Chapter 23
Applying the Practice Theoretical Perspective to Healthcare Knowledge Management

Obinna Anya, Hissam Tawfik, and Raouf N. G. Naguib

23.1 Introduction

In health care, knowledge management is primarily focused on providing clinical practitioners with appropriate knowledge resources, including techniques, strategies, tools and processes, for making the best patient care decisions at the point of need. A popular means for incorporating knowledge resources into the healthcare decision-making process is through evidence-based practice (EBP). EBP is the conscientious use of current best evidence in making decisions about patient care (Sackett et al. 2000). In practice, it offers a set of methods established upon explicit scientific criteria that allow the clinical practitioner to assess available research, clinical guidelines and other information resources prior to applying them to clinical decision-making.

As greater issues of social and organizational contexts in health care began to emerge—including considerations of a patient's unique health state and diagnosis, their individual risks, benefits of potential interventions, hospital norms and practices and patient's preferences and values—the practical applicability of EBP has been challenged. Despite its popularity and a "gold standard" status, Gabbay and le May (2011), in an ethnographic study of the use of clinical evidence by primary

O. Anya
IBM Research-Almaden, San Jose, CA, USA
e-mail: o.anya@ieee.org

H. Tawfik
Leeds Beckett University, Leeds, UK
e-mail: h.tawfik@leedsbeckett.ac.uk

R. N. G. Naguib (✉)
Liverpool Hope University, Liverpool, UK

BIOCORE Research & Consultancy Ltd, Liverpool, UK
e-mail: r.naguib@ieee.org

care physicians in the United Kingdom and the United States, observed that EBP is faltering because it focuses hugely on an idealized model of how clinicians ought to use the best evidence and pays little attention to the actual practices of clinical decision-making. The authors conclude that in addition to using the best evidence, clinicians in day-to-day decision-making often deploy a set of internalized, tacit-based and collectively reinforced guidelines that serve as the clinicians' "knowledge-in-practice-in-context". The approach emphasizes the role of collaboration, context and practice, rather than idealized rules, in guiding actions during clinical decision-making. For example, in co-located healthcare settings, the use of evidence often transpires in the midst of problem-based conversational encounters between clinicians about a clinical case at hand, joint critical appraisal of research evidence, a guideline or patient's medical record, referrals to a secondary care specialist or team-based formulation of a care plan or workflow (Abidi 2006). Decision support in such contexts typically occurs interactively and extemporaneously (Mejia et al. 2010; Whittaker et al. 1994) and is largely driven by a common ground offered by the clinicians' shared context of work and "knowledge-in-practice-in-context" (Kuziemsky and Varpio 2010; Gabbay and le May 2011).

In addition, a critical review of existing literature shows that a competent and accountable use of a system in a hospital is inseparable from a body of local work practices that go beyond clinical workflow representations, and through which an awareness of real-world clinical contexts, implicit local work structures, constraints and specific patient-centred needs could be constructed to facilitate effective cross-boundary healthcare knowledge management and decision support (Chaiklin 2011; Gabbay and le May 2011; Schatzki 2012; Button and Harper 1996; Brézillon 2011; Allert and Richter 2008; Tawfik et al. 2012). However, existing healthcare knowledge management systems lack sufficient capability to support problem-solving and facilitate clinical decision support based on practice-centred knowledge about a work situation. This provokes a number of challenges for cross-boundary knowledge management and decision support. How do we enable cross-boundary clinical decision support in a manner that allows for the construction of awareness of a clinical work process and available knowledge resources at the work practice level? Would such approach sufficiently take account of the situated and socially mediated nature of located work practices, clinical encounters, organizational circumstances and patients' specific needs? How do we enable accurate perceptions of work situations across boundaries of workplaces and organizations? How do we enable a suggestion or "second opinion" emanating from a user in a remote organization to be easily applied to support problem-solving and decision-making in another work context in spite of the lack of shared context of work for supporting cohesive interaction and knowledge sharing between the work settings?

