The impact of information technology on knowledge creation
An affordance approach to social media

David Wagner

Department of Economics and Management, European University Viadrina, Frankfurt, Germany

Gabriele Vollmar

VOLLMAR Wissen + Kommunikation Consulting, Reutlingen, Germany, and

Heinz-Theo Wagner

Department of Management, German Graduate School of Management and Law gGmbH (GGS), Heilbronn, Germany

Abstract

Purpose – The purpose of this paper is to outline the potential of information technology, particularly social media and their affordances, in supporting knowledge creation within organizations.

Design/methodology/approach – This is a conceptual paper which integrates the literature on both knowledge creation and social media.

Findings – Social media may support knowledge creation by affording new types behaviors that were not possible with previous forms of computer-mediated communication.

Research limitations/implications – The paper contributes to theory development by integrating knowledge creation theory and addressing the role of technology, more specifically social media and their affordances, in the knowledge creation process.

Practical implications – The results of the paper will help managers to understand which social media affordances support the distinct knowledge creation processes and target their use of technologies within the organization accordingly.

Originality/value – The paper is of high theoretical and practical relevance. It bridges two previously unconnected literatures and, in doing so, provides an innovative perspective on how social media and their affordances may support knowledge creation.

Keywords Knowledge management, Strategy, Social media, Knowledge creation, Knowledge-based view, Affordances

Paper type Conceptual paper

1. Introduction

Drucker (1993) was the first management scholar to describe the transition of developed countries toward a state where knowledge surpasses traditional concepts of production, labor, and capital to become the primary source of wealth creation in the economy. This perspective has consequently been established in the strategy literature as the knowledge-based view (KBV) of the firm (Eisenhardt and Santos, 2006; Kogut and Zander, 1992; Nonaka and Toyama, 2007; Spender and Grant, 1996). The KBV extends the more traditional resource-based view of the firm (Barney, 1991; Wernerfelt, 1984) in that it shifts the attention from tangible resources to more intangible ones, for which knowledge is the prime example. Knowledge assets thus

become a central element affecting the strategic decision making and resource allocation within firms in order to produce a competitive advantage.

With their book on organizational knowledge creation, Nonaka and Takeuchi (1995) make a particularly prominent contribution toward the KBV. The book gives an in-depth picture of the development of a new product within a Japanese firm and describes the knowledge processes involved in much detail. In particular, the authors introduce a dynamic model of knowledge conversion, the so-called SECI model, where SECI is an acronym that stands for socialization, externalization, combination, and internalization. Since its initial publication, knowledge creation theory has been developed further in many facets and several empirical tests have been conducted (see Nonaka *et al.*, 2006 for a review). Overall, the theory "has achieved [a] paradigmatic status" (Gourlay, 2006, p. 1415). The gist of the theory is that "firms differ because organizational knowledge creation gives rise to unique organizational knowledge systems" (Nonaka *et al.*, 2006, p. 1193).

In the Knowledge-Creating Company, Nonaka and Takeuchi do not explicitly deal with the role of information technology (IT) in the process of knowledge creation. However, a separate paper by Nonaka *et al.* (1996) bridges this gap. In this paper, Nonaka and colleagues acknowledge the crucial importance of IT in some stages of the knowledge creation process, yet they also state that technology's potential seems less promising in other areas. Externalization, combination, and internalization fall in the former category, whereas socialization falls in the latter. The technologies described in the paper are groupware, video conferencing, group idea processing, and collaborative document production. Nonaka and colleagues close with the remark that "every business organization that wants to prosper in the knowledge society should fuse synergistically IT as knowledge-creation tools and human beings with collaborative knowledge creation capabilities to become a 'knowledge-creating company'" (Nonaka *et al.*, 1996, p. 217). Surprisingly, in the more recent book *Knowledge Creation and Management*, edited by Ichijo and Nonaka, published in 2007, only one out of 16 essays deals with IT. Thomas Davenport, the essay's author, nonetheless reaffirms Nonaka and Toyama, 2007 by stating that "information technology has been perhaps the single most important intervention in managing knowledge" (p. 97).

Essentially, Nonaka's theory was developed prior to the widespread use of the internet. Through the internet, however, a number of interactive technologies were developed that are heavily used by organizations today (Chui *et al.*, 2012; Kane *et al.*, 2009; Treem and Leonardi, 2013). These interactive technologies are often referred to as social media. Although it is safe to say that there is no commonly accepted definition to date, Kaplan and Haenlein (2010) define social media as "internet-based applications that build on the ideological and technological foundations of web 2.0, and that allow the creation and exchange of user-generated content" (p. 62). Kietzmann *et al.* (2011) state that "social media employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content" (p. 241). Practically, social media are often associated with specific tools, such as blogs, wikis, social networking sites, social tagging, and microblogging (Treem and Leonardi, 2013). Social media are used for knowledge collaboration in diverse community settings: within organizations (Majchrzak *et al.*, 2009), across organizational boundaries (Fuchs and Schreier, 2011), or in open collectives (Faraj *et al.*, 2011; Gulati *et al.*, 2012). Andrew McAfee (2009) depicts a number of case studies that illustrate the application of social media for knowledge collaboration at organizations such as VistaPrint, Serena Software, the US Intelligence Service, and

