Conceptualizing perceived affordances in social media interaction design

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Abstract

Purpose – The purpose of this paper is to theoretically develop the concept of perceived affordance based on the existing studies, and to construct a conceptual framework to show how perceived affordances can facilitate the interaction design of social media.

Design/methodology/approach – The paper provides a review of the relevant literature on affordance and perceived affordance, and conceptually proposes a typology of perceived affordances in social media and an integrative framework for interaction design from sociomateriality perspective. Furthermore, a brief empirical example on the interaction design of crowdsourcing systems is used to ground and illustrate the authors' conceptual framework.

Findings – The paper shows that the perceived affordances may have multi-facet characteristics and the interaction design of social media should reflect the multi-dimensional perceived affordances. The perceived affordances can support or facilitate the design of basic elements of social media, such as content and form, to enhance both usability (human-computer interaction) and sociability (human-human interaction). A position of constitutive entanglement does not privilege either users or social media artifacts, nor does it provide a rigid triangle among these three components. Instead, the perceived affordances play a critical role in integrating the key components in social media interaction design as an ensemble.

Originality/value – The paper attempts to explore and develop the concept of perceived affordance and employ it as a theoretical lens to underpin interaction design of social media. Overall, the authors' study contributes to the design science literature in the information management field by elaborating a new theoretical perspective and providing a conceptual framework for the researchers and designers.

Keywords Affordance, Perceived affordance, Social media, Interaction design, IT artefact, User type and role, Application domain, Sociomateriality, Social interaction, Perception, User interfaces

Paper type Conceptual paper

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1. Introduction

Social media have seen their wide and rapid applications in practice. According to the statistics by Alexa.com, among the top ten sites with the heaviest traffic in the US in 2011, eight of them were social media sites, which attracted 148 million users in the US alone. Since there is no universally accepted definition for the term "social media," in this paper, we define social media as socio-technical systems, websites or applications that build on Web 2.0 technologies to provide space for social interaction, communication, collaboration, and community formation. For sustainable development of social media, some challenges cannot be overlooked. Among them, the interaction design of social media is of great importance yet not well addressed by academia. On one hand, the interaction design of social media means the interactive design process, during which the designers need to interact with users, and take into consideration of their demands and feedback. On the other hand, it also represents the interactive functions supported by social media. In this study, the concept of interaction design of social media incorporates both views. From the information management perspective, the design-science paradigm attempts to extend the boundaries of human and organizational capabilities by creating new and innovative artifacts (Hevner *et al.*, 2004). We believe that social media is one typical example of IT artifact, and the design of social media does need some theoretical supports and design principles. Although there are many heuristics and opinions, few studies have provided theoretical frameworks on the nature of social media interaction design.

In this study, affordance and perceived affordance are selected as theoretical foundations. First, we will briefly explain what affordance in phenomenon is. While approaching a chair with four legs, you recognize instantly and automatically that you can sit on it. Also, when you approach a door with a doorknob, you recognize instantly and automatically that the doorknob is there to help you open the door. Now imagine a chair with a broken leg or a door without a doorknob, you may have to think for a while before knowing if you can use it or try some other ways. Such properties of artifacts that are recognized and which contribute to the kind of interaction that occurs between an actor and the artifact are called affordances (Gibson, 1979). As such, affordances are not an outcome of the artifact alone nor of the actor alone, but of the complex interaction between multiple actors and the artifacts (Van Osch and Mendelson, 2011). Norman introduces the term "affordance" to the design area and proposes the concept of "perceived affordance", which argues that designers should care much more about what the user perceives than what is actually true (Norman, 2008). Thus it is important to investigate and examine the interactive design processes and artifacts based on users' perceptions. Yet, little work has focused on defining and discussing the perceived affordances in a way that can facilitate the understanding and practice of social media interaction design. Given this backdrop, this paper attempts to explore and develop the concept of perceived affordance and employ it as a theoretical lens to underpin interaction design of social media. The paper is organized as follows. The next section presents a brief review of the relevant literature on affordance and perceived affordance. Then, we identify three key components for the social media interaction design, namely social media artifact, user's type and role, and application domain. Subsequently, we theoretically develop the concept of perceived affordance based on the existing studies, and a conceptual framework is constructed to show how perceived affordances can facilitate the interaction design of social media from

sociomateriality perspective, in order to meet the needs of users and enhance user experience. Furthermore, an empirical example on the interaction design of crowdsourcing systems is used to ground and illustrate our conceptual framework. Overall, our study contributes to the design science literature in information management field by elaborating a new theoretical perspective and providing a conceptual framework for the designers and researchers on social media to better understand users' perceptions, and incorporate those elements into their design or evaluation work.

