



Knowledge Management Systems: Representation and Communication in Context

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Abstract

This paper develops a theoretical perspective on knowledge management systems, drawing from the work of Polanyi and Giddens, and the literature on communities of practice. This perspective views such systems as a form of re-presentation of the results of action and reflection, whose use should be conceptualised as inextricably interlinked to communication processes within a specific context. The paper places an emphasis on the importance of power relations as part of this context. The theoretical perspective is illustrated with an example taken from a particular case study. The paper is opposed to the knowledge-as-object approach that has been influential in the literature to date.

Keywords: Knowledge management systems, Representation, Tacit knowledge, Structuration theory, Communities of practice, Communication, Power relations

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1 Introduction

Knowledge and its ‘management’ have been seen as important topics over the last decade, and much has been written in both the practitioner and academic literatures. A key figure in the early literature was Ikujiro Nonaka (1991, 1994). He popularised the distinction between ‘tacit’ and ‘explicit’ knowledge, and developed the well-known spiral of organizational knowledge creation drawing on the dynamic process of conversions between these knowledge types. Although Nonaka himself was concerned with individual and group communication processes, it is arguable that his view of knowledge as an object, able to pass between different states, contributed to the idea that ‘knowledge management systems’ could be used to ‘externalise’ and ‘combine’ tacit forms of knowledge. It is somewhat ironic that Nonaka drew the tacit/explicit distinction from the work of the philosopher Michael Polanyi, since the view of ‘knowledge-as-object’ is diametrically opposed to Polanyi’s ideas, as we shall see later in this paper.

The knowledge-as-object approach is still influential. However, there has been an increased emphasis in recent years on practice-based theories of knowing and learning (Blackler 1995, Blackler et al, 2000), and the importance of context in designing and implementing knowledge management initiatives (Thompson and Walsham 2004), including those involving information and communication

technologies (McDermott 1999; Walsham 2001). One highly visible aspect of these approaches is work on ‘communities of practice’ (Lave and Wenger 1991; Wenger 1998), or more generally knowledge communities (Barrett et al 2004). Empirical evidence shows that these communities are formed within organizations, but also between people in different organizations, coming together across boundaries to learn and ‘share’ knowledge on particular topics (Anand et al 2002), or to collaborate collectively on the development of artefacts such as software (Markus et al 2000).

The focus of this paper is on knowledge management systems, and the key goal of the paper is to develop a theoretical way of viewing knowledge management systems which is opposed to the knowledge-as-object perspective. Instead, knowledge management systems are viewed as containing re-presentations of action and reflection, deeply involved in human processes of communication, and which cannot be divorced from their context. The next section of the paper draws mainly on the work of Polanyi to discuss theoretical views of knowledge and to derive a basic model of communication. This is followed by a further theoretical section which develops a sociologically-informed perspective on the context of communication and interaction, drawing from the literature on communities of practice, and concepts from the structuration theory of Giddens. The theoretical perspective of the paper is then illustrated by an example drawn from a particular case study. Some implications are drawn for practice, and the paper ends with a short conclusion on its contribution.

2 Knowledge, Representation and Communication

This section firstly discusses the work on Polanyi on the nature of knowledge, and then derives a model of basic communication, also based on his work.

2.1 A Theory of Knowledge

In discussing human beings’ perception of the world, Polanyi (1966) introduced the notion of tacit power as the way in which we actively shape or integrate new experience to discover and believe new knowledge:

‘I am looking at Gestalt (perceived organised whole that is more than the sum of its parts) ... as the outcome of an active shaping of experience performed in the pursuit of knowledge. This shaping or integrating I hold to be the great and indisputable tacit power by which all knowledge is discovered and, once discovered, is held to be true.’ (p6)

This tacit power produces the deep tacit knowledge that we have of the world in which we live, and this power is different for each individual due to our different initial dispositions and experiences.

In a later work, Polanyi (1969) defined tacit knowing as a triad:

‘We may say ... that the triad of tacit knowing consists in subsidiary things (B) bearing on a focus (C) by virtue of an integration performed by a person (A)’ (p182)

Subsidiary things, according to Polanyi, include sights, events and words which, of themselves, do not contain meaning. The individual *creates* meaning from the subsidiary things by an act of integration, through tacit power. He argues that human beings have the capacity to integrate and endow with meanings things of which we

possess only a subsidiary awareness. In discussing human acts of communication, Polanyi (1969) identified a distinction between attempts at sense-giving and sense-reading, both acts of tacit knowing:

‘Both the way we endow our own utterances with meaning and our attribution of meaning to the utterances of others are acts of tacit knowing. They represent *sense-giving* and *sense-reading* within the structure of tacit knowing’. (p181).