In this chapter, we describe a research effort targeted at developing an e-health system for clinical decision support and knowledge sharing across organizational and geographical boundaries, using the practice theoretical approach. The chapter concludes with a roadmap for the critical goal of designing healthcare knowledge management systems and user interfaces that meet the information, collaboration and workflow needs of healthcare professionals at the point of care.

23.2   Practices, Context and Healthcare Knowledge Management

Drawing upon respective work in knowledge management, human-computer interaction and the social sciences, this section provides a brief introduction to the concept of practice. The goal is to ground the application of the practice theoretical perspective in the underlying assumptions of the practice theories. In addition, the section aims to relate the discussion to relevant concepts and techniques in healthcare knowledge management and context-aware computing.

At the core, our approach to the practical theoretical perspective discussed in the chapter is the relationship between knowledge artefacts, context and situation and how that relationship enables an awareness of a community's work practice, i.e. their evolving approach to activity. Context is dynamically constituted through activity involving people and artefacts in a specific setting; it is not just "out there" but is consciously and purposefully generated through people's interaction with artefacts and the environment as represented in their practices (Dourish 2004). This interaction is both shaped by situation and the result of specific historical, cultural and ontological processes within which work is transformed. Practice theories are valuable in explicating human activities and practices in real-world situations, bringing to light "the conflux of multifaceted, shifting, intertwining processes that comprise human thought and behaviour", which are necessary for the development of effective healthcare knowledge management systems (Nardi 1996).

23.2.1   Healthcare Knowledge Management

Conceptually, healthcare knowledge management (KM) is characterized as "the systematic creation, modelling, sharing, operationalization and translation of healthcare knowledge to improve the quality of patient care" (Abidi 2008). It is aimed at promoting and providing optimal, effective and pragmatic healthcare knowledge and resources to clinical professionals (as well as patients and individuals) for the purpose of effecting high-quality, well-informed and cost-effective patient care decisions at the point of need. In practice, it is concerned with techniques, tools and processes for capturing, representing, organizing, synthesizing and operationalizing the different modalities of healthcare knowledge (including experienced-based know-hows) in order to realize comprehensive, validated and accessible healthcare knowledge resources for delivering quality and timely patient care decisions.

At a high level, knowledge management involves four major steps of capturing/creating/generating knowledge, representing/storing knowledge, accessing/using and disseminating/transferring knowledge (Davenport and Prusak 1998; Wickramasinghe and Davison 2004). The process of knowledge capture or creation generally has tremendous implications for the entire knowledge management process,

which requires an understanding of the knowledge construct, as well as of its context. However, knowledge is not a simple construct, particularly in health care, where its creation, use and sharing are heavily reliant practices that support common perceptions of the construct being used or shared (Wickramasinghe 2009). This is primarily as a result of the subjective nature of knowledge, which makes it dynamically malleable to the social, organizational and cultural practices of a community of practice. These attributes make it possible to transform knowledge from one form to another, e.g. from explicit knowledge to tacit knowledge and vice versa, following Nonaka's famous knowledge spiral model, and to apply various forms and modalities of knowledge in a single clinical case or decision-making situation, for example, the use of various forms of knowledge and clinical workflows within the "clinical mindline" construct developed by Gabbay and le May (2011). However, it poses a number of challenges to knowledge sharing across communities and organizational boundaries in health care. As noted by Abidi (2008), a healthcare knowledge management system ought to address the following activities and challenges:

- The need to capture, represent, model, organize and synthesize the various forms and different modalities of healthcare knowledge in order to realize comprehensive, valid and accessible knowledge resources for patient care decision-making
- The challenge of accessing, sharing and disseminating current and case-specific knowledge to healthcare stakeholders and patients in usable formats
- The need to operationalize and utilize healthcare knowledge, within clinical workflows and acceptable organizational contexts, to provide pragmatic patient care services, such as decision support and care planning at the point of need

Over the years, healthcare knowledge management, as a set of practices for effecting collaborative and quality patient care, has focused on three overarching themes, namely, streamlining the nature of knowing in the healthcare sector, identifying the types of knowledge management tools and initiatives that are suitable for the healthcare sector and minimizing the barriers, while strengthening the enablers, to the take up of knowledge management practices (Nicolini 2008).

