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Stephen Harwood

University of Edinburgh, stephen.harwood@ed.ac.uk

Najmeh Hafezieh

University of Edinburgh, n.hafezieh@sms.ed.ac.uk

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‘Affordance’ - what does this mean?

Stephen A. Harwood, Najmeh Hafezieh,

University of Edinburgh Business School, University of Edinburgh, UK

Email: stephen.harwood@ed.ac.uk, n.hafezieh@sms.ed.ac.uk

Abstract

The growing use of the concept of an affordance raises questions about its meaning and has led to much debate. This exploratory evaluation of usage reveals divergent meanings, exposes tensions and explains why there is confusion about the concept. The notion of an affordance focuses attention upon possible action, raising the issue of how affordances give rise to action. The discussion reveals latency in the nature of affordances, that they do not exist in isolation, can be designed into artefacts and have social, temporal and spatial dimensions for their actualization. An affordance is a necessary condition for its enactment, but sufficiency arises with the situatedness of enactment. Moreover, an affordance, which is actualized through its enactment, is thus performative. It is concluded that the term affordance should be used with caution and with more precision and rigour, as its everyday use is fraught with vagueness saying little about the complex dynamics that underpins affordance as a concept.

Keywords: affordances, conceptualisation, theory, socio-materiality, performativity.

1.0 Introduction

The term ‘affordance’ has recently pervaded the literatures, including that of Information Systems (e.g. Conole & Dyke, 2004; Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007; Leonardi, 2011; Robey, Raymond & Anderson, 2012; Treem & Leonardi, 2013; Goel, Johnson, Junglas & Ives, 2013; Gibbs, Rozaidi & Eisemberg, 2013; Fayard & Weeks, 2014). But why? Ever since the pioneering work of the Tavistock Institute in the 1950s (Trist, 1981) there has been recognition that the workplace cannot be split between technical and social systems. Instead, their interplay has given rise to profusion of conceptualisations, e.g. ‘socio-technical systems’ (Trist, 1981), ‘seamless web’ (Hughes, 1986), heterogeneous assemblages’ (Larkin, 1969, Landstrom, 2000), ‘socio-technical ensembles’ (Bijker (1995: 269), ‘sociotechnical constituencies’ (Molina, 1990, 1997) or ‘sociomaterial assemblages’ (Suchman, 2007; Orlikowski & Scott, 2008). However, these terms disguise the nature of this complex entanglement (Orlikowski, 2005), mangle (Pickering, 1993) and imbrication (Leonardi, 2011) of technology and the human agent. Nevertheless, despite these rich insights, they fail to address the question of why a technology is taken up. On the one hand, the essentialist view emphasises the role of the properties of artefacts, is deterministic (e.g. Winner, 1980). On the other, the anti-essentialist emphasises the meaning held about an artefact, and the manner in which inscriptions embedded in the artefact are read (e.g. Grint & Woolgar, 1997).

In contrast, the notion of affordance provides a bridge between the social and artefact, offering a concept to explain why a technology is taken up, operating at the micro-level of the detail of human activity (c.f. Cos-Aguilera, Hayes, & Cañamero, 2004; Zammuto et al, 2007; Markus & Silver, 2008). Hutchby (2001), succinctly captures the argument when presenting the Gibsonian affordance as an alternative to the

diametrical opposing essentialist and anti-essentialist views about technology. Affordances privileges neither view, instead supporting a mutually shaping perspective: “technologies can be understood as artefacts which may be both shaped by and shaping of the practices humans use in interaction with, around and through them” (Hutchby, 2001: 444). However, how does affordance explain this interplay between the social and artefact?

The term ‘affordance’ was introduced by James J. Gibson in 1966, but it was in his seminal work “The Ecological Approach to Visual Perception” (1979) that he developed his ‘theory of affordances’, which has since been the topic of much debate. This debate, which initially pre-occupied mainly psychologists, quickly shifted to researchers interested in the relationship between people and technology, in particular, Information Systems. One of the reasons for this on-going debate is that Gibson’s formulation of the term has been ambiguous (Şahin, Çakmak, Doğar, Uğur, Üçoluk; 2007), allowing for misunderstanding (McGrenere & Ho, 2000; Norman, 2013)) and confusion (Şahin, et al., 2007). However, Jones (2003) reveals how Gibson’s thinking about affordances had evolved over time, suggesting that perhaps a clearer explanation would have emerged should the opportunity have presented itself. Nevertheless, that the debate has been on-going suggests that there is much interest in how in the concept of affordances can serve as an instrument in discourse about the relationship between humans and artefacts. However, the manner in which the term is used still reveals diversity and ambiguity in how the term is used, which merely serves to confuse.