2. Related concepts

Two sets of related concepts will be clarified. One set is related to the perceptual psychological term "affordance," which was initially defined by James J. Gibson to represent how interactive organism-environment features index the behaviors an organism may perform (Gibson, 1979). The other set of concepts is related to the term "perceived affordance," which was introduced to the interaction design research by Donald Norman (Norman, 1988). Social media are designed to provide space for social interaction, communication, and collaboration. In order to achieve those purposes, designers should pay closer attention to whether the user perceives that some actions are possible (or in the case of perceived non-affordances, not possible). In that sense, during the design process, there can be both real and perceived affordances, and these two need not be the same.

2.1 Affordance

The word affordance was first coined by Gibson in his seminal book *The Ecological Approach to Visual Perception* (Gibson, 1979). Originated from ecological psychology and based on *Gestalt* principles, Gibson's studies of visual perception led to his founding of the discipline of ecological optics (Gibson, 1950). Gibson assumed that affordances are not simply phenomenal qualities of subjective experience; instead, they are ecological, in the sense that they are properties of the environment relative to an animal. In other words, affordances reflect the reciprocity of an acting organism and specified features of an environment, and can guide behaviors. Gibson (1979) provides a clear definition of affordance, and specifies that:

> An affordance casts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behavior. It is both physical and psychical, yet neither. An affordance points both ways, to the environment, and to the observer (p. 129).
>
> Any substance, any surface, any layout has some affordances for benefits or injury to someone (p. 140).

Gibson claimed that affordances can be perceived directly, without prior synthesis or analysis (Gibson and Pick, 2000). Direct perception is possible when there is an affordance and there is information in the environment that uniquely specifies that affordance. Generally, there are three fundamental properties of an affordance: an affordance exists relative to the action capabilities of a particular actor; the existence of an affordance is independent of the actor's ability to perceive it; and an affordance does not change as the needs and goals of the actor change (McGrenere and Ho, 2000). Given that the existence of an affordance and the actor's experience, knowledge, culture, or

ability to perceive are independent, there are some cases where an affordance exists but there is no information for actors to detect the affordance.

Later, three conflicting views of affordances become popular in ecological psychology field: the first is the selectionist view, which claims affordances are resources in the environment, and properties of objects that might be exploitable by some animal (Reed, 1996); the second is dispositional view, and affordances are dispositional properties of the environment, which tend to manifest some other property in certain circumstances by human being (Turvey, 1992); unlike the first two views, either focusing merely on environment or people, the third view is the combination of both. Affordances are "Relations between the abilities of organisms and features of the environment" (Chemero, 2003). Among those three views, the third one is the most approximate to Gibson's interpretation of affordance. Hence, affordances are not static properties, but dynamic relational attributes between organism and the environment. Affordances may be visible or invisible, depending on abilities of human beings to detect it, although affordances are pre-existing and not affected by the existing of human beings.

The concept of affordance was popularized in the HCI community through Norman's book *The Psychology of Everyday Things* (Norman, 1988). Norman appropriated the concept of affordances from Gibson for the design of everyday objects and both implicitly and explicitly adjusted the meaning given by Gibson. Norman regarded the affordance as the design aspect of an object which suggests how the object should be used. He also addressed the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used (Norman, 1988). In Norman's definition, affordance largely depends on the experience, knowledge, or culture of the actor and it provides strong clues to the operations of things and suggests the range of possibilities (Norman, 1988). The most fundamental difference between Gibson and Norman's definitions is that, for Gibson an affordance is the action possibility itself while Norman highlights both the action possibility and the way that action possibility is conveyed or made visible to the actor. Actually, Gibson is primarily interested in how we perceive the environment while Norman has more interest in manipulating or designing the environment so that utility can be perceived easily.