23.2.2   The Concept of Practice

Work practice can be defined as "the ways of doing work, grounded in tradition and shared by a group of workers" (Bødker 1991). It is a "customary way of doing things" (Allert and Richter 2008), and, according to Reckwitz (2002), it incorporates an appreciation of a people's cultural and historical phenomena as well as the specific contexts of their actions. The importance of practice lies in its ability to locate the precise situation of work; the design of computer support for work, by default, implies the design for the work situations of the users.

Practice refers to human everyday practical activity through which we share cooperatively produced understandings and knowledge about the world and our activities (Bødker 1991). However, practice has been generally overlooked

theoretically and is often taken as a "thin" term with little meaning, a term denoting a loose family of not necessarily coherent ideas and always treated as a background concept (Kirsh 2001; Hopwood 2010; Chaiklin 2011). Some thinkers conceive of practice, minimally, as arrays of activity, while others yet theorize practice as the skills, tacit knowledge and presuppositions that underpin activities.

The practice theoretical perspective is underlined by the following key assumptions, which are critical to effectively applying the practice theory for collaborative knowledge management support (Allert and Richter 2008):

- Practices are socially mediated in that they are shaped by, and evolve within, social communities and can even become part of the communities' identity (Büscher et al. 2001; Wenger 1998).
- Practices entail both a momentum of stability as well as change. While practices manifest and reproduce historically developed patterns of activity, they are also open to change in that the concrete activities have to be continuously adapted to new situations and changing conditions (Chaiklin 2011).
- Even though practices are often characterized by the use of particular artefacts (e.g. giving a PowerPoint presentation), practices are not determined by these artefacts in a strict sense. This difference is due to the fact that an artefact becomes a tool only when interpreted as such within a social and historical context.
- Practices do not exist in isolation but are part of a larger network of practices that is dependent on a broad-based notion of context. Practices are interrelated as both individual and collective actors, as well as artefacts are usually enrolled and used in several practices simultaneously.
- Practice is the research object to which studies of cultural-historical theory is directed (Chaiklin 2011). As a result, any scientific understanding of work practice must include some analysis of the socio-historical context in which the practice becomes enacted, since practice acts as a scaffold to augment and direct human actions (though in a non-deterministic way) within a work context.
- Practice represents a meaning-processing system, which processes information by constructing meaning, uniting action and meaning. It is essentially concerned with the ways in which actions can be rendered as meaningful, i.e. how a particular action, for example, becomes meaningful or is interpreted by certain people by virtue of where it was performed, when it was performed and with whom or what (Dourish 2004; Wenger 1998).

The concept of work practice offers an approach for organizing tools, actors and resources in a work environment, as well as for portraying how and why certain tools, actors and resources are used in certain knowledge use and sharing activities in relation to prevailing local contexts.

23.2.3 *The Role of Context*

One of the most significant elements that has emerged from work practice studies over the last two decades is the notion of the situatedness of work (Szymanski and Whalen 2011). This perspective argues that work, as well as knowledge use and sharing, contrary to the commonly held views of plans and rationalistic thinking, unfolds in response to the contingencies of a situation. Context allows us to address the situatedness and knowledge use and sharing and to recognize in the application of the practice theoretical perspective that knowledge sharing in health care is heavily reliant on practices that support common perceptions of shared knowledge artefacts. Practice is intrinsically linked with contexts so much so that each produces and locates the other in a complex interplay of socially produced knowledge, practices and relations (Saltmarsh 2009).