Google. In an attempt to focus the scholarly discussion surrounding social media on what technology allows individuals to do rather than discussing the technology features themselves, scholars have repeatedly drawn on the concept of affordances (Boyd, 2010; Faraj *et al.*, 2011; Leonardi, 2011; Treem and Leonardi, 2013). Markus and Silver (2008) define affordances "as the possibilities for goal-oriented action afforded to specified user groups by technical objects" (p. 622). In this paper, we argue that social media affordances influence the organizational knowledge creation process and shift the relevance and utility of technology use across the SECI components.

It has been shown above that knowledge is a key resource of organizations (Eisenhardt and Santos, 2006; Spender and Grant, 1996). Managing the knowledge creation process is thus a central aspect of an organization's strategy (Nonaka and Takeuchi, 1995; Nonaka *et al.*, 2006). It is also known that the impact of IT on organizational knowledge creation processes is high (Davenport, 2007; Nonaka *et al.*, 1996), yet the subject remains under-researched, evidence of which is lack of publications in this field. While social media technologies and their affordances have much potential to facilitate knowledge processes more generally (Faraj *et al.*, 2011), scholars have not explored their impact on the knowledge creation process. Therefore, we state the following research question:

RQ1. How do social media and their affordances affect the SECI model and, thus, the knowledge creation process?

This paper contributes to theory development by leveraging an established theory to explore an emerging phenomenon (Yadav, 2010). Bringing together knowledge creation theory and social media research will significantly help researchers to gain a better understanding of how IT may support knowledge creation (von Krogh, 2012; Majchrzak, 2009; Faraj *et al.*, 2011). There are considerable practical implications as well. The results will help managers to decide which parts of the knowledge creation process are particularly likely to benefit from technology support and which affordances need to be provided in order to accomplish successful knowledge conversions. The results also provide guidance to the efforts of community managers (Kane *et al.*, 2009), equipping them with useful examples of a variety of interventions to support knowledge creation in their host organizations.

The paper starts with a discussion of knowledge creation theory more generally. It continues with a description of organizational spaces for knowledge creation and the particular relevance of the internet as a collaborative space. Next, we introduce social media affordances and provide an overview of the affordance literature. Consequently, each of the knowledge creation processes is described in more detail, followed by a discussion of how the distinct social media affordances enable or inhibit the SECI processes. The paper intentionally adopts the structure used by Nonaka *et al.* (1996) in order to make comparisons of technologies and their affordances transparent. It concludes with a discussion of the findings and suggestions for future research.

2. Knowledge creation theory

Although "it is notoriously difficult to define knowledge satisfactorily" (Gourlay, 2006, p. 1430), for the purpose of this paper it seems adequate to view knowledge as "a meaningful set of information that constitutes a justified true belief and/or an embodied technical skill" (Nonaka *et al.*, 1996, p. 205). In organizations, knowledge often becomes embedded not only in documents or repositories, but also in organizational

routines, processes, practices, and norms (Davenport and Prusak, 1998). Organizational knowledge creation, in turn, "is the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it with an organization's knowledge system" (Nonaka *et al.*, 2006, p. 1179). To be fair, there are many other organization scholars interested in how firms may facilitate the creation and sharing of knowledge (e.g. Argote and Miron-Spektor, 2011; Brown and Duguid, 2002; Cross *et al.*, 2001; Wenger *et al.*, 2007). However, an inclusion of their work would go beyond the scope of this paper.

To become a source of creativity and innovation, knowledge must be activated at a certain time and in a shared space. For Nonaka and Konno (1998), the concept of ba describes such a possible place of resource concentration, where individual, collective, and organizational knowledge may meet and interact. Ba may also be described as a shared space for emerging relations. "It can be a physical, virtual, or mental space, but all three have knowledge embedded in ba in common, where it is acquired through individual experiences, or reflections on other's experience" (Nonaka *et al.*, 2006, p. 1185). If knowledge creation is considered a process in which human beings and human understandings interact, then ba becomes an essential prerequisite because knowledge sharing requires shared understanding. However, understanding is not universal as humans construct their own subjective realities and truths. Therefore, a shared understanding of subjective realities and meanings has to be developed. In the words of Nonaka and Konno (1998), "to participate in a ba means to get involved and transcend one's own limited perspective or boundary" (p. 41). Nonaka and Konno (1998) further introduce the notion of the cyber ba, "a place of interaction in a virtual world […] supported by information technology" (p. 46). The sphere of social media may be seen as such a cyber ba, because it enables and supports knowledge activation at a certain time and in a shared space by enabling and facilitating human interaction and collaboration.