Although the idea of affordance is relatively novel, it has gained increasing attention from researchers who share the interests of design research, such as the engineering design, library system design, and personal technological products design (Maier and Fadel, 2008; Sadler and Given, 2007; Tang *et al.*, 2011; Zhang, 2008a, b). Bærentsen and Trettvik (2002) indicate that the interpretation of the concept of affordance in HCI has often retained the subjective-objective dichotomy. They argue that such misunderstanding may be caused by the lacking of activity of the organism, and they suggest that this drawback can be overcome by employing the concepts of activity theory as a frame of reference for the concept of affordance. Hartson (2003) expands the affordance concept and identifies four types of affordance, including physical affordance, cognitive affordance, sensory affordance, and functional affordance. The physical affordance is a feature that actually supports or facilitates physical actions; the cognitive affordance is a feature that supports thinking or learning; the sensory affordance is a feature that supports or facilitates users in sensing; and the functional affordance is one level higher than the physical affordance,

and it is a feature supporting physical action for some functional purpose. Zhang (2008a, b) proposes a motivational affordances framework with a set of ten design principles for ICT positive design and use. Motivational affordances comprise the properties of an object that determine whether and how it can support one's motivational needs. The ultimate goal of designing an ICT for human use is to achieve high motivational affordance so that users would be attracted to it, really want to use it, and cannot live without it. Based on the findings from the video analysis, Van Osch and Mendelson (2011) propose a typology of affordances regarding the interactions between developers, users, and artifacts. Among them, designed affordances refer to a set of affordances that is perceived and recognized by developers. Improvised affordances deal with the set of affordances that is perceived and recognized by users and therefore emerges while using the artifact. Emergent affordances refer to the set of affordances that is neither anticipated and designed by developers nor actively recognized and improvised by users in actual use, but which nonetheless has an impact on the interactions between artifacts and actors.

2.2 Perceived affordance

In recent studies, Norman stresses the importance of perceived affordances and differentiates them from real affordances (Norman, 1999, 2008). He claims that design is about both, but the perceived affordances are what determine usability. For designers, they should care more about what the user perceives than what is actually true (Norman, 2008). Perceived affordances are not related to a whole class of actors but only to the perceivers, and they contain an analyzable part that represents the perceivers. In the design of everyday things, the ultimate goal should be to design properties conveying information that uniquely specifies an affordance and indicates the ease of undertaking. It is worth noting that the concept of perceived affordance is more relevant to the cognitive science while the affordance by Gibson is originated from psychology, thus the perceived affordance may depend on instinct and mental model of users. The former often links to physical characteristics, for example, the size of an object in relation to the human form; the later emphasizes the user's understanding and expectations of interaction with the object (McGrenere and Ho, 2000). Meanwhile, perceived affordance inherits the key element "environment" from ecological psychology, which was embodied in the related concepts such as contexts (the environment or process in which the element is displayed) and cultures (the influence of social norms on the individual's understanding and use of an artifact). Norman concludes that well-designed artifacts should have perceived affordances that give out the correct clues as to artifacts" usage and functionality (Norman, 1988).

3. Key components in interaction design of social media

HCI researchers and designers have accumulated much experience in improving usability of products for decades. Usability is concerned with how intuitive and easy it is for individuals to learn to use and interact with a product (Nielsen and Wagner, 1996). The interaction design of social media largely depends on usability whose focus is interaction across the human-computer interface. However, as we defined that social media is a tool that can support or facilitate technology-mediated social participation, communication, and collaboration, designing only for usability is not enough, and we need to understand how social media can support social interaction among users.

Thus, sociability is another determinant of the interaction design of social media. It is concerned with how users interact with each other via the supporting technologies and artifacts, and the focus is human-human interaction which embedded with more social elements (Preece, 2000). Usability and sociability are two highly related terms in practice. Usability factors are of interest to designers, and sociability factors are of interest to community participants, site owners, and managers (Preece and Shneiderman, 2009). In this paper, we identify three key components for the social media design as follows.