This paper explores the manner in which the concept of affordances has been used in a wide range of literatures. It draws upon a large pool of papers, though selectively focuses upon those which provide conceptual development. This study commences with a brief examination of the work of James Gibson and Donald Norman, then provides a thematic evaluation of subsequent formulisations of the term affordance. The contribution is to provide a preliminary overview of how the notion of affordance can be interpreted.

2.0 Origin and early debates about the term

1.1 James Gibson

James Gibson, an ‘ecological psychologist’, ‘coined’ (1966) or ‘made up’ (1979) the word affordance to mean “something that refers to both the environment and the animal... The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill” (Gibson, 1979: 127), i.e. can be both positive (e.g. beneficial) and negative (e.g. injurious). Whereas the meaning of an object may change with the observer’s changing needs, the affordances offered do not change, are invariant, being always present. However, an affordance is not a property or quality residing in either the object or subject, but relates to how objects are perceived with regard to their possibilities for use. Affordances, “are properties of things taken with reference to an observer but not properties of the experiences of the observer” (Gibson, 1979: 137), “they are neither physical nor phenomenal” (Gibson, 1979: 143). An affordance is not bestowed upon an object by a need of an observer and his act of perceiving it. The object offers what it does because it is what it is” (Gibson, 1979: 139). As such, affordances cut across the objective-subjective

dichotomy. That affordances can be misperceived raises a critical question of how affordances are perceived – what information (stimuli) is there.

Whilst Gibson, in his earlier work, draws attention to the role of learning when making sense of objects, Eleanor Gibson, his wife, reveals that learning was “not something that my husband thought a lot about” (Szokolszky, 2003: 271), though was an issue which interested her:

And so, in designing a learning theory that fits development I have also used the notion of affordances. I think now that what is learned are affordances, and differentiation is a process that explains refining learning and behavior. But my notion of learning is really perceptual learning; I think that it is a discovery process. Children discover affordances through observation and consequences of their exploration. (Szokolszky, 2003: 274)

Perceptual learning is described as “equally the means of discovering distinctive features and invariant properties of things and events” (Gibson, 2000: 295). Moreover, whilst it commences as exploratory activity (e.g. visually examining or trialing), it “can become performatory as an affordance is discovered. This shift is marked by making contact with the environment and ensuing control of it” (Szokolszky, 2003: 297).

Gibson’s contribution is to draw attention to the action capabilities of observers, relative to that perceived.

1.2 Donald Norman

An alternative view was developed by Norman (1988). Norman, a cognitive psychologist, defined affordance as referring “to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used” (Norman, 1988: 9). He acknowledges:

I believe that affordances result from the mental interpretation of things, based on our past knowledge and experience applied to our perception of the things about us. My view is somewhat in conflict with the views of many Gibsonian psychologists, but this internal debate within modern psychology is of little relevance here (Norman, 1988: 219).

Gibson’s example of a door draws attention to the importance of a signal, which informs us how to act, but that also that it is important to determine what are permissible actions based on affordances and constraints.

However, Norman’s view is later revised and clarified:

the term affordance refers to the relationship between a physical object and a person... An affordance is a relationship between the properties of an object and the capabilities of the agent that determine just how the object could possibly be used... Whether an affordance exists depends upon the properties of both the object and agent (Norman, 2013: 11).

This reveals a shift from a properties emphasis to a relational perspective, with the warning of confusing properties as affordances. Counter to affordances are anti-affordances that (constraints) prevent interaction and use. Moreover, affordance need not be visible, yet still exist, raising the distinction between real (physically present), perceived (appearances - signifiers) and invisible affordances. Thus, when interacting with an object, the challenge is to understand how to use it. This raises the question of how appropriate use is discovered. Norman draws upon Gibson’s view, that the senses

“pick-up information about the world” (Norman, 2013: 12), with signals (information) contained within affordances revealing what is possible: “affordances determine what actions are possible. Signifiers [are signals that] communicate where the action should take place” (Norman, 2013: 14). Designers of objects, in order to make them understandable, can create ‘signifiers’ to reveal where to act, i.e. a signal “communicates appropriate behaviour” (Norman, 2013: 14).