3. Social media affordances
The term affordance was coined by a Psychologist called James Gibson. Gibson (1986) argues that physical objects are not perceived free of values. Often, they are associated with certain types of uses which influence perceptions. Essentially, then, the term affordance is about an object's perceived utility. Scholars studying the relationship between technologies and organizational practices have found great value in the concept (Faraj *et al.*, 2011; Zammuto *et al.*, 2007). The focus on affordances helps scholars to avoid the study of technological features and instead focusses their attention on activities that were not previously possible without the technology (Leonardi, 2011). The same technology may thus afford distinct possibilities for action and may be used differently among people. A number of social media affordances have been proposed by Boyd (2010), Faraj *et al.* (2011), McAfee (2009) as well as Treem and Leonardi (2013). An overview of these affordances is provided in Table I. Please note that the meanings ascribed to the affordances overlap somewhat. Due to this overlap, the left hand column represents the overarching affordances that may or may not have sub-categories.

4. The impact of social media affordances on the knowledge creation process
The following section deals with the SECI processes introduced earlier. More specifically, socialization, externalization, combination, and internalization will shortly

Affordance	Description	Source
Reviewability		
Reviewability	Viewing and managing the content of front and back narratives over time; reviewing a range of ideas; reviewing the full range of contributions from a single individual	Faraj *et al.* (2011)
Visibility	Ability to make behaviors, knowledge, preferences, and communication network connections visible	Treem and Leonardi (2013)
Persistance	Communication remains accessible in the same form as the original display after the actor has finished his or her presentation; expressions are automatically recorded and archived	Treem and Leonardi (2013)
Scalability	Visibility is great	Boyd (2010)
Searchability	Content can be accessed through search	Boyd (2010), McAfee (2009)
Recombinability		
Recombinability	Borrowing of and building on each other's contributions	Faraj *et al.* (2011)
Replicability	Content can be duplicated	Boyd (2010)
Experimentation	Try out novel ideas	Faraj *et al.* (2011)
Editability	Ability to craft and re-craft a communicative act before it is viewed by others; ability of an individual to modify or revise content they have already communicated	Treem and Leonardi (2013)
Association		
Association	Established connections between individuals, between individuals and content, or between an actor and a presentation; enable users to make visible their social networks	Treem and Leonardi (2013)
Tagging	Ability to categorize content by attaching simple, one-word descriptions	McAfee (2009)
Links	Ability to provide a connection from one web page to another, citations take the form of links	McAfee (2009)
Authoring	Generating content and putting it online for a broad audience; authoring can take many forms (an insight, a fact, an experience, a link, an edit) and include various types of media (written status updates, photos, videos, etc.)	McAfee (2009)

Table I.
An overview of social
media affordances

be introduced and the interactions of social media affordances and the various knowledge creation processes will be explored. At this point, it is useful to introduce the distinction between tacit and explicit knowledge, which was first popularized by Polanyi (1966). Tacit knowledge is personal, context specific, subjective knowledge, whereas explicit knowledge is codified, systematic, formal, and therefore easier to communicate. All of the SECI processes can essentially be described as conversions of the two forms of knowledge. The conversion matrix originally developed by Nonaka and Takeuchi (1995) is presented in Table II.

	Tacit knowledge	Explicit knowledge
Tacit knowledge	Socialization	Externalization
Explicit knowledge	Internalization	Combination
Source: adapted from Nonaka and Takeuchi (1995, p. 62)		

Table II.
The SECI processes

4.1 Socialization: from tacit to tacit

The concept of socialization is mainly linked to direct, interpersonal experience sharing, observation, and imitation. Good examples of this process are a professional apprenticeship or the traditional master scholar relationship. The goal of this process is to "build a field of interaction [which] facilitates the sharing of members' experiences and mental models" (Nonaka and Takeuchi, 1995, pp. 70-71). These shared mental models then allow individuals to put themselves in the position of others. They are often derived from specific contexts and associated emotions. Socialization may further happen in a non-verbal manner, e.g. through co-presence and observation.

