WIKIPEDIA

Affordance

Affordance is what the environment offers the individual. James J. Gibson, coined the term in his 1966 book, *The Senses Considered as Perceptual Systems*,[1] and it occurs in many of his earlier essays (e.g.[2]). However, his best-known definition is taken from his seminal 1979 book, *The Ecological Approach to Visual Perception*:

> The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment.
>
> — Gibson (1979, p. 127)[3]

The word is used in a variety of fields: perceptual psychology, cognitive psychology, environmental psychology, industrial design, human–computer interaction (HCI), interaction design, user-centered design, communication studies, instructional design, science, technology and society (STS), sports science and artificial intelligence.

Contents

Original development

Psychologist James J. Gibson developed the concept of affordance over many years, culminating in his final book *The Ecological Approach to Visual Perception*[4] in 1979. He defined an affordance as what the environment provides or furnishes the animal. Notably, Gibson compares an affordance with an ecological niche emphasizing the way niches characterize how an animal lives in its environment. The key to understanding affordance is that it is relational and characterizes the suitability of the environment to the observer, and so, depends on their current intentions and their capabilities. For instance, a set of steps which rises four feet high does not afford climbing to the crawling infant, yet might provide rest to a tired adult or the opportunity to move to another floor for an adult who wished to reach an alternative destination. This notion of intention/needs is critical to an understanding of affordance, as it explains how the same aspect of the environment can provide

different affordances to different people, and even to the same individual at another point in time. As Gibson puts it, “Needs control the perception of affordances (selective attention) and also initiate acts.”[5] Gibson's is the prevalent definition in cognitive psychology.

According to Gibson, humans tend to alter and modify their environment so as to change its affordances to better suit them. On his view, humans change the environment to make it easier to live in (even if making it harder for other animals to live in it): to keep warm, to see at night, to rear children, and to move around. This tendency to change the environment is natural to humans, and Gibson argues that it is a mistake to treat the social world apart from the material world or the tools apart from the natural environment. He points out that manufacturing was originally done by hand as a kind of manipulation.

Gibson argues that learning to perceive an affordance is an essential part of socialization. The theory of affordances introduces a "value-rich ecological object".[4] Affordances cannot be described within the value-neutral language of physics, but rather introduces notions of benefits and injuries to someone. An affordance captures this beneficial/injurious aspect of objects and relates them to the animal for whom they are well/ill-suited. During childhood development, a child learns to perceive not only the affordances for the self, but also how those same objects furnish similar affordances to another. A child can be introduced to the conventional meaning of an object by manipulating which objects command attention and demonstrating how to use the object through performing its central function.[6] By learning how to use an artifact, a child “enters into the shared practices of society” as when they learn to use a toilet or brush their teeth.[6] And so, by learning the affordances, or conventional meaning of an artifact, children learn the artifact's social world and further, become a member of that world.

Affordances were further studied by Eleanor J. Gibson, wife of James J. Gibson, who created her theory of perceptual learning around this concept. Her book, *An Ecological Approach to Perceptual Learning and Development*, explores affordances further.

Jakob von Uexküll had already discussed the concept in the early twentieth century,[7] calling it the "functional tinting" (*funktionale Tönung*) of organisms with respect to stimuli.[8] However Smith (2009) points to certain shortcomings in a view of Gibson's affordance doctrine as falling within the tradition of Uexküll.[9] In Smith (2001) he describes philosophical roots of Gibson's ideas going back to Aristotle.[10]

Anderson, Yamagishi and Karavia (2002) found that merely looking at an object primes the human brain to perform the action the object affords.[11]

As perceived action possibilities

In 1988, Donald Norman appropriated the term *affordances* in the context of human–machine interaction to refer to just those action possibilities that are readily perceivable by an actor. This new definition of "action possibilities" has now become synonymous with Gibson's work, although Gibson himself never made any reference to action possibilities in any of his writing.[12] Through Norman's book *The Design of Everyday Things*,[13] this interpretation was popularized within the fields of HCI, interaction design, and user-centered design. It makes the concept dependent not only on the physical capabilities of an actor, but also on their goals, beliefs, and past experiences. If an actor steps into a room containing an armchair and a softball, Gibson's original definition of affordances allows that the actor may throw the chair and sit on the ball, because this is objectively possible. Norman's definition of (perceived) affordances captures the likelihood that the actor will sit on the armchair and throw the softball. Effectively, Norman's affordances "suggest" how an object may be interacted with. For example, the size, shape and weight of a softball make it perfect for throwing by humans, and it matches their past experience with similar objects. The focus on perceived affordances is much more pertinent to practical design problems, which may explain its widespread adoption.

