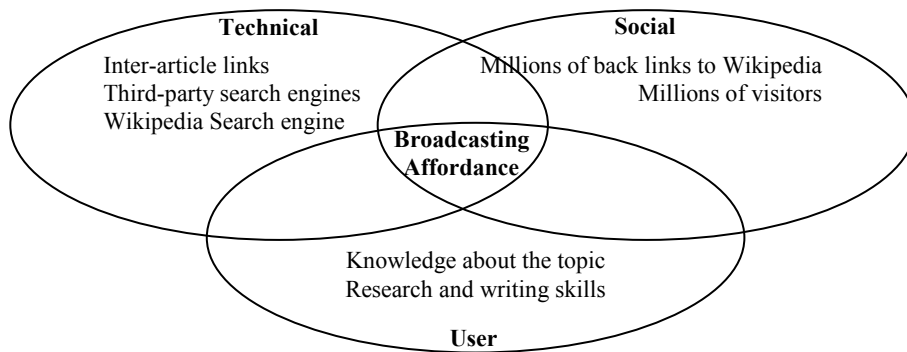


Figure 7. Broadcasting Affordance

There is also a social component for this affordance that millions of people come to Wikipedia every day for information; and also many people link to Wikipedia articles on their personal weblogs. This is the socially known value of Wikipedia and its critical mass which has made such broadcasting affordance possible. The user component to this affordance might be less influential than that of the other affordances. The user aspect which may affect broadcasting affordance is the user knowledge about the topic and his/her skills in writing and structuring the article. However, the user aspect would not play significant role in shaping broadcasting affordance.

CONCLUSION AND IMPLICATIONS

This study was to examine how to define and study technology from an affordance perspective. We proposed our definition of affordance concept and its four dimensions. Then we defined technology affordance and compared with other definitions around the three identified dimensions of the affordance concept. Lastly, we demonstrated the practical value of our definition by empirically identifying the six affordances of Wikipedia environment.

The contribution of this study is twofold. Firstly, it defines technology affordances in its richest form using the three identified dimensions. What differentiates our conceptualization of technology affordance is that it does not limit affordance to the materiality of technology, which is the case for most other technology affordance definition. The three dimensions of technology affordance are pretty replicable for any case of technology; however their proportional influence on shaping affordances might differ based on the technology and its context.

Secondly, this study empirically identifies six main affordances of Wikipedia which are mostly generalizable to wiki technology in their specific contexts, or some are generalizable to online community and social media technologies. For instance, except management affordance, the other five would be applicable to Facebook as a social media; however Facebook may have other affordances not included within Wikipedia ones. These identified Wikipedia affordances and their dimensions can be the first step for developing a measurement tool which allows scholars study and compare technology consequences from an affordance angle.

REFERENCES

1. Barley, S.R., Meyerson, D.E., Grodal, S., 2010. E-mail as a Source and Symbol of Stress. *Organization Science* 22, 887-906.
2. Burton-Jones, A., Straub, D.W., 2006. Reconceptualizing system usage: An approach and empirical test. *Information systems research* 17, 228.
3. Chemero, A., 2003. An Outline of a Theory of Affordances. *Ecological Psychology* 15, 181-195.
4. Costall, A., 1995. Socializing Affordances. *Theory & Psychology* 5, 467 -481.
5. DeSanctis, G., Poole, M.S., 1994. Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization science* 5, 121-147.
6. Fayard, A.L., Weeks, J., 2007. Photocopiers and Water-coolers. *Organization studies* 28, 605-634.
7. Fichman, R., Kane, G., 2009. The Shoemaker's Children: Using Wikis for Information Systems Teaching, Research, and Publication (includes Comments and Editorial Note). *Management Information Systems Quarterly* 33, 1-22.
8. Gaver, W.W., 1991. Technology affordances, in: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: Reaching Through Technology*. pp. 79-84.
9. Gibson, J.J., 1986. *The ecological approach to visual perception*. Lawrence Erlbaum.
10. Greeno, J.G., 1994. Gibson's affordances. *Psychological Review* 101, 336-342.
11. Heft, H., 2003. Affordances, Dynamic Experience, and the Challenge of Reification. *Ecological Psychology* 15, 149-180.
12. Hutchby, I., 2001. Technologies, texts and affordances. *Sociology* 35, 441-456.
13. Jones, K.S., 2003. What Is an Affordance? *Ecological Psychology* 15, 107-114.
14. Leonardi, P., 2011. When Flexible Routines Meet Flexible Technologies: Affordance, Constraint, and the Imbrication of Human and Material Agencies. *Management Information Systems Quarterly* 35, 147-167.
15. Michaels, C.F., 2003. Affordances: Four Points of Debate. *Ecological Psychology* 15, 135-148.
16. Norman, D.A., 1988. *The psychology of everyday things*. Basic Books (AZ).
17. Norman, D.A., 1999. Affordance, conventions, and design. *interactions* 6, 38-43.
18. Orlikowski, W.J., 2000. Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations. *Organization Science* 11, 404-428.
19. Orlikowski, W.J., 2007. Sociomaterial practices: Exploring technology at work. *Organization studies* 28, 1435.
20. Stoffregen, T.A., 2003. Affordances as Properties of the Animal-Environment System. *Ecological Psychology* 15, 115-134.
21. Treem, J.W., Leonardi, P.M., Social Media Use in Organizations: Exploring the Affordances of Visibility, Editability, Persistence, and Association, in: *Communication Yearbook* 36.
22. Turvey, M.T., 1992. Affordances and Prospective Control: An Outline of the Ontology. *Ecological Psychology* 4, 173-187.
23. Warren, W.H., 1984. Perceiving affordances: Visual guidance of stair climbing. *Journal of Experimental Psychology: Human Perception and Performance* 10, 683-703.