Similar to many applications for personalized support and intelligent services, healthcare knowledge management systems are highly dependent on their execution context (Bricon-Soufa and Newman 2007). A common definition of context considers it as "any information that can be used to characterize the situation of an entity", where an entity refers to a person, place or object that is considered relevant in an interaction sequence (Dey 2001). Context is critical in the design of care support systems for the elderly because of its ability to enable us to construct and maintain awareness of a person's activities, status or context in different settings; yet, it has remained a poor source of information in computing environments (Dey 2001). As a result, the term has been considered differently by different authors—as the surroundings of the interaction between the user and the application (Coutaz et al. 2005), what is needed to characterize and encode the situation of an entity, information about the activity or task the user is currently performing or what is needed to understand what people do and how and why they achieve and maintain a mutual understanding of the context for their actions (Dourish 2004).

23.3 Applying the Practice Theoretical Perspective

In this section, we describe how a practice-centred approach to healthcare knowledge management could contribute to the challenge of building computer applications that allow individuals to more effectively construct and convey information about their contexts of work, including actual work practices, local circumstances and varying work situations in a manner that facilitates cross-boundary knowledge sharing and decision support beyond what is currently offered by existing workflow-based approaches. A practice theoretical perspective allows us to uncover the specific details of knowledge use and sharing at the work practice level, i.e. the level at which work unfolds in the actual sense. Under the EBP approach, evidence is often generated out of controlled experiments, and, as a result, their use often guides knowledge reuse at an abstract level and hardly incorporates details of actionable

tasks and processes necessary for accomplishing work in a real-world context (Anya and Tawfik 2016; Anya et al. 2010).

23.3.1 Capturing Practice-Related Knowledge

The first step in applying the practice theoretical perspective is to capture practice-related knowledge. Practice-related knowledge belongs to the form of knowledge known as tacit or "know-how", rather than explicit or factual knowledge (Wickramasinghe and Davison 2004). It is also hugely a subjective form of knowledge.

To address these challenges, we carried out a user-centred study of clinical work practices in order to understand the "what", "how" and "why" behind their knowledge use and sharing practices for patient care support. The goal is to provide a user-centred basis for our approach to applying the practice theoretical perspective to healthcare knowledge management and to identify design requirements to inform the development of technological support and e-health decision support. Specifically, we believe that by collecting an account of the various ways by which clinicians often contextualize procedures, improvise practices in order to accommodate for peculiar workplace circumstances and specific patient-centred needs and seek to construct meaning out of their local interactions with technologies, one can provide some useful insights into the design of knowledge management systems for e-health decision support at a work practice level. The details of the study appear in Tawfik et al. (2012). The findings indicate that differences in clinical practices and approaches to knowledge use and sharing among clinicians are associated with differences in local work contexts across work settings but are moderated by their adherence to best practice guidelines and the need for patient-centred care. The study further reveals that an awareness, especially of the ontological, stereotypical and situated practices, plays a crucial role in adapting knowledge for patient care decision support (Table 23.1).

23.3.2 Modelling Practice-Related Knowledge

In this section, we describe our approach to modelling practice-related knowledge use and sharing, which is concerned with using the knowledge acquired from a work process ("know-how") to enable context-aware patient care decision support. Our approach combines adaptations of the activity system and the situation awareness theory in a model that considers non-workflow-based aspects of work, e.g. the situated factors of a work environment in order to accommodate accounts of the situated perspective of healthcare knowledge use and sharing.

A work practice model brings out details of the rich contextual framework in which work unfolds and suggests lines of enquiry that would potentially lead to

Table 23.1 Process-data vs. practice-based data in healthcare KM (Adapted from Leidner et al. 2006)