In order to illustrate his philosophical ideas regarding tacit power and acts of communication, Polanyi tells a story. He asks us to suppose that we are travelling in a country we have not visited before. By the end of the first morning, we will be full of new experiences and may report them by letter to a friend. In Polanyi’s view, this involves three ‘integrations’, or the holistic blending of experience through tacit power as defined above. The first is an intelligent understanding of the sights and events in the new country, the second is the composing of a written account of this experience, and the third is the interpretation of this account by our friend.

Polanyi discusses the different types of integration involved in this example. He argues that the first triad is mainly cognitive and involves a sense-reading. The second triad, which puts the results of the first into words, resembles more the performance of a practical skill of the sense-giving type, while the third returns to the cognition type of sense-reading, which integrates written and other clues to a meaningful experience. However, although the first and third triads both involve cognitive sense-reading, Polanyi notes that they are different in character:

‘We may say that the observed meaning of an experience differs structurally from one conveyed in a letter ... the first meaning is *immediately experienced*, while the second is *only present in thought*.’ (p189)

Finally, in this short description of Polanyi’s theoretical ideas, it is worth noting his views on ‘explicit knowledge’, such as the contents of books for example or even a single word. Polanyi is clear that there is no objective explicit knowledge independent of the individual’s tacit knowing:

‘The ideal of a strictly explicit knowledge is indeed self-contradictory; deprived of their tacit coefficients, all spoken words, all formulae, all maps and graphs, are strictly meaningless. An exact mathematical theory means nothing unless we recognise an inexact non-mathematical knowledge on which it bears and a person whose judgement upholds this bearing.’ (1969, p195)

He argues further that all knowledge falls into two classes. It is either tacit or, if subsidiary aspects are made explicit in a book for example, then its meaning remains rooted in tacit knowledge.

2.2 An Adapted Model of Communication

Polanyi wrote the theoretical material outlined above before the days of modern information and communication technologies. His example of the traveller describes a direct sensory experience of events and its communication to a friend by letter. However, I wish to argue that his theories provide a valuable basis for thinking about communication in the contemporary world, involving any form of technology. I will

illustrate this with a real-life example in a later section of the paper, but in this subsection I wish to adapt Polanyi's ideas to derive a basic model of communication shown in Figure 1 below.

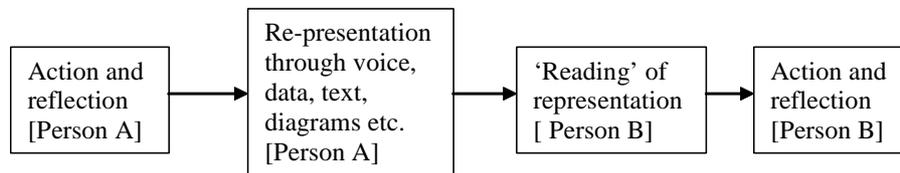


Figure 1: A Model of Basic Communication

This four-stage model, like the story of the traveller, starts with action and reflection on the part of a particular individual, Person A. This person may be travelling to a new country, or carrying out some standard business activity such as a meeting. Regardless of the specific type of action they are undertaking, they are engaged in a whole range of sense-reading activities, reflecting on the action that they are taking, and absorbing subsidiary sights, sounds, and events. They perform integrations, based on their tacit power, to create sense out of what is happening to them and around them.

Let us now suppose that Person A wishes to communicate some of this experience to Person B. Unlike the story of the traveller, this re-presentation of the experience could be through media such as data, text, or diagrams, and through technologies such as a database, mobile phone, or a videoconference. Nevertheless, regardless of the media and the technology, the process of representation has some similar characteristics to that of Polanyi's traveller. This is primarily an effort at sense-giving, with the focus being on the content of the communication output, based on the subsidiary awareness that Person A has of their experience, but the meaning of the output to Person A remains rooted in their tacit knowing.