Nonaka *et al.* (1996) clearly state that "information technology is not so useful in this mode" (p. 206). We posit that it is time to rethink this statement as some social media affordances are likely to facilitate socialization. As mentioned earlier, social media environments provide a shared space for human interaction and collaboration where individuals may be virtually co-present and observe each other. The use of social media affords relationship formation, for example, and information seeking, mainly by means of association and reviewability. Association is the act of establishing relations between individuals or between individuals and content. The former type of association – person to person – is colloquially called friending or following and represents the confirmation of a social tie, e.g. when a connection is made on a social network site. The latter type of association – person to content – is particularly relevant to identify expertise. Unless people were actively asked to reveal such relationships, they previously remained invisible (Cross and Parker, 2004). Organizational profiling systems, wiki edits, or the identification of people whose interests match certain tags may provide information about where expertise is located within an organization or a community of practice. New types of suggestion systems are further aiming to support emerging relations (Treem and Leonardi, 2013). These types of suggestion systems are one example of what McAfee (2009) calls extensions. Of course, a prerequisite for this to happen is that information is publicly available over time, i.e. what is called reviewability above. Reviewability allows organizational knowledge to be sustained over time and a knowledge base to be produced progressively. Reviewing front and back narratives may additionally give the viewer a good sense of the author's context, i.e. about emotions and tensions in the development of knowledge assets (Faraj *et al.*, 2011). A novice in an organization, for example, may identify and connect to a senior expert in his field through the affordance of association. That expert may have contributed extensively to a knowledge repository, such as a wiki, the content of which is reviewable. The novice may then connect to this expert on a social network site or a microblogging service to follow that expert's updates. The updates will allow the novice to observe the behavior of the expert, giving him or her potentially valuable information about important meetings or conferences the expert attends, current projects the expert is working on, or interactions with other senior experts. The novice may thus be socialized into his job through social media. This process may work equally well within and across organizational boundaries. The studies by Steinfield *et al.* (2009) and Majchrzak *et al.* (2009) provide an example of a social network site at IBM that makes use of both types of affordances and would support the socialization process outlined above.

4.2 Externalization: from tacit to explicit

"Externalization is a process of articulating tacit knowledge into such explicit knowledge as concepts and/or diagrams, often using metaphors, analogies, and/or sketches" (Nonaka *et al.*, 1996, p. 206). This process is often triggered by dialogue or collective reflection. The goal of the process is to build concepts from tacit knowledge.

A good example of externalization is the development of a new product concept (Nonaka and Takeuchi, 1995).

Nonaka *et al.* (1996) provide a number of examples involving IT to support the externalization process, e.g. groupware and conference systems. One may infer from their writings that it certainly is possible to aid externalization with help of IT. However, they remain remarkably silent about why this is the case and what it is that the technology affords people to do. It is argued here that authoring and editability are the key affordances in this process. Authoring, according to McAfee (2009), "means generating content and putting it online for a broad audience" (p. 133). As stated above, authoring may take a variety of forms and the content need not be written words only. Posts may take the form links, audio, and video. Authoring allows people to freely articulate their thoughts and make these articulations available for the wider public to view and discuss (Faraj *et al.*, 2011). Editability is the ability to craft and re-craft a communicative act either by the original author or by consequent viewers of the content. This affordance allows organization members to regulate personal expressions, target content at an envisioned audience, and consecutively improve information quality (Treem and Leonardi, 2013). Fuchs and Schreier (2011) show that organizations frequently draw on social media to tap into and make explicit customers' tacit knowledge in order to develop new products. Being able to draw on customer insights in this way has wider implications for organizational strategy, in general, and the innovation of value creation processes, in particular (Haefliger *et al.*, 2011).

4.3 Combination: from explicit to explicit

In this stage, existing bodies of explicit knowledge are exchanged by individuals using various media and communication channels, such as data and documents as well as personal meetings or phone conversations. The explicit knowledge concepts, which have been generated in the externalization phase, are – by exchange and combination – integrated into a knowledge system (Nonaka and Takeuchi, 1995). Through – sometimes unexpected and surprising – combination of existing explicit knowledge, new knowledge may finally emerge. A good example of this process is formal education at a university.

Nonaka and Takeuchi (1995) point out that "creative uses of computerized communication networks and large-scale databases facilitate this mode of knowledge conversion" (p. 68). They clearly see the biggest potential for IT in the combination process as this is the time when knowledge is most explicit and thus easier to process with help of IT (Nonaka *et al.*, 1996). For the exchange and combination of knowledge, the social media affordances called editability and recombinability play a major role. Editability, the ability to modify and revise content, makes it easy adapt content that was previously generated in a different, though maybe related, setting. "Recombinability refers to forms of technology-enabled action where individual contributors build on each other's contributions" (Faraj *et al.*, 2011, p. 1234). Of course, this presupposes that content be reviewable in the first place. Both affordances, in combination, enable organization members to integrate existing pieces of content and supply them to various communities of practice (Wenger *et al.*, 2007). The best example for combination of explicit knowledge is probably the organizational use of blogs and wikis at the US Intelligence Service (McAfee, 2009).

4.4 Internalization: from explicit to tacit

In the last stage of the knowledge conversion cycle, explicit knowledge again becomes tacit knowledge by individual impropriation. This happens when "when experiences,

through socialization, externalization, and combination, are internalized into individuals' tacit knowledge bases in the form of shared mental models or technical know-how" (Nonaka and Takeuchi, 1995, p. 69). Such tacit mental models which are shared by a majority of an organization's members form part of its organizational culture (Schein, 1990). In this stage, learning by doing and room for experimenting are crucial as the embodiment of knowledge mostly happens through re-experience. However, internalization may also be accomplished through documentation, e.g. through the use of manuals and tutorials (Nonaka *et al.*, 1996).