Element	Process-based knowledge	Practice-based knowledge
Role	Handle task execution	Mainly act to influence task execution based on prevailing circumstances of work
Nature of knowledge	Formal work specifications, domain rules and conceptual knowledge	Informal specifications, common sense knowledge, world views, local norms, organizational values and beliefs, power structures, rituals, stories and myths
	Rigid and generic, i.e. independent of work settings	Flexible and easily adapts to changes in local work settings, e.g. availability of tools and services
Type of knowledge	Explicit knowledge—codified in rules, tools and processes	Mostly tacit knowledge—unarticulated knowledge not easily captured or codified
Context/model type	Mostly ontological context and domain model and stereotyped context	Mostly situated context and situation model and often stereotyped context
Means of transmission	Formal controls, procedures and standard operating procedures with heavy emphasis on information technologies to support knowledge creation, codification, transfer and decision support	Informal social groups that engage in storytelling and improvisation
Affecting factors	Factors within internal work processes, e.g. task methods	External factors, such as economic status, government policies and regional agenda
Means of enabling awareness	Through formal processes	Through the extent of influence on work processes in order to enable or constrain them
Means of mediation	Rules, tools, roles, subjects and objects	Tools, roles, subjects and objects, community, history and social and cultural practices
Paradigm	Rationalistic thinking, task structures, workflow-based technologies	Activity, cultural-historical and social theories
Practice system category	Ontological, stereotyped	Situated, stereotyped
Benefits	Provides structure to harness generated ideas and knowledge	Provides an environment to generate and share high-value tacit knowledge for decision support
	Achieves scale in knowledge reuse	Provides spark for fresh ideas and responsiveness to changing environment
Disadvantages	Fails to tap into tacit knowledge. May limit innovation and forces participants into fixed patterns of thinking	Can result in inefficiency. Abundance of ideas with no structure to implement them

Table 23.1   (continued)

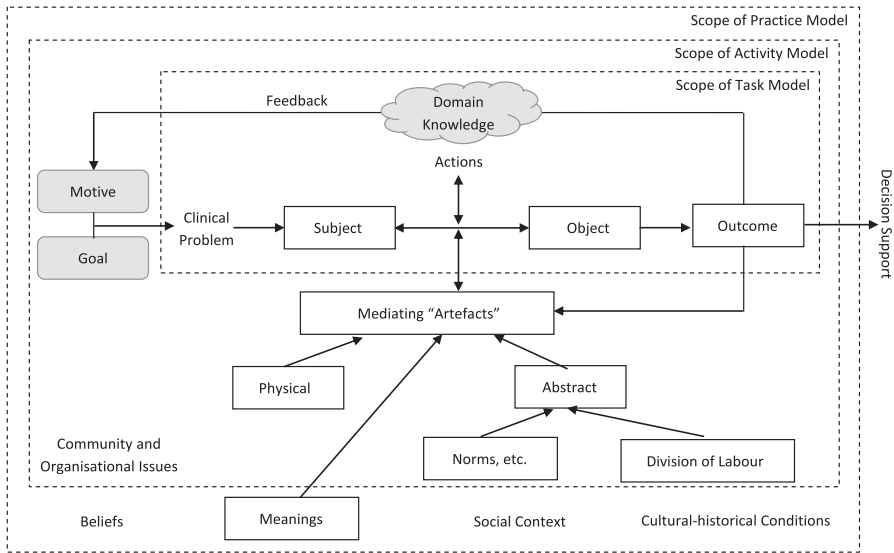| Element	Process-based knowledge	Practice-based knowledge
Role of information technology	Heavy investment in IT to connect people with reusable codified knowledge	Moderate investment in IT to facilitate conversations and transfer of tacit knowledge and "influencers" for more adaptive cross-boundary decision support

Fig. 23.1   Scope of a practice-based knowledge management model highlighting the role and relationships among various elements of work practice in enabling an understanding of knowledge use at the work practice level (Adapted from Wilson 2006)

enhanced adaptive cross-boundary support to work, which a less detailed analysis would not suggest. To further highlight this, we extended a process model of activity proposed by Wilson (2006) and show how a work practice model offers a much wider scope than an activity or a task model for understanding the context and setting in which we perform our activities. Figure 23.1 shows how work is realized within this system from the perspective of a work process, driven by motive and goal and directed (by work practice elements and activity factors) towards a desired outcome (Wilson 2006).