We now look at the third stage where the explicit output is looked at, or listened to, by Person B. As noted by Polanyi, this stage is also of the cognitive type, but is of a different form to that experienced by Person A in the first stage. The 'reading' by Person B of Person A's representation of their experience, is rooted in the tacit power of Person B, and is present only in thought, rather than being based on immediate experience. The integrations performed by Person B with respect to the representations of Person A will also include their subsidiary awareness and knowledge concerning Person A. Finally, to complete the model, Person B will then engage in action and reflection of their own, influenced by the change in their tacit power brought about by their interaction with Person A's representation of their experience.

3 Communication in Context

Polanyi's theories, and my adaptation above, are philosophical and psychological in nature, dealing with processes in the human mind, the nature of cognition and knowledge, and a model of one-to-one communication. I wish to complement this theoretical basis with more sociologically-informed theory which takes account of the

complex social context within which processes of cognition, learning and communication take place in contemporary work situations. In order to achieve this, I first draw from the literature on situated learning and communities of practice, and I then describe aspects of structuration theory which can be used to provide further conceptual elements with which to theorise interaction in context.

3.1 Communities of Practice

I will start this knowing-in-practice material from Lave and Wenger's (1991) book on situated learning. Their key argument is that learning takes place in situated contexts of practice, and thus that knowing and doing are inextricably interlinked. Lave and Wenger also argued that this individual learning normally takes place within communities with whom individuals identify and interact on an ongoing basis. They coined the term 'communities of practice' in their 1991 book, and this concept has since been developed by a number of authors (Brown and Duguid 1991, 1998; Wenger 1998, 2000), and has received widespread attention amongst management practitioners.

So learning is individual but takes place within communities. Tsoukas (2003) describes this well in the following quote, where he also criticises the knowledge-as-object school:

'Tacit knowing cannot be "captured", "translated", or "converted", but only displayed and manifested in what we do. New knowledge comes about not when the tacit becomes explicit, but when our *skilled performance is punctuated in new ways through social interaction.*' (p410 – italics added).

Thus, people exercise their own, unique tacit power in interaction, but they learn from others through this interaction. This is not the same as 'sharing knowledge' if this is seen in a simplistic way as two or more people having identical views. There is no such thing as 'shared' meaning in any absolute sense (Boland 1996).

Lave and Wenger (1991) stated clearly in their 1991 book that situated learning and knowing-in-practice need to take account of contexts of power relations, although they did not develop this line of argument in their book. Contu and Willmott (2003) argued that this radical power-sensitive approach had, however, been hi-jacked to a large extent by managerialist interpreters such as Brown and Duguid, who saw only consensus within communities and implicitly supported managerial-control agendas:

'Brown and Duguid (1991) ... adopt and disseminate more conservative aspects of situated learning theory. In particular, they embrace the idea of 'communities of practice' ... (but) challenging and innovative elements of situated learning theory, such as the idea that learning practices are shaped, enabled and constrained within relations of power, are dimly recognised or discarded.' (p284)

Wenger (1998) displays ambivalence on this issue himself. He states clearly that dissensus can be present in communities:

'Peace, happiness, and harmony are therefore not necessary properties of a community of practice' (p77).

However, he does not develop this line of analysis in his 1998 book, nor in some later contributions (e.g. Wenger and Snyder 2000). Yet, the detailed empirical example of the medical claims processors in the book makes clear that they were severely disenchanted with management's control agenda, so much so that this opposition to management was a key focal point in their identity as a community. Wenger (1998) therefore provides an excellent example of Contu and Willmott's (2003) argument of the importance of the context of power relations for learning in knowledge communities but, ironically, neither piece of work makes any explicit theoretical use of this.

3.2 Structuration Theory

A widely-cited sociological theory, which certainly takes power seriously, is the structuration theory of Anthony Giddens (1979, 1984). The theory has been widely used in a number of academic fields, including that of information systems (for a good review, see Jones 1999). Giddens described his theory as 'an ontology of social life' and thus as a sensitising device in any social study. In this paper, I would like to use some of Giddens' concepts in this spirit, namely as ways of informing thinking and research about the focus of the paper, namely representations through knowledge management systems. In particular, I wish to draw on his three modalities of human agency/structure, namely interpretive schemes, norms and power relations. The discussion in this sub-section is oriented to developing questions about the use of knowledge management systems in communities. Illustrations of the value of this approach will be provided in the later case study material.