Norman later explained that this restriction of the term's meaning had been unintended, and in his 2013 update of *The Design of Everyday Things*, he added the concept "signifiers". In the digital age, designers were learning how to indicate what actions were possible on a smartphone's touchscreen, which didn't have the physical properties that Norman intended to describe when he used the word "affordances".

> Designers needed a word to describe what they were doing, so they chose *affordance*. What alternative did they have? I decided to provide a better answer: *signifiers*. Affordances determine what actions are possible. Signifiers communicate where the action should take place. We need both.[14]

However, the definition from his original book has been widely adopted in HCI and interaction design, and both meanings are now commonly used in these fields.

Following Norman's adaptation of the concept, *affordance* has seen a further shift in meaning where it is used as an uncountable noun, referring to the easy discoverability of an object or system's action possibilities, as in "this button has good affordance".[15] This in turn has given rise to a use of the verb *afford* – from which Gibson's original term was derived – that is not consistent with its dictionary definition (to provide or make available): designers and those in the field of HCI often use *afford* as meaning "to suggest" or "to invite".[16]

The different interpretations of affordances, although closely related, can be a source of confusion in writing and conversation if the intended meaning is not made explicit and if the word is not used consistently. Even authoritative textbooks can be inconsistent in their use of the term.[15][16]

When affordances are used to describe information and communications technology (ICT) an analogy is created with everyday objects with their attendant features and functions.[17] Yet, ICT's features and functions derive from the product classifications of its developers and designers. This approach emphasizes an artifact's convention to be wholly located in how it was designed to be used. In contrast, affordance theory draws attention to the fit of the technology to the activity of the user and so lends itself to studying how ICTs may be appropriated by users or even misused.[17] One meta-analysis reviewed the evidence from a number of surveys about the extent to which the Internet is transforming or enhancing community. The studies showed that the internet is used for connectivity locally as well as globally, although the nature of its use varies in different countries. It found that internet use is adding on to other forms of communication, rather than replacing them.[18]

False affordances

William Gaver[19] divided affordances into three categories: perceptible, hidden, and false.

- A **false affordance** is an apparent affordance that does not have any real function, meaning that the actor perceives nonexistent possibilities for action.[20] A good example of a false affordance is a placebo button.[21]
- A **hidden affordance** indicates that there are possibilities for action, but these are not perceived by the actor. For example, it is not apparent from looking at a shoe that it could be used to open a wine bottle.
- For an affordance to be **perceptible**, there is information available such that the actor perceives and can then act upon the existing affordance.

This means that, when affordances are perceptible, they offer a direct link between perception and action, and, when affordances are hidden or false, they can lead to mistakes and misunderstandings.

Affordance in robotics

Problems in robotics[22] indicate that affordance is not only a theoretical concept from psychology. In object grasping and manipulation, robots need to learn the affordance of objects in the environment, i.e., to learn from visual perception and experience (a) whether objects can be manipulated, (b) to learn how to grasp an object, and (c) to learn how to manipulate objects to reach a particular goal. As an example, the hammer can be grasped, in principle, with many hand poses and approach strategies, but there is a limited set of effective contact points and their associated optimal grip for performing the goal.