Nonaka *et al.* (1996) identify computer simulations and IT-based learning as important tools in this regard. As is the case in the externalization phase, Nonaka and colleagues indicate through examples that IT may facilitate internalization, yet they do not provide much detail as to how this happens or evaluate the potential of IT in this phase. Given that internalization builds on learning by doing and experimenting, it is suggested here that the affordances of reviewability and experimentation are particularly helpful in shedding light on the internalization process. Reviewability guarantees that the organizational knowledge base can easily be queried for questions or problems that occurred in the past. Being able to follow resolution of these problems helps individuals to avoid them when they face them at a later point in time. "Experimentation […] refers to the use of technology to encourage participants to try out novel ideas" (Faraj *et al.*, 2011, p. 1234). Faraj and colleagues (2011) name comment boxes and feedback rating systems as mechanisms that facilitate experimentation. For example, an individual may post content to a community. This content may take various forms, such as text, audio, or video. Other community members may then comment, like, or otherwise rate the content and, in doing so, help the original poster internalize the results while developing the idea further. The social network site at IBM can again be drawn on as an example (Majchrzak *et al.*, 2009). A more general trend in business and education that uses experimentation, and one that is closely related to social media technologies, is gamification (Cohen, 2011). Here different real-life scenarios are depicted virtually and individuals may walk through these scenarios as if they were a game. Gamification may be considered an extension of what Nonaka *et al.* (1996) describe as computer simulations and IT-based learning. An overview of the SECI processes, including the affordances that affect the individual stages, is provided in Table III.

It may be noted at this point that the conversion process should not stop here. It should be conceived of as a cycle. "The tacit knowledge accumulated at the individual-level needs to be socialized with other organizational members, thereby starting a new spiral of knowledge creation" (Nonaka and Takeuchi, 1995, p. 69).

	Tacit knowledge	Explicit knowledge
Tacit knowledge	Socialization	Externalization
	Association	Authoring
	Reviewability	Editability
Explicit knowledge	Internalization	Combination
	Reviewability	Editability
	Experimentation	Recombinability

Table III.
Social media affordances which support the various SECI processes

5. Discussion

This paper contributes to theory development by integrating knowledge creation theory with the emerging phenomenon of social media (Yadav, 2010). Uniting both literatures significantly helps scholars to gain a better understanding of how modern IT may support knowledge creation by affording new behaviors that were not possible with previous forms of computer-mediated communication. This study is grounded in the KBV of the firm and, thus, relates to the strategy literature more generally (Eisenhardt and Santos, 2006; Nonaka and Toyama, 2007; Spender and Grant, 1996). The paper also endeavors to support the theorizing of social media (Kietzmann *et al.*, 2012), which has been identified as an important issue in the information systems community (Majchrzak, 2009; Urquhart and Vaast, 2012). It also shows that social media technologies and their affordances have a strategic impact on how organizations manage and create knowledge (Haefliger *et al.*, 2011; Gulati *et al.*, 2012; von Krogh, 2012). The insights generated here are relevant for the community of organization scholars who study firms with a focus on knowledge assets and technology.

With respect to the reference paper by Nonaka *et al.* (1996), several achievements may be noted. First of all, the original paper has been updated. Given that technology has advanced significantly over the past years, this update is both warranted and necessary. Next, the paper addresses a gap left by Nonaka and colleagues. Although they provide a number of examples showing that IT may support the knowledge creation processes, they fail to explain why and how IT would facilitate these processes. This paper offers an explanation for these essential questions by employing an affordance approach. It shows which new behaviors social media in organizational settings makes possible. Various affordances, which have been discussed in the recent organizational literature, are presented and integrated. More precisely, the affordances of association, authoring, reviewability, editability, recombinability, and experimentation are shown to affect knowledge conversions, although each of the affordances makes differential contributions to the distinct knowledge conversion processes. In general, all SECI processes can today be supported by social media technologies. Even socialization, the phase Nonaka *et al.* (1996) were most critical about, is shown to be facilitated through the affordances of association and reviewability (Treem and Leonardi, 2013). This is in stark contrast to earlier expectations that "information technology is not so useful in this mode" (Nonaka *et al.*, 1996, p. 206).