In order to appropriately model these situation-dependent factors, we employ the use of a situation awareness model. We describe this situation awareness model and show how we have integrated it into the work practice model. At the core of the situation awareness model is a situation model—a "setting" consisting of entities and interactions among entities, which one becomes aware of via the situation awareness model. The notion of a situation model enables us to understand "the complete state of the universe [of work] at an instant of time" in relation to what influences a

clinician's actions and task requirements. We will show in the next section how we have further incorporated context modelling into a practice model in order to portray the subsets of this universe that are considered "contextually relevant" to decision-making at any instant (Dourish 2004).

Next, we apply the situation awareness model proposed by Endsley (1995). The primary basis of the situation awareness model, as we apply it to this work, is to gain an understanding of the state of a clinical work situation with a view to knowing how information, events and one's own actions (or those of others) will impact the goals and objectives of providing the best possible care to the patient. Based on his well-known definition of situation awareness, Endsley's situation awareness model can be categorized into three hierarchical levels: perception of elements in current situation, comprehension of current situation and projection of future status. At the perception level, the model recognizes necessary information about the environment. The comprehension level interprets the perceived information in order to make sense of the current of the environment. The projection level uses the knowledge of the current environment to predict its possible future states.

Endsley's model has been applied in areas such as air traffic control, ship navigation and military operations but includes a fundamental assumption that makes it unsuitable to cross-boundary clinical decision support. The researcher assumes that the agent seeking to gain an awareness of a situation and to influence his/her decision by the elements in the situation is a direct observer of the situation. In cross-boundary e-health, this is not the case; a clinician A wanting to provide a suggestion to support the decision-making process of another clinician, B, who is in a different workplace or even geographical region, is not a direct observer of the situation B is in. As a result, we have refined the basic structure of the situation awareness model by inserting two new levels—conceptualization and stereotyping between perception and comprehension—and moving projection to the decision support phase. Figure 23.2 depicts the resultant model for enabling healthcare knowledge management from a practice theoretical perspective and consists of four phases: *perception of work situation*, *conceptualization of work domain*, *stereotyping of work locality and comprehension of work status and problem requirements*.

The model allows information interchange and decision support across clinical work settings and disparate practice systems. In principle, it aims to generate contextually enriched knowledge in order to adaptively support decision in a specific work context by explicating the forms of work practices in a specific work setting and consequently tailoring an information item (which we refer to as a suggestion), which originates from a different work setting, to fit into the practices and problem-solving patterns in the user's work context in a way that accommodates for both institution-specific and situation-dependent variations in care.

Typically, when people provide suggestions towards assisting other people, e.g. in online forums, they usually provide the information item in a general context or, at least, in terms of their own individual contexts and experiences. As has been argued in this work, people in different work settings, e.g. clinicians—owing to differences in work culture, available resources and expertise, patients' needs and institutional agenda—have evolved work practices that conform to their work
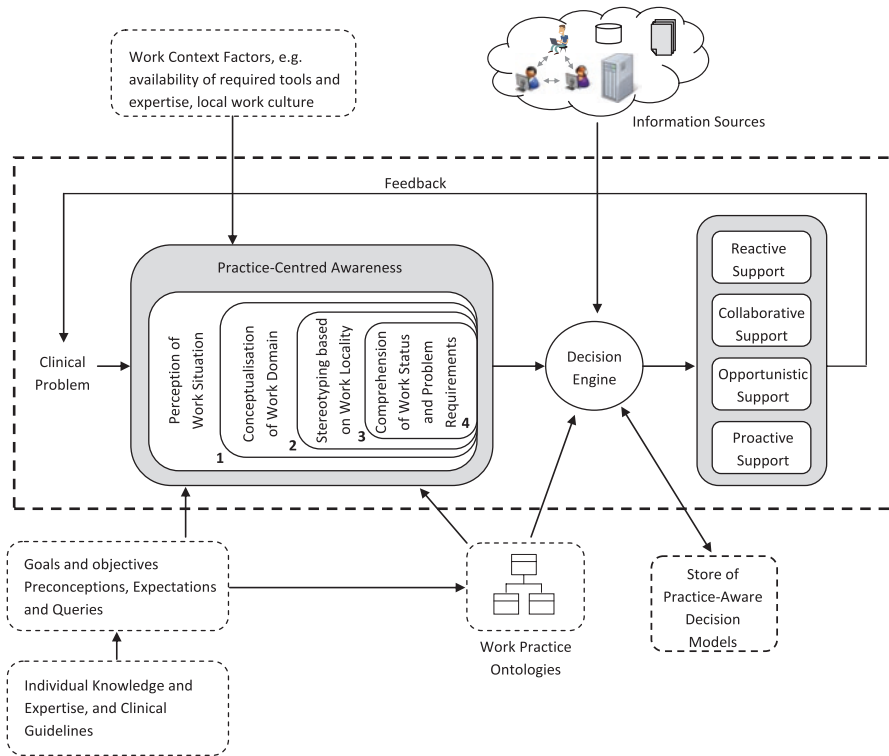
Fig. 23.2 A practice-centred knowledge management model (Adapted from Endsley 1995)