Interpretive schemes relate to *how* things are represented in communities and organizations. Information and communication technologies, including so-called knowledge management systems, are deeply involved in providing interpretive schemes. Examples include accounting systems which represent the organization through financial parameters, or databases of client information which represent aspects of the company's market. A focus on interpretive schemes leads to questions as to why particular forms of representation are chosen in particular contexts, and what types of representation are perceived to be valuable by the individuals within particular communities.

Norms relate to *what* is normally represented and for whom. Picking up the client database example again, clients can be represented in variety of ways from simple descriptions of aspects such as their name and location through to more complex data on their perceptions, and attitudes. The database could be used by other sales people within their own community to inform their selling activities, or by senior management to assess the performance of their sales workforce. A focus on norms leads to questions such as what aspects of a client are being represented, and who is using this information.

Power relations, the third modality of Giddens' theory, implies a focus on *who* requires particular representations and *for what purposes*. Representations, and deliberate mis-representations in some cases, are made by human actors who are always aware of the context of power relations within which they operate. It might, for example, be advantageous for a salesperson to misrepresent the number of contacts they have made with clients in order to impress senior managers. Other questions related to power relations concern the incentives or disincentives, financial or otherwise, which are provided for specific representations. For example, payment

systems for sales people can be linked to contributions to the sales community through putting material on to contact databases.

The three modalities of structuration theory can be used, therefore, as sensitising devices to generate some searching questions on the nature, purpose and value of computer-based representations within and between communities of practice in organizations. However, a final theoretical note is that the three modalities are inextricably interlinked. Giddens says that the modalities are separated for analytical purposes only. In practice, a question about what is represented is also a question about how it is represented and for what purpose. I turn now to an example taken from a case study, where the theoretical schema developed above, including the questions generated through the use of structuration theory, will be illustrated through their application.

4 Case Illustration: Compound UK

Compound UK is the pseudonym for the UK selling division of a multinational pharmaceuticals company. The company is concerned primarily with selling products, such as drugs, to hospitals and general medical practices. The company implemented Lotus Notes, the leading groupware technology at that time, to enable improved knowledge sharing and team-working. Fuller descriptions and analyses of the case can be found in Hayes and Walsham (2000a, 200b). It is not the intention here to repeat this earlier material, or to analyse all elements of this complex case study. The purpose of this section is to select *one example of a knowledge management system* from the case, and analyse this from the theoretical standpoint developed above.

The specific example I have chosen is the knowledge management system to record details of the visits made by employees, particularly salespeople, to doctors in clinics and hospitals. The representations of the visit included structured information such as the date of the visit and the name of the person visited, which were stored in a contact-recording database. However, salespeople were also encouraged to record less-structured observations about the contact person or people, the context in which they worked, and the outcome of the visit in terms of business prospects. Such details were stored in a strategic-selling database. The purpose of the latter was to bring together different employees' knowledge of the client organization in order to complete a successful sale.

4.1 Knowledge, Representation and Communication

Looking first at the basic model of communication in Figure 1, it can be related directly to the Compound UK example. In the first stage, the salesperson visits the doctor's clinic or the hospital, and brings their tacit power to bear to make sense of this experience. In this case, unlike Polanyi's traveller example, the re-presentation of the visit in the second stage is stored in a computer system, as a contact record or a strategic selling sheet, but the theoretical principles are similar to those for a letter. The representation is an effort at sense-giving, but the meaning of the explicit output to the salesperson is rooted in their own tacit knowing, and in no sense fully reflects their knowledge of the customer. They know more than they can tell.

Moving to the third stage of the communication model, we need to consider how another employee of Compound UK will 'read' the representation. The first obvious

thing to note is that they will bring their own tacit power to bear in order to create meaning from the computer records, and thus the meaning to them will not be the same as for the creator of the representation. As noted by Polanyi, their reading is also of a different type, not being based on immediate experience, but being only present in thought. The tacit power the 'reader' brings to bear on the computer records will take account of their knowledge of the creator of the records, and their own knowledge of the customer if any.

In the final stage of the process, the 'reader' will take their own actions based partly on the meaning they have created from the records. As we shall see in a moment, this meaning can be highly diverse. Even a simple numerical statistic such as the number of visits recorded by a particular salesperson in a specific period can be used to create different meanings for different people. A simple analogy of the four-stage process is a form of 'Chinese whispers' in which the original 'message' goes through a series of distortions. We start from the ontology of the clinic or hospital itself, and end up at the action taken by the reader of the salesperson's representation.