3.0 Gibson versus Norman

Whilst there appear to be similarities between the two formulations of affordances, they are distinctively different as noted by McGrenere & Ho (2000) and Sahin et al. (2007). Whilst a Gibsonian affordance is directly perceived, Norman’s affordance involves cognition, visibility and discoverability. For Gibson, an affordance is invariant and pertains to the object, though is not a property and exists with reference to the agent. In contrast, the focus of attention for Norman’s affordance is upon the relationship between the properties of an object and the capabilities of the agent. Moreover, an affordance can be invisible, though an object can be designed to incorporate signals that enable affordances to be discovered.

These different conceptualisations reflect the different orientations of Gibson and Norman; Gibson, who was concerned with the visual perception of affordances and did not make the distinction between human and animal, and Norman, whose interest lay with the design and utility of technology (McGrenere & Ho, 2000). However, these differences, together with lack of clarity in Gibson’s account of affordance (illustrated in the difficulty in establishing the nature of the relational aspect tacitly invoked in the Gibsonian affordance), has led to confusion about how to use the concept of affordance (Şahin, et al., 2007), as illustrated by McGrenere & Ho (2000: 5): “yet most who cite Gibson and perhaps even quote him resort to using the meaning given by Norman”. Nevertheless, Kaptelinin & Nardi (2012) defend Gibson from criticism about any deficiencies with regard to his formulation of his theory:

Gibson’s notion of affordance as “natural affordances”, such as those for manipulation and locomotion, is consistent with the overall aims of his research project which centered on perception. It would be unfair to criticize Gibson for not developing the notion of affordance beyond natural affordances, i.e., to criticize him for not choosing a different research agenda. Therefore, while current debate clearly indicates that Gibson’s original notion is too limited to properly serve the needs of HCI research and practice, the notion has its own inherent contours, and cannot be “upgraded” without being transformed into something it is not (Kaptelinin & Nardi, 2012: 970-971).

4.0 Deconstructing the usage of ‘affordances’ into its constituent elements

One of the relatively consistent views about an affordance is that it concerns the possible actions that an object offers. However, a more detailed evaluation of how others have used the term affordances reveals variety in the underlying concepts. Aside from differences in definition, there are differences in such issues as how viewed as a process and whether are perceived or interpreted, are relational or dispositional, or are representational or performative. To add are material, social,

spatial and temporal dimensions. Finally, there are debates surrounding the design of affordances.

Definition: One of the difficulties with the concept of affordances is that it is unclear what an affordance is. A cursory examination of the variety of definitions to be found in the literatures reveals the idiosyncratic nature of what constitutes an affordance (c.f. Lindberg & Lyytinen, 2013). Moreover, the concept lacks precision (Jarzabkowski & Pinch (2013). Affordances have been defined in terms of an offering (Gibson, 1979), relations (Stoffregen, 2000; Chemeo, 2000, 2003), properties (Norman, 1988; Gaver, 1991; Turvey, 1992), and functionality (Cos-Aguilera et al., 2004). Indeed, it subsumes both functionality and behavior (Maier & Fadel, 2001). It can reside in the object (Gibson, 1979, Gaver, 1991; Turvey, 1992) or are emergent in the relations between object and subject (Stoffregen, 2000; Chemero, 2003). There is clear divergence about what constitutes an affordance, illustrated by Sahin et al. (2007) who, through a systematic process of formulating a definition for the affordance of autonomous robotics, establish five definitions, each pertaining to a different viewpoint. To add, is the study of the affordances of spaces and buildings, with implications on human practices (Fayard and Weeks, 2005; Maier, Fadel & Battisto (2009); Mittleman, 2009). Affordances are offered, not only by the object, but also by space which has implications for the design of space (Atmodiwirjo, 2014). Faraj & Azad (2012) acknowledge the many different meanings of affordance but conclude that it is perhaps counterproductive to establish 'one true meaning'. Whilst it may be incorrect to state that there are right and wrong definitions, this does raise the desirability of more precise articulations of the term is being used to avoid misunderstanding.