While the paper generally takes a positive stance toward social media technologies and their potential for knowledge creation, it is important to acknowledge that several challenges remain to be addressed. von Krogh (2012), for example, raises an important concern, namely that despite the enhanced potential for social media to support the creation of knowledge, it becomes much more difficult for organizations to protect their knowledge assets. This raises the question as to whether social media technologies may pose a risk to organizations as much of their proprietary knowledge no longer resides within the organization. As a consequence, costs and risks need to be carefully balanced against potential gains. Treem and Leonardi (2013) point to the fact that organization members may distort information in order to gain recognition for skills and knowledge that they may not have. A solution to this problem could be to let third parties validate or rate data that has previously been entered by organization members. A last challenge is certainly the issue of adoption (Davis *et al.*, 1989). While the benefits of using social media technologies may be clear to many organization members, they may still choose not to contribute. Analyzing perceived utility, ease of use, and employee motivations may help to alleviate such problems.

There are several avenues for future research. The current paper lays out some fundamental connections between social media affordances and knowledge creation. However, we do not claim that our model is exhaustive. Given that affordances evolve over time (Faraj *et al.*, 2011), future research will likely encounter additional affordances that may again affect the knowledge creation process. Scholars may also find it fruitful to address some of the limitations described above. Faraj *et al.* (2011) further suggest that the dynamics of knowledge collaboration may prove a particularly promising field of future research. Analyses may reveal who engages in problem solving, how ideas evolve and get connected over time as well as which organizational actions are taken in response to certain stimuli. Drawing on Treem and Leonardi (2013), we would like to direct scholars' attention to the issue of how organizational social media can be analyzed quantitatively and qualitatively in order to inform the management and creation of knowledge assets. Researchers will likely have to develop innovative methods to process the huge amounts of data associated with social media use (Hogan, 2008; Giles, 2012; Lazer *et al.*, 2009). Last but not least, much more research is needed to empirically explore knowledge creation (Nonaka *et al.*, 2006). In particular, the propositions put forward in this paper need to be verified. Case-based research is likely to be a fertile approach in this regard (Nonaka and Takeuchi, 1995, Leonardi, 2011; Urquhart and Vaast, 2012).

Ultimately, we want to outline practical implications of the study. The results of our paper will help managers to understand which social media affordances support the distinct knowledge creation processes and target their use of technologies within the organization accordingly. The paper also provides guidance to the efforts of community managers (Kane *et al.*, 2009), equipping them with useful examples of a variety of interventions to support knowledge creation in their host organizations. Overall, we concur with Nonaka *et al.* (1996) stating that "every business organization that wants to prosper in the knowledge society should fuse synergistically IT as knowledge-creation tools and human beings with collaborative knowledge creation capabilities to become a 'knowledge-creating company'" (p. 217). Social media technologies and their affordances, in particular, have much potential to help organizations with this endeavor.

6. Conclusions

(1) we are moving toward a knowledge society, in which the knowledge assets of an organization increasingly determine its competitive advantage;

(2) IT may help organizations to manage its knowledge resources;

(3) social media are new, more interactive types of technologies, e.g. wikis, blogs, microblogging, social networking, and social tagging;

(4) social media afford a variety of new behaviors that were not previously possible, e.g. authoring, reviewability, editability, recombinability, association, and experimentation;

(5) the behaviors afforded by social media have implications for the knowledge creation process:

• socialization is supported by the affordances of association and reviewability;

• externalization is supported by the affordances of authoring and editability;

- combination is supported by the affordances of editability and recombinability; and

- internalization is supported by the affordances of reviewability and experimentation.

(6) However, there are also a number of challenges:

- data ownership and security;

- distortion of information, i.e. deception; and

- adoption of social media.

(7) Areas for future research:

- empirical validation of propositions put forward in this paper;

- quantitative and qualitative analysis of data from social media; and

- dynamics of knowledge creation.

References

Argote, L. and Miron-Spektor, E. (2011), "Organizational learning: from experience to knowledge", *Organization Science*, Vol. 22 No. 5, pp. 1123-1137.

Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99-120.

Boyd, D. (2010), "Social network sites as networked publics: affordances, dynamics, and implications", in Papacharissi, Z. (Ed.), *Networked Self: Identity, Community, and Culture on Social Network Sites*, MIT Press, Cambridge, MA, pp. 39-58.

Brown, J.S. and Duguid, P. (2002), *The Social Life of Information*, Harvard Business School Press, Boston, MA.

Chui, M., Manyika, J., Bughin, J., Dobbs, R., Roxburg, C., Sarrazin, H., Sands, G. and Westergren, M. (2012), "The social economy: unlocking value and productivity through social technologies", McKinsey Global Institute (Ed.), available at: www.mckinsey.com/insights/mgi/research/technology_and_innovation/the_social_economy (accessed March 6, 2013).

Cohen, A.M. (2011), "The gamification of education", *Futurist*, Vol. 45 No. 5, pp. 16-17.

Cross, R., Parker, A., Prusak, L. and Borgatti, S.P. (2001), "Knowing what we know: supporting knowledge creation and sharing in social networks", *Organizational Dynamics*, Vol. 30 No. 2, pp. 100-120.

Cross, R.L. and Parker, A. (2004), *The Hidden Power of Social Networks*, Harvard Business School Press, Boston, MA.