See also

- Action-specific perception
- Ambient optic array
- Form follows function
- Usability

References

1. J. J. Gibson (1966). *The Senses Considered as Perceptual Systems*. Allen and Unwin, London.
2. J. J. Gibson (1975). 'Affordances and behavior'. In E. S. Reed & R. Jones (eds.), *Reasons for Realism: Selected Essays of James J. Gibson*, pp. 410-411. Lawrence Erlbaum, Hillsdale, NJ, 1 edn.
3. J. J. Gibson (1979). *The Ecological Approach to Visual Perception*. Houghton Mifflin Harcourt (HMH), Boston.
4. James J. Gibson (1979), *The Ecological Approach to Visual Perception*, ISBN 0-89859-959-8.
5. J. J. Gibson (1982). Reasons for Realism: Selected Essays of James J. Gibson. Resources for Ecological Psychology. L. Erlbaum, New Jersey. p.411
6. Emma Williams and Alan Costall (2000), *Taking Things More Seriously: Psychological Theories of Autism and the Material-Social Divide*, ISBN 0-415-16704-3.
7. Uexküll, Jakob von (1980 [1920 etc.]), *Kompositionslehre der Natur*, edited by Thure von Uexküll, Frankfurt am Main.
8. Dorion Sagan (2010). "Introduction: *Umwelt* after Uexküll" (https://books.google.com/books?id=ADSDl6_SeW8C&pg=PA5). In Jakob von Uexküll; Marina von Uexküll; Joseph D. O'Neil (eds.). *A Foray Into the Worlds of Animals and Humans: With a Theory of Meaning* (Joseph D O'Neil translation of 1940 ed.). University of Minnesota Press. p. 5. ISBN 9781452903798. "Organisms in their life-worlds recognize not only sensory inputs, but also functional tones, the use they need to make of certain stimuli if they are to do what they need to survive."
9. Smith, Barry (2009). "Toward a Realistic Science of Environments" (http://ontology.buffalo.edu/eco/Ecological_Psychology.pdf) (PDF). *Ecological Psychology*. **21** (2): 121–130. doi:10.1080/10407410902877090 (https://doi.org/10.1080%2F10407410902877090).
10. Smith, Barry (2001), *Objects and their environments: From Aristotle to ecological ontology*, ISBN 978-0748408450
11. Anderson, S. J.; Yamagishi, N.; Karavia, V. (2002). "Attentional processes link perception and action" (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1691021). *Proceedings of the Royal Society B: Biological Sciences*. **269** (1497): 1225–1232. doi:10.1098/rspb.2002.1998 (https://doi.org/10.1098%2Frspb.2002.1998). PMC 1691021 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1691021). PMID 12065038 (https://pubmed.ncbi.nlm.nih.gov/12065038).
12. R. Osborne (2015). An ecological approach to educational technology: affordance as a design tool for aligning pedagogy and technology. Ph.D. thesis.
13. Donald Norman, *The Design of Everyday Things*, ISBN 0-465-06710-7, originally published under the title *The Psychology of Everyday Things* (often abbreviated to *POET*)

14. Norman, Donald (2013). *The Design of Everyday Things: Revised and Expanded Edition* (2nd ed.). Basic Books. ISBN 978-0465050659.
15. *Human–Computer Interaction*, Preece et al. (1994, p. 6): The authors explicitly define perceived affordances as being a subset of all affordances, but another meaning is used later in the same paragraph by talking about "good affordance."
16. *Universal Principles of Design*, Lidwell, Holden & Butler (2003, p. 20): The authors first explain that round wheels are better suited for rolling than square ones and therefore better afford (i.e. allow) rolling, but later state that a door handle "affords" (i.e. suggests) pulling, but not pushing.
17. Faraj, S., & Azad, B. (2012). The Materiality of Technology: an Affordance Perspective. In *Materiality and Organizing: Social Interaction in a Technological World*. ISBN 9780199664054.
18. Barry Wellman, Anabel Quan-Haase, Jeffrey Boase, Wenhong Chen, Keith Hampton, Isabel Diaz de Isla and Kakuko Miyata. 2003. [[1] (http://jcmc.indiana.edu/vol8/issue3/wellman.html) "The Social Affordances of the Internet for Networked Individualism."] *Journal of Computer-Mediated Communication* 8, 3 (April)
19. Gaver, William W. (1991). "Technology affordances". *Proceedings of the SIGCHI conference on Human factors in computing systems Reaching through technology - CHI '91*. pp. 79–84. doi:10.1145/108844.108856 (https://doi.org/10.1145%2F108844.108856). ISBN 978-0897913836.
20. "Affordances" (http://www.interaction-design.org/encyclopedia/affordances.html)
21. "Placebo buttons, false affordances and habit-forming" (https://www.webcitation.org/6DkdHrjD1?url=http://architectures.danlockton.co.uk/2008/10/01/placebo-buttons-false-affordances-and-habit-forming/). Archived from the original (http://architectures.danlockton.co.uk/2008/10/01/placebo-buttons-false-affordances-and-habit-forming/) on 2013-01-18. Retrieved 2009-07-28.
22. Yamanobe, Natsuki; Wan, Weiwei; Ramirez-Alpizar, Ixchel; Petit, Damien; Tsuji, Tokuo; Akizuki, Shuichi; Hashimoto, Manabu; Nagata, Kazuyuki; Harada, Kensuke (2017). "A brief review of affordance in robotic manipulation research". *Advanced Robotics*. 31(19-20). pp. 1086–1101. doi:10.1080/01691864.2017.1394912 (https://doi.org/10.1080%2F01691864.2017.1394912).