Affordances as process: Since the concept of an affordance relates to possible actions, this raises the question of how, i.e. what is the process which results in an affordance being sought, recognised and actualised. Bernhard, Recker & Burton-Jones's (2013) deconstruction of this process, drawing upon research in the Information Systems domain, commences with an (1) object with 'existing' affordances and a (2) user with intent. Affordances are (3) perceived, implying there is (4) information available to reveal their presence, and (5) actualised, involving (6) effort (i.e. how easy is actualisation), which gives rise to (7) effects. This draws attention to the semiotic aspects of affordances (i.e. the nature of the signifier), and whether it correctly perceived as such. Moreover, it is proposed that this deconstruction usefully avoids the argument (e.g. McGrenere & Ho, 2000; Hutchby, 2001; Leonardi, 2011; Robey et al, 2012; Norman, 2013) of whether affordances reside in the object, user or the relationship between the two and what constitutes these affordances. Affordances exist, are perceived and are actualised in a process that spans time. Pollock (2012) proposes the term 'affordizing' to denote the actualisation of an affordance. However, Markus & Silver (2008) claim that affordances offer 'potentially necessary' conditions for usage, but that that these are neither necessary nor sufficient conditions for usage. Strong, Volkoff, Johnson, Pelletier, Tulu, Bar-On Trudel & Garber (2014) offer a theory for the actualisation of an affordance, which is conceived as an individual journey, with each journey being unique. Individual journeys, which may involve learning, overcoming obstacles and misdirections, collectively allow organisational objectives to be achieved, thus constituting an organisational journey, which can thus involve more than one person.

Directly perceived or interpreted: The notion that an affordance is interpreted is counter to Gibson's notion that objects are directly perceived, though does align with Norman's view of the need for an agent to discover and determine affordances. This creates a role for cognition, but cognition, it is claimed, introduces an inaccessible 'magical and mysterious' element into the formulation of an affordance (Bærentsen & Trettvik, 2002). The need to perceive or cognise an affordance draws attention to Norman's distinction between perceived and invisible affordances, which need signalling (signifiers or information), to which Gaver (1991) adds 'false' affordances, which gives rise to mistaken actions. Thus, an engagement with an object may be undermined due to mis-interpretation or lack of information about what it offers. This can lead to exploratory activity, the discovery of new information and the detection of new affordances, these being 'sequential affordances' or 'nested affordances' if 'grouped in space' (Gaver, 1991). The example of a door handle reveals this progressive mode of discovery:

For instance, the pivoting door handle... may appear to afford grasping, but passive observation will probably not indicate the affordance of turning it or using it to open the door. However, once grasped (B), a random or exploratory press downwards will convey tactile information revealing the affordance of turning the handle. When the handle is fully turned (C), the new configuration is one from which pulling is natural. The results of a pull will indicate whether the door affords opening or not. (Gaver, 1991: 81)

The progression from grasping to turning to pulling is sequential, but is nested within the affordance of opening the door. This, perhaps, is illustrative of the more general notion of how one learns about affordances which Gibson (2000) labels 'perceptual learning'.

A relational or dispositional view of affordance: Gibson's (1977) notion of an affordance is that it is neither a property of an object nor of a subject or agent, but exists with reference to how perceived. This invokes some form of translation between property of object and perception by agent, which has been interpreted as denoting affordance as being a relational concept (e.g. Hutchby, 2001; Chemero, 2003; Stoffregen, 2003; Cos-Aguilera et al., 2004; Vyas, Chisalalita & van der Veer, 2006; Şahin, et al., 2007). For example, Cos-Aguilera et al., (2004) take the view that affordances are related to task, environment and agent and, whilst embracing the view of affordances as function, also hold the view that affordances are dependent upon the agent's morphology and internal behaviours and goals. The affordances are in the relationship. Likewise, Vyas et al, 2006 view affordances as an 'interactional' relationship, whereby affordances emerge during the interaction between user and environment, with this relationship being interpretative. However, whilst there may be general agreement that affordances are relational, there are different explanations of how this relationship is brought about.

For example, Stoffregen (2003) argues that the actualisation of an affordance becomes an emergent property of the conjoined elements (animal and environment), which together offers the affordance: "affordances are properties of the animal–environment system, and they exist only at the level of the animal–environment system" (Stoffregen, 2003: 124), thus they are emergent properties. This definition emphasises that affordances are opportunities irrespective of whether actualised, but that actualisation (behaviour) arises when complementary affordances AND intentions are conjoined. This allows the availability and persistence of many options in terms of

affordances and intentions within the animal-environment system, of which only one is actualised.

In contrast, Bærentsen & Trettvik (2002) argue that, since affordances have activity as their focus, then there is a call for a theory that has activity as the mediating element between subject and object. However, they argue that Gibson's view of activity is inadequate as it ignores the development of human activity from a cultural and historical perspective (e.g. the division of labour). They draw upon activity theory developed by Vygotsky, Leont'ev and others. Activities comprise of motivations, goals, which are adapted to the operational conditions. Operations can be viewed at both biological (sensory motor systems) and consciousness levels. Gibson's focus upon the behavioural aspect relates to the operational aspect at the biological level.