Davenport, T.H. (2007), "Information technologies for knowledge management", in Ichijo, K. and Nonaka, I. (Eds), *Knowledge Creation and Management: New Challenges for Managers*, Oxford University Press, New York, NY, pp. 97-120.

Davenport, T.H. and Prusak, L. (1998), *Working Knowledge: How Organizations Manage What They Know*, Harvard Business School Press, Boston, MA.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1989), "User acceptance of computer technology: a comparison of two theoretical models", *Management Science*, Vol. 35 No. 8, pp. 982-1003.

Drucker, P.F. (1993), *Post-Capitalist Society*, Butterworth–Heinemann, Waltham, MA.

Eisenhardt, K.M. and Santos, F. (2006), "Knowledge-based view: a new theory of strategy", in Pettigrew, A.M., Thomas, H. and Whittington, R. (Eds), *Handbook of Strategy and Management*, SAGE Publications, London, pp. 139-164.

Faraj, S., Jarvenpaa, S.L. and Majchrzak, Ann. (2011), "Knowledge collaboration in online communities", *Organization Science*, Vol. 22 No. 5, pp. 1224-1239.

Fuchs, C. and Schreier, M. (2011), "Customer empowerment in new product development*", *Journal of Product Innovation Management*, Vol. 28 No. 1, pp. 17-32.

Gibson, J.J. (1986), *The Ecological Approach to Visual Perception*, Lawrence Erlbaum Associates, Hillsdale, NJ.

Giles, J. (2012), "Computational social science: making the links", *Nature*, Vol. 488 No. 7412, pp. 448-450.

Gourlay, S. (2006), "Conceptualizing knowledge creation: a critique of nonaka's theory*", *Journal of Management Studies*, Vol. 43 No. 7, pp. 1415-1436.

Gulati, R., Puranam, P. and Tushman, M. (2012), "Meta-organization design: rethinking design in interorganizational and community contexts", *Strategic Management Journal*, Vol. 33 No. 6, pp. 571-586.

Haefliger, S., Monteiro, E., Foray, D. and von Krogh, G. (2011), "Social software and strategy", *Long Range Planning*, Vol. 44 Nos 5-6, pp. 297-316.

Hogan, B. (2008), "Analyzing social networks via the internet", in Fielding, N. (Ed.), *The SAGE Handbook of Online Research Methods*, SAGE Publications, London, pp. 141-160.

Kane, G.C., Fichman, R.G., Gallaugher, J. and Glaser, J. (2009), "Community relations 2.0.", *Harvard Business Review*, Vol. 87 No. 11, pp. 45-50.

Kaplan, A.M. and Haenlein, M. (2010), "Users of the world, unite! The challenges and opportunities of social media", *Business Horizons*, Vol. 53 No. 1, pp. 59-68.

Kietzmann, J.H., Hermkens, K., McCarthy, I.P. and Silvestre, B.S. (2011), "Social media? Get serious! Understanding the functional building blocks of social media", *Business Horizons*, Vol. 54 No. 3, pp. 241-251.

Kietzmann, J.H., Silvestre, B.S., McCarthy, I.P. and Pitt, L.F. (2012), "Unpacking the social media phenomenon: towards a research agenda", *Journal of Public Affairs*, Vol. 12 No. 2, pp. 109-119.

Kogut, B. and Zander, U. (1992), "Knowledge of the firm, combinative capabilities, and the replication of technology", *Organization Science*, Vol. 3 No. 3, pp. 383-397.

Lazer, D., Pentland, A., Adamic, L., Aral, S., Barabási, A.-L., Brewer, D., Christakis, N., Contractor, N., Fowler, J., Gutmann, M., Jebara, T., King, G., Macy, M., Roy, D. and Alstyne, M.V. (2009), "Computational social science", *Science*, Vol. 323 No. 5915, pp. 721-723.

Leonardi, P.M. (2011), "When flexible routines meet flexible technologies: affordance, constraint, and the imbrication of human and material agencies", *MIS Quarterly*, Vol. 35 No. 1, pp. 147-168.

McAfee, A. (2009), *Enterprise 2.0: New Collaborative Tools for Your Organization's Toughest Challenges*, Harvard Business School Press, Boston, MA.

Majchrzak, A. (2009), "Comment: where is the theory in Wikis?", *MIS Quarterly*, Vol. 33 No. 1, pp. 18-20.

Majchrzak, A., Cherbakov, L. and Ives, B. (2009), "Harnessing the power of the crowds with corporate social networking tools: how IBM does it", *MIS Quarterly Executive*, Vol. 8 No. 2, pp. 103-108.

Markus, M.L. and Silver, M.S. (2008), "A foundation for the study of IT effects: a new look at DeSanctis and Poole's concepts of structural features and spirit", *Journal of the Association for Information Systems*, Vol. 9 No. 10, pp. 609-632.