3.1 Social media as an IT artifact

IT artifact is a key concept in Information Systems discipline and evolves as people develop, exploit, and apply them for different activities in different domains or contexts. Orlikowski and Iacono (2001) define it as bundles of material and cultural properties packaged in some socially recognizable form such as hardware and/or software. Benbasat and Zmud (2003) define it as the application of IT to enable or support some task(s) embedded within a structure(s) that itself is embedded within a context(s), whereby its hardware/software design encapsulates the structures, routines, norms, and values implicit in the rich contexts within which the artifact is embedded. Agarwal and Henry Lucas (2005) define the IT artifact as the integration of the processing logic found in computers with the massive stores of databases and the connectivity of communication networks, and it includes IT infrastructure, innovations with technology, and especially the Internet. From those notions we can find that the IT artifacts demonstrate strong relationships among information, technology, and organization/society, and may be embedded within a domain or context. Markus and Silver (2008) propose a new approach for characterizing the IT artifact via three components: technical objects, functional affordances, and symbolic expressions. Among them, the functional affordance has a strong relevance to the concept of affordance theory and demonstrates the likely uses and effects of the IT artifact. According to our definition about social media mentioned above, which is a technology-mediated or supported socio-technical system enabling participation, communication, and collaboration, social media has a strong IT/IS focus, and can be regarded as an IT artifact. Zhang *et al.* (2011) classifies the IT artifacts type into tangible and intangible categories. The former includes hardware, software, platform, service, features/functions, etc.; while the latter involves contracts, intellectual property, and policies, etc. In this paper, we place more emphasis on the tangible aspects, including interface, platform and service, of social media. Thus, we explore two primary embedded attributes of IT artifacts in interaction design, i.e. content and form. In terms of the contents of social media, they mainly consist of types and attributes. In terms of the forms of social media, it mainly consists of presentations and the behaviors. Form presentations refer to the static elements, including place location, banner size, color scheme, and media form, etc., while form behaviors refer to some dynamic elements such as movement, flashing, pop-up, etc.

3.2 User type and role in social media

These years several widespread design paradigms, such as user-centered design (UCD) or user experience design (UED), all have demonstrated that user is of great importance in the design process, and their attitudes, intentions, motivations, and inspirations

should be fully considered and incorporated into the artifact design. Norman believes that the perceived affordance depends on instincts and mental models of users, which indicates that users with different knowledge, different experiences, and different interests may lead to different understandings and reactions towards the same IT artifact (Norman, 1988). Thus, it is important for the designers to place great emphasis on user typologies in social media interaction design.

DeSanctis (2006) expands the notion of a user from an entity perspective, which includes individual, group, organization, and community. Although it is a general classification, it fits well with the diverse types of social media users. Furthermore, the perceived affordances may vary according to different user types. For example, YouTube can be utilized as an entertainment tool (hedonic social information systems) by individual user or as an advertising tool (business social information systems) by organization users. Additionally, some researchers expand the notion of user from a role perspective. For example, Preece and Shneiderman (2009) propose a reader-to-leader framework to illustrate the roles of users in social media, including reader, contributor, collaborator, and leader. Zhao *et al.* (2010) identify the role of users in social media as lurker, peripheral participant, active participant, and core contributor. We argue that designers should attach great importance to carefully consider the types and roles of users when designing the social media and its multi-facet perceived affordances.

3.3 Application domains of social media

Application domains normally provide the background and implied goals for social media applications that address general or particular issues or present diverse functions. Some social media may carry domain specific characteristics, for example, Threadless is a crowdsourcing platform for the design and rating of t-shirts; while other social media can be applied in different domains and play multiple roles. For example, as a social network site, Facebook is usually used to build social connections, but it can now be applied to conduct some social commerce through its word-of-mouth effect. Therefore, designers should keep on thinking how their social media can possibly be used in which domains or contexts by which users. As an IT artifact, social media evolve as people develop, exploit, and utilize them for different activities in different domains or contexts. In addition, the "external beta" design model also allows designers to improve and update their social media platforms and services continually, which can bring more experiences and surprises for users. We believe that the application domains may act as incubators or environments for interactions between social media and users, and different domains may host different rules, norms, and culture, etc.