In contrast, Turvey (1992) argues that possibilities for action are grounded in latent, potential or dispositional affordances, which has led to the formulation of affordances as dispositions, where a disposition is a 'causal propensity' to realise actualisation, this requiring particular conditions. Moreover, all affordances have a complement that is an 'effectivity', which is "the casual propensity for an animal to effect or bring about a particular action... [in other words is] a dispositional property of an organism" (Turvey, 1992: 179). Thus, if there is no complement, then there can be no dispositional property, which implies that an affordance or effectivity cannot exist without the existence of the other. Further, Turvey states "Dispositionals [or causal propensities] never fail to be actualized when conjoined with suitable circumstances. Disposition and suitable circumstances equals actuality" (Turvey, 1992: 178).

Turvey's (1992) dispositional view of affordances which emphasis the object, has been developed by Fayard & Weeks (2014), who propose an integrative perspective toward affordances, argue that affordances are both relational and dispositional, drawing upon Bourdieu's (1977) notion of habitus to explicate the social underpinnings in complementing affordances as a middle-ground theory that can not explain the socio-cultural context of this relation. Habitus, defined by Bourdieu (1977: 214) "as a system of dispositions", highlights the social nature of personal development. Whilst affordances draw focuses attention upon the relationship between artefacts and socially embedded individuals, habitus gives account of the manner of the social embedding of individuals.

Affordance as representation or as performative: The notion of an affordance as a representation is countered by the view that it is performative. Steedman (2002) presents a representational model of affordances, relating these to the formation of language used in planning purposeful action, this denying Gibson's notion of direct perception. Instead, actions are cognitively represented. Thus, whilst affordances relate to properties, they are related through preconditions and consequences: "If the precondition is a conditional stimulus such as a light, and the consequence is a reward, such as food, while the action concerned is pecking or pressing a bar, then it can be considered as a representation of an operant in the cognitive sense..." (Steedman, 2002: 733). This formulization relates objects to events in a manner that applies to human cognition and/or natural language semantics: the affordance exists as a representation. However, Steedman acknowledges that one of the challenges of this view is that little is known about the cognition of how objects are conceptualised.

More recently, Burton-Jones & Grange (2013) drew association between affordances and representation theory. The underpinning argument of representation theory is that the system represented within an information system is perhaps the only means available to observe the represented system (e.g. inventory records to observe inventory in a warehouse). Whilst representations assist understanding of situations, this is invoked in the cognitive perspective of affordances which requires understanding of how to realize the intended outcome.

In contrast, is a view that the affordance manifests through its actualization, that an affordance is performative. This was suggested by Eleanor Gibson, whereby, through the process of discovering what is being afforded, at the point of its discovery becomes performatory (Gibson, 2000). Similarly, Cos-Aguilera et al. (2004) describe actions as being performed, with the 'set of affordances' being defined by the possibility of behaviours being performed. Likewise, Volkoff & Strong (2013) refer to the actualisation of an affordance as performed. However, the strongest case for the performative nature of affordances is presented by Lindberg & Lyytinen (2013), who view affordances as both social constructivist and performative. Whilst any understanding of potential use is socially formed, it is in the practical engagement when an affordance is performed, that defines the affordance. Lindberg & Lyytinen (2013) draw upon Feldman & Pentland (2003) to propose two levels of affordance: 'ostensive' (affordances as abstractions) and 'performative' (affordances as enactment). Ostensive affordances are instantiated as performative affordances in their enactment.

The material dimension: Lindberg & Lyytinen (2013) explain the link between affordance and materiality: "an object has materiality because it conveys affordances, not because it is solid... [Since] affordances create action possibilities, the object impinges on the world, and its implication in activities makes its materiality real, whether it is solid or not" (Lindberg & Lyytinen, 2013: 47). This can be interpreted to suggest that, irrespective of an object's physical or digital form, by virtue of its presence, it is the materiality of the object that affords possibilities for action. This is illustrated in Treem & Leonardi's (2012) examination of how organizations use social media, which is undertaken using a relational view of affordances.