4.2 Communication in Context

As discussed in the earlier theoretical material, the rather atomistic model of communication in Figure 1 is useful to think about and conceptualise basic communications processes around the contact-recording and strategic-selling databases at Compound UK. However, I argued earlier that this needed to be complemented by a more sociologically-informed analysis, asking questions about the nature of situated learning in communities. The theoretical approach put forward drew on the literature on communities of practice, complemented by concepts from structuration theory. How do these apply to the example from the Compound UK case study?

The case study can certainly be related to the communities of practice perspective. For example, as described in Hayes and Walsham (2000a, 2000b), the salespeople themselves actively engaged with one another in communities to learn about clients and the selling process. The primary purpose of the strategic selling approach was, however, to encourage employees to create new communities across job roles, for example involving both sales people and medical advisors, in order to learn from one another. Again, this was effective in some cases. But what of the potentially darker side of communication and interaction in communities, for example the effects of asymmetric power relations on the learning and communication processes? In order to address this question, and more generally to analyse communication in context, I will use the questions inspired by structuration theory in the rest of this section to describe elements of the use of the knowledge management system of the contact recording and strategic selling databases.

Why were the particular forms of representation chosen? The first thing to note is that both the contact-recording system and the strategic-selling system were implemented top-down i.e. senior management required that salespeople entered data into them. There was, however, some ambiguity as to the motives behind this. Some senior managers suggested that Notes should be viewed as 'empowering', and that members of the sales force should only input contacts that they deemed relevant to future sales situations. Other senior managers suggested that salespeople should input a significant number of contacts to prove that they were working hard. Hayes and Walsham (2000a) describe this as competing discourses of empowerment and control.

This ambiguity made salespeople sceptical of the 'empowerment' rhetoric, and in some cases resulted in defensive behaviour and deliberately distorted representations. One graphic example was the entering of a full stop only in a strategic selling sheet, rather than any meaningful information, simply to get an increased number of such sheets filled in.

What types of representation were perceived as valuable by the salespeople themselves? An example of this is the clear distinction that was made by many salespeople about the strategic-selling sheets for primary care clinics versus hospitals. The former was often perceived as of little use, since primary care is not inherently complex and the pharmaceutical products are fairly standard. In contrast, strategic selling sheets were normally perceived as more useful in the complex hospital setting. Thus, in the language of Polanyi, sense-giving attempts in the former were not necessarily criticised for their sincerity, but those attempting sense-reading of the same context found them of little value to a deepening of understanding. In political terms, however, some ambitious salespeople filled in strategic selling sheets for primary care also, in order to impress management. This created resentment amongst some of the other salespeople, and thus dissensus rather than consensus within the community of salespersons.

What knowledge of the sense-giver was helpful in order to aid the reader's sense-creation process? A specific positive example here was provided by one of the senior medical advisors, charged with providing medical advice to the salespeople, who were not qualified doctors themselves. His approach was to form relationships with individual salespeople by harnessing opportunities to meet them in person, for example at training and induction sessions. Electronic interaction, for example through inputting and reading strategic selling sheets, was then thought to be rather more effective due to the face-to-face relationships that had been built. Sense-reading of another person's electronic sense-giving efforts is facilitated by tacit knowledge of the sense-giver. In the language of communities of practice, the medical advisor acted in a bridging role between the communities of the salespeople and the medical advisors, and was aware of the need for trust-building approaches based on personal relationships.

Who required all this to happen and for what purpose? I have touched on this already in talking about competing discourses of empowerment and control. This example can be extended by looking at the statistic of the number of contacts recorded by a salesperson. One interpretation of this measure is that it reflects how hard a particular person is working for the company. However, an alternative 'reading' is that what matters is whether sales are made, and that the number of contacts does not reflect this at all. Even a simple numerical measure in a database can thus be interpreted very differently by different readers. The knowledge that senior management were looking at the contact numbers had an effect on the practices of the salespeople within their community, and in some cases created a climate of distrust between the salesperson and management.