4. Conceptual development and an integrative framework

4.1 A typology of perceived affordances in social media

Although Norman introduces the concept of perceived affordances and emphasizes its important role in interaction design, he does not further elaborate the concept from a theoretical perspective and provide more detailed guide on how to use it in the research or design work. Jordan (2001) uses psychological theories to propose four levels of pleasure that designed artifacts should provide us, i.e. physical, psychological/emotional, social, and cognitive/intellectual. Zhang (2008a) explores the motivation sources from psychological, social, cognitive, and emotional aspects that are most relevant to ICT use. Grange and Benbasat (2011) propose a guiding

framework with three levels of affordances and perceived affordances for research studying IT use, and posit the interaction at both horizontal and vertical axis lead to the success or failure of IT design. The horizontal axis is about two sets of concepts: affordances (designer) and perceived affordances (user). The vertical axis draws three levels of affordances: (perceived) action affordances, (perceived) functional affordances, and (perceived) structural affordances. Generally, the extant studies indicate that the perceived affordances may have multi-facet characteristics. In that case, it is necessary to investigate the typology of perceived affordances from its essence and based on users' perceptions. In this paper, we develop four types of perceived affordances in social media based on our previous study (Tang *et al.*, 2011): perceived physical affordance, perceived cognitive affordance, perceived affective affordance, and perceived control affordance. The perceived physical affordance in our study is broader, covering the physical affordance and sensory affordance in Hartson's (2003) study. In addition, we add two new types of perceived affordance, one of which is perceived affective affordance that is related to the affective properties of social media. The other one is the perceived control affordance, considering the controllability of the social media from user's perspective. It is worth noting that these four types of perceived affordances are not totally exclusively, and some of users' perceptions or reactions may involve more than one type of perceived affordances.

4.1.1 Perceived physical affordance. Physical affordance is the attributes of the IT artifact that can be sensed, acted upon, or physically manipulated by users for a particular purpose. Perceived physical affordance usually utilizes human senses to achieve certain goals of the IT artifact. It is a user's perception or appraisal of the degree of IT artifact's physical affordance. In interactive design of social media, vision, audition, and touch are three physical attributes considered to lower the complexity between human-computer interactions (Te'eni *et al.*, 2007). For example, some metaphors can be used to substitute long descriptions, and some speed-aid can help those amblyopic get the information and effectively use the social media.

4.1.2 Perceived cognitive affordance. Cognitive affordance is the attributes of the IT artifacts that would help, aid, support, facilitate or enable a user's thinking, knowing, and/or cognitively/mentally processing something, which may take effect immediately or have a potential impact. Perceived cognitive affordance is a user's perception or appraisal of the existence or lack of IT artifacts' cognitive affordance. It is not about how people learn to use the artifacts, but it is about users' perceptions of the artifacts to support conceptual, analytical, and problem-solving process. Types of examples in social media design include: provide information, such as news, reminders, reinforcement, or suggestions, etc.; influence information processing, such as affect work, jobs, learning, or performance, etc.; inspire or enlighten some ideas which may lead to some valuable behaviors.

4.1.3 Perceived affective affordance. Affective affordance is the attributes of the IT artifacts that can trigger or stimulate users' emotional reactions. For example, some social media allow their users to show "like" or "dislike" to user generated content by others, and choose to follow someone they like. Perceived affective affordance is user's perception or appraisal of IT artifacts' affective affordances. For example, some social media often elaborately launch some campaigns or design functions to respond to those influential social events or issues which may involve various user's emotions and affects.

4.1.4 Perceived control affordance. Control affordance is the attributes of IT artifacts that emphasize a user's power of making choices of the situation or the environment rather than of one's own behavior. For example, whether it is a user's own decision to listen to the background music reflects the degree of control affordance. It is different from physical affordance in that physical affordance does not hint whose will it is for the IT artifacts to be displayed or interacted in certain way, while control affordance gives hints of who should initiate the action or interaction. Perceived control affordance represents the features of IT artifacts that support users' willingness to be in control. Users tend to feel and behave more positively when they perceive that there is more room for control in the environment. For example, on one hand, social media should allow users to delete something they do not want to read easily. On the other hand, more autonomy should be provided to users to make their personalized settings.