The social dimension: The notion of affordances has tended to be used in a singular sense – the affordances of an object with regard to an agent, e.g. a door handle. However, the everyday comprises of many people who selectively engage with many objects. Gaver (1996) draws attention to the social implications of affordances that they do not exist solely for individual actions but also for social interaction. Moreover, that through affordances "social activities are embedded in and shaped by the material environment" (Gaver, 1996: 112). Their selection and use is, as proposed by Gibson (2000), the outcome of learning to discriminate in this material environment, which is, in part, determined by the observer's "culture, social setting, experience and intentions" (Gaver, 1991: 81). Thus, any analysis should establish the nature of the complex of factors that shape social interaction (Gaver, 1996). Similarly, Vyas et al. (2006) view the interaction between user and technology as socially and culturally constructed, which raises awareness of social and cultural contexts. This sociocultural domain is also made evident when considering the use of technology as practice, the notion of practice invoking social structures and thus social groups. This invokes Bourdieu's (1977) notion of habitus, which Fayard & Weeks (2014)

introduce to denote the social nature of practice. Thus a more meaningful view of affordances is one that can be extended to user groups. This has been explored by Leonardi (2013) who proposes the distinction between affordances that are idiosyncratically enacted (individualized affordances), those that arise through the synchronised activities that use different affordances collectively (collective affordances) and those that arise through similar usage (shared affordances).

This draws attention to the social context within which practices manifest and the inherent complexity of the interplay between technology and the human agent within this social context. Lindberg & Lyytinen (2013) have introduced the concept of 'affordance ecologies', with the ecology metaphor being used to invoke thinking about this complexity and dynamicity, which comprises of three domains: infrastructure, organization and practice.

An environmental (spatial) dimension: An alternative view of affordance draws upon Gibson's notion of how an animal interacts with its 'environment'. This shifts attention away from the specifics of the artefact to the arrangement of artefacts within a space and how space is designed and used. The affordances offered by space have been examined by Maier & Fadel (2003), Maier, Fadel & Battisto (2009) and Koutamanis (2005) in the context of architecture, Fayard & Weeks (2005), in the context of the office and Atmodiwirjo (2014) in the context of autistic children. The organisation of space and artefacts can create an environment that comprises of meaningful multiplicities of affordances that support sensory integration and enhance experience (Atmodiwirjo; 2014). More specifically, Fayard & Weeks (2005) reveal how space can be used to bring people together (i.e. affords proximity), to deny access to people (i.e. afford privacy) and to support informal interaction (i.e. affords legitimacy). Strong et al. (2014) that a multiplicity or bundle of affordances, which may be interrelated, may be actualised at different times drawing attention to a temporal dimension.

Do events (a temporal dimension) have affordances? This temporal dimension is highlighted in a debate, triggered by Stoffregen (2000), about whether an event has affordances. Stoffregen (2000) argues that affordances and events are qualitatively different, defining events as static (i.e. stationary) and dynamic (i.e. moving) properties of objects and surfaces defined (i.e. measures) independent of the observer" (Stoffregen, 2000: 6). Whilst affordances are defined with respect to an animal and invoke behaviour, events though being properties, are not defined with respect to an animal and do not refer to behaviour. Thus, events cannot be perceived, whereas affordances can.

Respondents to this claim included Chemero (2000), Gibson (2000) and Bingham (2000). Chemero (2000) questions Stoffregen, particularly his claim that events may not be perceived. Events are defined as "changes in the layout of affordances of the animal-environment system" (Chemero, 2000: 39). Using the example of an experiment involving stepping across a gap between moving platforms (e.g. a boat at dock) an event arises when the gap becomes uncrossable (i.e. is action related). Gibson (2000a), is more emphatic claiming that "there is no such thing as perceiving an affordance without perceiving events" (Gibson, 2000a: 54-55). The information to be found in events about an affordance includes "relevant environment features, the activity of the organism, and the consequences that ensue as well as the relations

among these” (Gibson, 2000a: 54). Bingham (2000) argues that events are perceived and offers a critical evaluation of Stoffregen (2000). Bingham counters “events are not properties. Events are substantial, spatiotemporal things that can have or exhibit properties and that can enter into relations with other properties things, that is, other events” (Bingham, 2000: 30). It is argued that, since events can have properties, and that properties can support behaviour of a more or less particular form, then events are not “intrinsically free of reference to animal behaviour” (Bingham, 2000: 32). Moreover, that animals do perceive events. Whilst objects are recognised by their form, events are recognised by their spatiotemporal forms, i.e. forms of motion. Bingham questions Stoffregen’s interpretation of Gibson’s views about events, claiming that Gibson held the view that events are perceived. To reinforce the overall argument, attention is drawn to a methodological issue: affordance properties should not be perceived without perception of the relevant event, this implying the contextual relevance of affordances.

Design of affordance: Norman (1988: 188) argues that a design is likely to have failed if it requires instructions; that “it should exploit natural relationships and natural constraints”. However Norman (1988, 1999, 2013) acknowledges how concept of affordances has been adopted by the design community. One mode of adoption is presented by Hartson (2003), who proposes four affordances, each of which are selected for how they assist users engage with computers.