Nonaka, I. and Konno, N. (1998), "The concept of 'Ba': building a foundation for knowledge creation", *California Management Review*, Vol. 40 No. 3, pp. 40-54.

Nonaka, I. and Takeuchi, H. (1995), *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, Oxford University Press, New York, NY.

Nonaka, I. and Toyama, R. (2007), "Why do firms differ? The theory of the knowledge-creating firm", in Ichijo, K. and Nonaka, I. (Eds), *Knowledge Creation and Management: New Challenges for Managers*, Oxford University Press, New York, NY, pp. 13-31.

Nonaka, I., Umemoto, K. and Senoo, D. (1996), "From information processing to knowledge creation: a paradigm shift in business management", *Technology in Society*, Vol. 18 No. 2, pp. 203-218.

Nonaka, I., von Krogh, G. and Voelpel, S. (2006), "Organizational knowledge creation theory: evolutionary paths and future advances", *Organization Studies*, Vol. 27 No. 8, pp. 1179-1208.

Polanyi, M. (1966), *The Tacit Dimension*, Routledge & Kegan Paul, London.

Schein, E.H. (1990), "Organizational culture", *American Psychologist*, Vol. 45 No. 2, pp. 109-119.

Spender, J.C. and Grant, R.M. (1996), "Knowledge and the firm: overview", *Strategic Management Journal*, Vol. 17, pp. 5-9, available at: www.jstor.org/stable/2486987

Steinfield, C., DiMicco, J.M., Ellison, N.B. and Lampe, C. (2009), "Bowling online: social networking and social capital within the organization", *Proceedings of the Fourth International Conference on Communities and Technologies*, Association for Computing Machinery, New York, NY, pp. 245-254.

Treem, J.W. and Leonardi, P.M. (2013), "Social media use in organizations: exploring the affordances of visibility, editability, persistence, and association", in Salmon, C.T. (Ed.), *Communication Yearbook*, Routledge, Vol. 36, New York, NY, pp. 143-189.

Urquhart, C. and Vaast, E. (2012), "Building social media theory from case studies: a new frontier for IS research", *Proceedings of the International Conference on Information Systems 2012*, Association for Information Systems, Atlanta, GA, December 16-19, available at: www.aisel.aisnet.org/icis2012/proceedings/ResearchMethods/8/ (accessed March 6, 2013).

von Krogh, G. (2012), "How does social software change knowledge management? Toward a strategic research agenda", *The Journal of Strategic Information Systems*, Vol. 21 No. 2, pp. 154-164.

Wenger, E., McDermott, R. and Snyder, W. (2007), *Cultivating Communities of Practice: A Guide to Managing Knowledge*, Harvard Business School Press, Boston, MA.

Wernerfelt, B. (1984), "A resource-based view of the firm", *Strategic Management Journal*, Vol. 5 No. 2, pp. 171-180.

Yadav, M.S. (2010), "The decline of conceptual articles and implications for knowledge development", *Journal of Marketing*, Vol. 74 No. 1, pp. 1-19.

Zammuto, R.F., Griffith, T.L., Majchrzak, A., Dougherty, D.J. and Faraj, S. (2007), "Information technology and the changing fabric of organization", *Organization Science*, Vol. 18 No. 5, pp. 749-762.

Further reading

Wasko, M. and Faraj, S. (2005), "Why should I share? Examining social capital and knowledge contribution in electronic networks of practice", *MIS Quarterly*, Vol. 29 No. 1, pp. 35-57.

About the authors
David Wagner is currently a PhD Student at the European University Viadrina and the German Graduate School of Management and Law as well as a Lecturer at the Business School Berlin Potsdam. David's background is in management and psychology. He received his BSc in Management and Economics from the Otto-von-Guericke University Magdeburg in Germany and graduated with an MSc in Management Psychology from the University of Nottingham in the UK. For his PhD, David is researching the strategic use of social media in organizational settings. David Wagner is the corresponding author and can be contacted at: dwagner@europa-uni.de

Gabriele Vollmar has been engaged in knowledge management since 1996. She is supporting organizations in defining their knowledge management strategies, developing knowledge management measures, and reporting their intellectual capital. Gabriele is the Chairwoman of the German Society for Knowledge Management and a Member of the Knowledge Management Advisory Board at the German Ministry of Economics. She has teaching appointments at the University of Stuttgart, Germany, and the University of Duisburg-Essen, Germany.

Dr Heinz-Theo Wagner is a Professor of Management and Innovation at the German Graduate School of Management and Law, Heilbronn. Previously, Heinz-Theo worked in diverse management positions and as a management consultant on business and IT projects for various companies. He received his PhD for his research on IT-business alignment from the E-Finance Lab at the Goethe University in Frankfurt am Main, Germany. His current research interests include the economic and organizational aspects of IT, business-IT alignment, the IT business-value-creation process, and innovation management.