contexts and seek to address their individual issues. We posit that in order to be effective, a suggestion needs to adapt to the various ways by which a user works. As a result, our context-morphing approach aims to restructure (i.e. customize) the information content of a suggestion in order to add value to the ways by which clinicians often contextualize problem-solving procedures in order to accommodate for specific local contexts and individual patient-centred needs (Harrison et al. 2010; Gabbay and le May 2011). To achieve this, our approach focuses on the following actions:

- Improvise: What resources, tools, expertise and standardized services does the user lack? How do they make up for them by virtue of their work practices? How can the suggestion provided help users in accomplishing this in relation to their overall work goal and expected solution?
- Influence: What internal (person-related and organization-dependent) and external (e.g. regional policies) factors have shaped the user's decision-making? How do the factors affect the decision quality? How can the suggestion provided help ensure quality?

- Augment: How can the suggestion enrich the user's work practices and existing information towards achieving the overall work goal and expected solution and vice versa?
- Explain: How can the suggestion help offer an explanation or justification for the user's work practices (Kofod-Petersen and Aamodt 2009)?
- Apply: Here the suggestion is directly applied to user work context without any action on it. This occurs where the work context of the suggestion provider and that of the user are similar.

23.3.3 Designing and Evaluating KM Systems Based on the Practice Theoretical Perspective

Most research has approached the task of designing systems that relate to the context of computation by focusing on the technical issues associated with context, e.g. the syntactic connections between different concepts or the use of sensor technologies to enable systems to respond to changes in the computational environment (Dourish 2004; Kaenampornpan and O'Neill 2005). However, much effort is still required to study and analyse context from a knowledge-level perspective (Newell 1981). By seeking to construct a computational model of context of work, including organizations of people, tools and resources for work, as well as the underlying motives and circumstances of problem-solving, our approach aims to build decision support systems that are aware of their "context" through an ontology of "the structure of a total world" (Newell 1981). From a knowledge-level perspective, a thrust of this research is to understand the "work practices" of clinicians across various regional and organizational work settings in order to enable context-aware decision support in a manner that takes account of the "bounded rationality" across work setting (Simon 1991).

23.4 Discussion and Concluding Remarks

Although this chapter explored the application of the practice theoretical perspective to healthcare knowledge management, the specific approach described is based on the activity theory and the theory of situation awareness. Whereas activity theory belongs to the family of practice theories (Foot 2014), allowing us a lens for uncovering the real actions of practitioners as they engage in clinical decision; the theory of situation awareness provides a framework for the perception of environmental elements and events with respect to the time and place of decision-making. Their combined used enables the exploration of how practice can be used, managed and transformed to suit various clinical problem situations and patients' needs. The approach blurs the distinction between action and context to explore the notion that

practice supports common perception of shared knowledge items within and across communities of practice. A key thesis of the chapter is that the dynamics of knowledge management in patient care decision-making is complex and particularly challenging when knowledge is shared across community and organizational boundaries in collaborative health care. The process is reliant on contextual features that support common perceptions of shared information and usually occurs within a complex structure of clinical work practices that is shaped by a wide range of factors, including organizational culture, local contexts, socially constructed traditions of actions, experiences and patients' circumstances, which vary across organizational and community settings.