Norman’s perceived affordance becomes cognitive affordance, helping users with their cognitive actions. Norman’s real affordance becomes physical affordance, helping users with their physical actions. We add a third kind of affordance that also plays an important role in interaction design and evaluation, sensory affordance, helping users with their sensory actions. A fourth kind, functional affordance, ties usage to usefulness (Hartson, 2003: 316)

However, Norman (1988, 1999, 2013) conceded that adoption has not necessarily been in the manner as intended, in part, arising from misunderstanding about the concept. One feature of this misunderstanding is the distinction between an affordance and the information to signify an affordance as depicted by Norman (1999, 2013).

This distinction between the design of affordances (utility) and the design of information that reveals the affordance (usability) is developed by McGrenere & Ho (2000). They discuss the affordances of software in terms of the functions available to the user (e.g. text editing, drawing), using the example of a scroll-bar to raise the question of whether it is an affordance or information about an affordance, a similar argument used by Norman (1999) recording an icon on a screen and whether it is an affordance or signifies a affordance. In contrast to Norman, for whom the icon is a sign or ‘learned convention’ and thus is not an affordance, McGrenere & Ho (2000) argue that the notion of nested affordances explains how the affordance of the functionality of software is enabled through the screen’s ‘button’s’ affordance of clickability and that the scrollbar (an icon) is an object that affords scrolling. An alternative view to the information-affordance debate relates to the distinction between action and the control of action, whereby affordances enable action, whilst information about affordances enable the control of action (Stoffregen, 2000).

5.0 Discussion – Conclusion

The preceding evaluation of the concept of affordance draws attention to the problems of definition, lack of clarity about how an affordance is enacted as well as the issues about whether affordances are perceived or interpreted, are relational or dispositional, or are representational or performative. It further reveals that affordances can be viewed in terms of material, social, spatial and temporal dimensions. Finally, there are debates surrounding the design of affordances. Overall, the single word ‘affordance’ is thwarted with multiple interpretations and consequent tensions. However, does it matter?

Take the example of a door handle as illustrated in figure 1. How does the concept of affordances explain use of this door handle and what can this reveal about different interpretations of the concept of affordance? The two doorknobs, by virtue of their shape, can be perceived as the means by which the door could be both opened by those authorised and secured. They appear to offer multiple affordances. Whilst the upper doorknob may be perceived as offering the most likely means of releasing and opening the door, no such mechanism existed, with the signifiers being deceptive and the affordance of enabling the door to open being false, it does not exist.



Figure 1. No ordinary door handle.

In the case of the lower doorknob, the affordances offered are not so apparent. To open the door, the more astute might interpret the black end section of the knob to signify a scanning mechanism that requires something (e.g. a swipe card) to activate

it, but there is nothing visible to indicate what this might be. The information signifying the role of the black end portion requires knowledge as a prerequisite of being able to use this lower doorknob and thus actualise its affordance. However, it is not apparent that this mechanism that controls the securing of the door, collects data; that this door handle is part of an information system that is invisible to the user of the door handle. Data is collected about the user entering the room, though not, in this case, of leaving the room, with the door handle on the other side of the door being a conventional door handle. These affordances are hidden. This distinction between visible, invisible and false affordances as well as the role of signifiers supports both Norman's (1988, 2013) and Gaver's (1991) conceptualisation of affordances.

What differentiates this examination of a door handle from other studies featuring door handles (e.g. Norman, 1988; Gaver, 1991; Koutaminis, 2005) is that it reveals the affordances offered by a sensor embedded in the handle. These affordances are not visible, nor easily discoverable. It requires the person who created and embedded the sensor to share knowledge with others, these being those who will collect and use the data. That the designer of the door handle has rendered the affordance of collecting data invisible, suggests that a, perhaps unconscious, decision has been made about the status of the main users of the door handle, the room users. They are to be monitored.

If this one example is extended to the situation where there are many sensors in operation, it invites questions about the broader ramifications of sensors distributed throughout technologies that become part of the everyday fabric of what are being referenced under the terms of 'smart technologies', 'the internet-of-things' and 'smart cities'. The affordances of smart technologies are not perceptible other than through the appearance or form of each artefact. Gibson's argument that affordances are perceptible collapses with the design of 'smart' technologies and the invisible affordances of data collection, as revealed with the sensor in the door handle. Affordances concern what is possible, but digital technologies, particularly those involving sensors, do not require perceptual forms to enable them to act. Moreover, the affordances of artefacts are enabling other artefacts to act, invisible systems comprising of interacting artefacts, serving people in terms of sensing their requirements and performing accordingly (e.g. activate lights when a room is being entered; remotely report fridge food stock levels).