What incentives (or disincentives) were provided to encourage sense-givers and sense-readers to use the knowledge management system? I have described some of the incentives already in terms of the value of strategic selling sheets in hospitals or, more darkly, a salesperson's fear of disapproval from senior management if their contact numbers were low. More generally, Compound UK demonstrated an ambiguity that is fairly common in contemporary business organizations. Senior

management rhetoric encouraged team-working behaviour within communities of practice, but financial reward systems were largely on individual performance.

5 Implications for Practice

This is not a 'how to do it' paper aimed to provide a set of handy tools for practising managers or the builders of knowledge management systems in organizations. Nevertheless, I would like to offer a few thoughts on issues which need to be faced in practice. I will put these forward as a set of questions which need to be addressed in any organization, and thus where effort needs to be directed. One of the reviewers of an earlier version of this paper criticised the empirical material as follows:

'Somehow, in the empirical part of the paper, the idea is communicated that if only people had lightened up on the use of power to direct the interpretive activities of organizational members, the whole exercise would have worked better.'

This was not the author's intention in the sense that power is ever-present in any human situation, and cannot be 'lightened up'. However, the nature and effects of power relations are not static, nor are they opaque to reflection. For example, the senior managers and the knowledge management system designers in Compound UK would no doubt have behaved differently if they had thought more carefully about the questions below.

What incentives are there for members of a particular work community to represent their work effectively, and for others to use those representations? For example, it is no good espousing the rhetoric of teamwork if attempts at sense-giving to others are not encouraged by an individualistic reward system. A question from the point of view of potential sense-readers is whether the topic being addressed is sufficiently important to them, and whether new insights are likely by taking the time and effort to read others' representations. It was the failure of this for strategic selling sheets in primary care in Compound UK which led this system to be criticised by many of its potential users.

What forms of representation should be chosen? Both media and technology choice should be regarded as open questions to be addressed directly by knowledge community members. A blended approach is often the most effective where representations through electronic databases or web sites are complemented by other forms of interaction such as face-to-face meetings. The precise form of representation, and how these are aggregated, is a further question. The management of Compound UK may have been sensible to ask for contact records from their salespeople, but less wise to aggregate the numbers of these as a representation of sales effectiveness.

Can members of knowledge communities be encouraged and enabled to make better representations? This is not merely a matter of language, although this is important, but also a question of finding out what is valuable to others, and how this should be delivered. The salespeople in Compound UK often found the strategic selling sheets for hospitals valuable, but as far as I am aware no formal training was provided as to how to make more effective inputs to the sheets. Feedback mechanisms can be one approach here, where community members are encouraged to comment positively on the sense-giving efforts of others when they find them valuable.

Can sense-reading be helped by better knowledge of the representer and his or her context? Our tacit understanding of people is an example of Polanyi's deeply intuitive integration processes, where we see subsidiary details such as the person's physical characteristics and body 'language', but form tacit judgements about their personality as a whole. There is no replacement for this by electronic means, although video contact does offer some value here. Virtual teams, trying to work with others across time and space, understand well the value of face-to-face contact, even if only occasional. In the Compound UK case, the medical advisor who formed social relationships with salespeople initially through face-to-face contact provided a good example of how to blend different forms of interaction with members of the sales community.

6 Conclusions

Viewed from the perspective of this paper, and as illustrated by the case study, organizations involve learning communities of sense-readers and sense-givers, taking action, reflecting on it, making re-presentations based on their tacit knowing, 'reading' others' representations, and taking further action in turn. Knowledge management systems contain particular forms of representation, and we should ask questions about what and how particular forms of representation are being used, and why. Communities are not always harmonious and consensual, and situated learning in communities, including that supported by knowledge management systems, is inextricably interlinked to the context of power relations.

The perspective in this paper contrasts to that of the apolitical knowledge-as-object school of thought which still dominates much of the literature on knowledge management systems. This paper is suggesting the need for a change of language. Knowledge is not an object which can be captured, stored and transferred. We should stop using phrases such as 'knowledge repositories', 'knowledge transfer', and even 'knowledge sharing' if the latter is viewed as two or more people having identical viewpoints. Instead, we should focus on how to support sense-reading and sense-giving processes, how to facilitate knowledgeable action, and how to enable effective interaction between people with different tacit power and understanding. We should be concerned with the political context of situated learning in communities, and with tensions and dissensus as well as consensus in communities. This paper has aimed to make a small contribution to a change in language and perspective on knowledge management systems, but more theoretical and empirical work is needed to develop these ideas further.

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