4.2 An integrative framework from sociomaterial perspective

Sociomateriality is a recent theoretical perspective to untangling the relationship between actors and artifacts, which advances the view that there is an inherent inseparability between the technical and the social (Orlikowski, 2007; Orlikowski and Scott, 2008). Sociomateriality assumes that actors and artifacts are not self-contained, independent entities that influence each other through impacts or interactions, but rather they enact each other in practice (Barad, 2003). It emphasizes that material agency and actor agency are so entangled with each other that previously taken-for-granted boundaries are dissolved (Yoo, 2010). Orlikowski (2007) argues that by separating and privileging the technology and/or the people, we lose sight of their mutual constitution. She draws on two empirical examples (information search and mobile communication) to ground and illustrate the ideas. Wanger *et al.* (2010) explore project survival in an enterprise system environment using a sociomaterial perspective. The findings show that practices can be negotiated through whole processes of use rather than being permanently and systematically selected at a particular time point, which share similar views with the assumption that users should be actively involved in the whole process of interaction design rather than being invited for the usability testing and evaluation. Besides organizational context, Thambusamy and Nemati (2011) investigate sociomateriality in the context of an individual's everyday interaction with his/her online social networks, and aims to address the research question: "How does sociomateriality entail itself in the phenomenon of social networking?"

When social media artifacts are designed, they possess certain degree of affordance (thus intended affordances). However, due to users" mental transformation processes, sometimes, the intended affordance of the social media cannot be detected by users, or the users" perceived affordances of social media may be a mismatch to the intended affordances. Thus, it is of great importance to examine the inherent inseparability between the user and the social media artifacts. From sociomateriality perspective, we argue that in the case of social media interaction design, actors (users and designers) and artifacts (interface, platform, and service etc.) are so entangled with each other that exploring them as one integrative entity makes more sense than treating them as distinct or independent entities.

Perceived affordances address the reciprocity between designed artifacts and actors, and the environment in which interactions happen. It is interesting to find that

the concept of perceived affordances appropriately point out the essential elements for the interaction design of social media, especially the nature mapping between their components respectively, i.e. designed object versus social media artifact, actors versus user, and environment versus application domains. Furthermore, based on our discussion on the usability and sociability of social media, we can state that users may have multi-level and diverse needs and requirements, and the interaction design of social media should reflect the multi-dimensional perceived affordances. Thus, we construct an integrative framework on perceived affordances in social media interaction design, which includes three main components: social media artifacts, users, and application domains (see Figure 1). It is important to note that we group these three components into one entity which are constitutively entangled. The perceived affordances based on four primary users' perceptions can support or facilitate the design of basic elements of social media, such as content and form, to enhance both usability (human-computer interaction) and sociability (human-human interaction). A position of constitutive entanglement does not privilege either users or social media artifacts, nor does it provide a rigid triangle among these three components. Instead, the perceived affordances play a critical role in integrating the key components in social media interaction design as an ensemble.

We will use an example to illustrate our framework. In the case of crowdsourcing systems interaction design, there are two types of users: the organizations directly benefitting from the crowd input, otherwise, called the assigners, who initiate the process of crowdsourcing and has a task as the main appendant; and the individuals or members of communities forming the crowd who are providers. They respond to the task and attempt to submit their solutions as feedbacks. A crowdsourcing system builds a link between the assigners and providers, which serves as an enabler and has some parameters as the rules for the whole lifecycle of crowdsourcing, such as the skill-set, certification level, due date, expected outcomes, and payments for the winners. Between the assigner and the crowdsourcing system, we distill three actions, i.e. submit, validate, and reward (not necessarily for collaboration based crowdsourcing such as Wikipedia), in which submitting a task and its related requests exists at the early stage of crowdsourcing lifecycle (Whitla, 2009), while the validating (evaluate the feedback and select the satisfied ones) and rewarding (especially for some crowdsourcing contests) are the last two steps in the whole process