However, a more sinister aspect is revealed. Few were aware that data about who was using the door was being collected. Covert data collection raises the issues of transparency, security of data collection, ownership of data collected and the invasion of the privacy of those about whom the data relates to, as well as the possibility of data exploitation and abuse. This creates an imbalance between those who are knowledgeable and have access to these invisible affordances, and those who are unaware of them. This invites the anti-social possibilities of monitoring, lurking, bullying...

So what does this case reveal?

This case substantiates a number of the dimensions raised previously. The intentional nature of behaviour draws attention to the distinction between Gibson's and Norman's formulation of affordance. Gibson's formulation was conducted within the domain of the natural world, which did not discriminate between human and animal and

emphasized the purposive nature of their behavior. Instead, Norman's formulation draws attention to the significance of cognition, interpretation, the purposeful nature of human behavior and the designed nature of artifacts.

The case-study presented supports this latter formulization, suggesting that the affordance of an artifact is latent (dispositional) until such time that it is discovered and actualized by a person using the artifact. Affordances are not properties, but properties provide affordances. Affordances do not exist in isolation but as packages or 'affordance configurations' (Lindberg & Lyytinen, 2013), which can be either visible or invisible. This is very evident with information systems and the everyday use of these. Users engage through the signage that reveals what possible actions can enacted, but this assume knowledge which must be learnt. Thus, an affordance is not a representation of possible actions (Steedman, 2002), but is actualized through its enactment, actualization arising from perceiving how the artifact can be used. In other words, an affordance is performative through its enactment in the sense of Latour (1986) and Pickering (1993) as opposed to its other possible meanings (Harwood & El-Manstrly, 2012). Its enactment reveals and defines the affordance from the many possible affordances an artefact can potentially offer. Unless an affordance is enacted, it only exists as a possibility and thus need never be enacted and hence is superfluous.

Whilst Markus & Silver (2008) claim that affordances offer 'potentially necessary' conditions for usage, but that that these are neither necessary nor sufficient conditions for usage, it can be argued that affordances are necessary, but not sufficient conditions for usage. If there is no affordance, then there cannot be a possibility for action, without which there can be no action. For conditions to be sufficient, then this invokes a social context and shared knowledge about conventions of behaviour and practice. Cars afford the possibility of killing, but there is a convention about cars not being used for this activity, irrespective of the knowledge held about how to use a car. It is postulated that the situatedness in which an affordance is enacted provides the necessary, and sufficient conditions for an affordance to be actualised. This relational view of an affordance concurs with Chemero (2003).

As a concept, affordance offers a useful bridging device to explain the interplay between the artefact and human user. It draws together a variety of dualities: subject-object, user-artefact, design-use, perception-intention. These dualities dissolve within the concept of an affordance revealing a complex dynamic over space and time within the most mundane of enactments. However, if an affordance is a necessary but not sufficient condition for an enactment, and that the situation within which an affordance is latent, provides the necessary and sufficient conditions, then this invites questions about what constitutes the situatedness of actualisation. It draws attention to the situatedness of practices (Suchman, 1987) and 'affordance ecologies' (Lindberg & Lyytinen, 2013). More pragmatically, the concept of affordance draws attention to the manner in which newer forms of technology (e.g. social media, smart phones) are used.

To conclude, the issue is not about the usefulness of the term but about the manner of its use. It was claimed in the Introduction that the concept of affordance 'provides a bridge between the social and artefact, offering a concept to explain why a technology is taken up'. However, as an explanatory bridging device it loses its power due to the multiple ways in which the concept can be constructed. This is problematic in that it

then becomes difficult to understand in what specific sense an author is using the term, if there is any. Indeed, it cannot be assumed that there is a specific construct underpinning an author's use of the term. For example, Lee (2010) argues in his critical commentary about IS research, that whilst researchers may espouse a belief in 'scientific rigour', which calls for key terms to be rendered into 'scientific constructs', in practice, IS researchers can lack rigour in their use of terms, with usage being that of the 'everyday, layperson sense'. Irrespective of whether this is the case, the term of affordance is a useful term as it is potentially laden with meaning. However, if this meaning is to be usefully conveyed and the concept of affordance is to perform as a bridging device, then attention needs to be given to the manner in which the concept is constructed in its use and how this is articulated.

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