Further reading

- Philosophical and theoretical aspects of affordances are discussed in Heras-Escribano, M. (2019) The Philosophy of Affordances. Cham: Palgrave Macmillan.

Link: https://www.palgrave.com/gp/book/9783319988290

- The role of affordances in evolution and niche construction is discussed by

Rob Withagen; Margot van Wermeskerken (2010). "The role of affordances in the evolutionary process considered: A niche construction perspective" (https://www.academia.edu/1570495). *Theory and Psychology*. **20** (4): 489–510. doi:10.1177/0959354310361405 (https://doi.org/10.1177%2F0959354310361405).

And by

Manuel Heras-Escribano; Manuel de Pinedo-García (2018). "Affordances and Landscapes: Overcoming the Nature-Culture Dichotomy Through Niche Construction Theory" (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5767241). *Frontiers in Psychology*. **8** (2294): 2294. doi:10.3389/fpsyg.2017.02294 (https://doi.org/10.3389%2Ffpsyg.2017.02294). PMC 5767241 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5767241). PMID 29375426 (https://pubmed.ncbi.nlm.nih.gov/29375426).

- The role of affordances in agency is discussed by Rob Withagen; Harjo J de Poel; Duarte Araújo; Gert-Jan Pepping (2012). "Affordances can invite behavior: Reconsidering the relationship between affordances and agency" (http://www.fmh.utl.pt/spertlab/images/files/WithagenEtAl2012.

pdf) (PDF). *New Ideas in Psychology*. **30** (2): 250–258. doi:10.1016/j.newideapsych.2011.12.003 (https://doi.org/10.1016%2Fj.newideapsych.2011.12.003).

- Affordance and computation is discussed by AJ Wells (2002). "Gibson's affordances and Turing's theory of computation" (http://eprints.lse.ac.uk/2606/1/Affordances_and_Computation_APA_style_%28LSERO%29.pdf) (PDF). *Ecological Psychology*. **14** (3): 140–180. doi:10.1207/S15326969ECO1403_3 (https://doi.org/10.1207%2FS15326969ECO1403_3).
- The normative character of affordances is discussed by Manuel Heras-Escribano; Manuel de Pinedo (2016). "Are affordances normative?". *Phenomenology and the Cognitive Sciences*. **15** (4): 565–589. doi:10.1007/s11097-015-9440-0 (https://doi.org/10.1007%2Fs11097-015-9440-0).
- The relation between niche construction, self-organization and affordances is discussed by Bruineberg and Rietveld https://www.frontiersin.org/articles/10.3389/fnhum.2014.00599/full

External links

- A series of slides concerning theories of vision and (incidentally) the role of affordances and some interesting optical illusions concerning affordances Aaron Sloman (March 12, 2014). "What's vision for, and how does it work? From Marr (and earlier) to Gibson and beyond" (http://www.cs.bham.ac.uk/research/projects/cogaff/misc/talks/sloman-beyond-gibson.pdf) (PDF). Retrieved May 22, 2014.