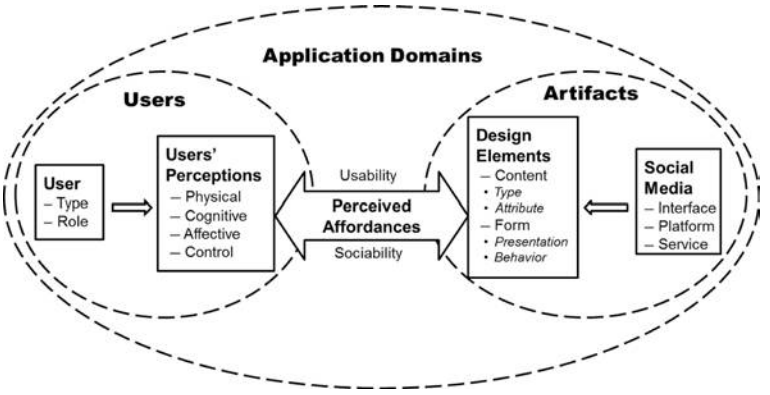

Figure 1.
An integrative framework on perceived affordances in social media interaction design

(Yang *et al.*, 2008). Between the providers and the crowdsourcing system, another three actions, i.e. push and pull, participate, and bid represent the interactions, in which push and pull signify the functionalities (e.g. personalized recommendation and customization) provided by the platform to attract, incent, and sustain the crowd (Kittur *et al.*, 2008). Participation happens when people have the intention to join some of the projects and take some actions to respond to the tasks. Bidding is a submission state by the participants who have produced outcomes and join in the competition (not necessarily for all types of crowdsourcing systems). In addition, the assigner and the providers may have some direct connections via the crowdsourcing system, and the crowdsourcing system can also provide space for participants to form online communities and build social networks. Therefore, designers should meet the physical and control needs of users (assigners and providers), and those perceived affordances may be carefully implemented in the information architecture of crowdsourcing systems, such as information labeling, information organization, navigation, and information search blocks. Furthermore, for the continual usage of the crowdsourcing systems, designers should keep users' cognitive and affective needs in mind, and provide some corresponding affordances, such as perceived usefulness, perceived ease of use, perceived affective quality, relatedness, and sense of belonging, etc. It is worth noting that, the four perceived affordances in our typology may theoretical support the three factors in Kano *et al.* (1996) model. Perceived physical affordances focus on the basic factors in crowdsourcing systems design, and perceived cognitive and control affordances help solving the performance factors while perceived affective affordances can to some extent, enhance user's experience, satisfaction, and continual usage. In terms of the application domains of crowdsourcing systems, it is very important for designers to consider two primary dimensions, namely context and function. First, the context can be divided into two categories: business and non-business. The former includes companies, for-profit organizations or marketplaces, while the latter includes non-profit organizations or institutions, such as public libraries, R&D centers, government, etc., where mass participation, scientific collaboration, or citizen science take place. Second, the function can be classified by the nature and granularity of the task (Rouse, 2010; Schenk and Guittard, 2009). Low task granularity usually deals with some routine tasks, such as data collection, rating, and translation of simple texts. Middle task granularity usually refers to some creative tasks, such as logo design, photography, user-generated advertisement, etc. High task granularity usually copes with some sophisticated problems and complicated tasks, such as product development and intellectual consultant. In general, it is obvious that different task granularities need various extents of participant's involvement (time and effort), intellectual capital, and opportunity cost, etc. Accordingly, perceived affordances should be provided for various users with diverse purposes and in different application domains, and designers should adhere to some design principles in the interaction design of crowdsourcing systems, such as evocative, adaptive, and open-ended.

5. Conclusion

In this paper, we systematically review the affordance related concepts and extend the perceived affordance concept to cover design problems for social media interaction design. We then develop a typology of the perceived affordances in social media and build a conceptual framework to show how perceived affordances can facilitate the

interaction design of social media from sociomateriality perspective. We also provide a preliminary explication of the framework using crowdsourcing system as an example. Our objective is to propose the perceived affordance as a theoretical lens in social media interaction design, and help us reconfigure those taken-for-granted notions, assumptions, and practices of design research. For researchers from the Information Management field, they may investigate some theoretical foundations and propose some hypotheses on the basis of our framework, and more detailed empirical or experimental studies can be conducted to test our model. For designers, this framework may act as a roadmap and provide some guidelines to recognize and investigate the multiple, emergent, and shifting design philosophy and assemblages in their everyday design work.

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