We argue that an integrated approach to understanding knowledge management in health care is needed and could lead to the design of improved system to support better knowledge use and sharing at the point of care and point of need. A large part of the paradox of healthcare knowledge management is that though information technology has enabled a knowledge-rich healthcare system with accessible databases and repositories, healthcare knowledge remains largely underutilized, and often wrongly utilized, in patient care decision-making. Addressing the problems facing the healthcare sector from a knowledge management perspective calls for an integrated approach with the capability to manage the tension between evidence-based practice and practice-based evidence, which in many ways has a lot in common with the tension between process data or between explicit knowledge and tacit knowledge. A practice theoretical perspective would enable healthcare organizations to uncover and understand the communication and coordination practices that make for more effective and efficient patient care decision-making. By making their knowledge explicit and adhering to evidence-based standards, healthcare organizations will be more suitably equipped to develop standardized practice management techniques.

Besides knowledge management, the potential role of the practice theoretical perspective in healthcare knowledge management resonates strongly with one of the major concerns of the computer-supported cooperative work community with health care, namely, investigating how healthcare decision-making is collaboratively and practically achieved in various work contexts and designing systems to support that process (Fitzpatrick and Ellingsen 2013). Against this background, a practice theoretical perspective to healthcare knowledge has a lot to offer to computer-supported cooperative work research, including providing a framework to foster the articulation and sharing of clinical, operational knowledge and experiences in collaborative health care.

While a practice theoretical perspective is highly valuable in understanding and utilizing non-explicit and less evidence-based types of knowledge and making such knowledge assets more explicit, implementing healthcare knowledge management systems based on the practice theoretical perspective is hugely challenging. As noted by the areas of focus in this chapter, the challenges stem from the difficulty in capturing practice-related knowledge, modelling practice-related knowledge and designing and evaluating systems that are built and based on that approach. Recent trends in health care, including the proliferation of online healthcare knowledge

resources easily available to patients, as well as new innovations in telemedicine, pose enormous challenges to healthcare knowledge management. We believe that addressing some of them effectively and efficiently would impact on elements of the practice theoretical perspective.

References

Abidi, S. S. R. (2006). Healthcare knowledge sharing: Purpose, practices and prospects. In R. Bali & A. Dwivedi (Eds.), *Healthcare knowledge management: Issues, advances and successes* (pp. 65–86). New York: Springer.

Abidi, S. S. R. (2008). Healthcare knowledge management: The art of the possible. In D. Riaño (Ed.), *Knowledge management for health care procedures*, *Lecture notes in computer science* (Vol. 4924). Berlin: Springer.

Allert, H., & Richter, C. (2008, April 1–2). Practices, systems, and context working as core concepts in modeling socio-technical systems. In M. Möller, T. Roth-Berghofer, & W. Neuser (Eds.), *Proceedings of the fifth international workshop on philosophy and informatics, WSPI 2008*, Kaiserslautern.

Anya, O., & Tawfik, H. (2016). Designing for practice-based context-awareness in ubiquitous e-health environments. *Computers & Electrical Engineering*, *61*, 312–326. Retrieved August 24, 2016, from https://doi.org/10.1016/j.compeleceng.2016.08.012

Anya, O., Tawfik, H., Amin, S., Nagar, A., & Shaalan, K. (2010). Context-aware knowledge modelling for decision support in e-health. In *International joint conference on neural networks (IJCNN)* (pp. 1–7).

Bødker, S. (1991). Activity theory as a challenge to systems design. In H.-E. Nissen, H. K. Klein, & R. Hirschheim (Eds.), *Information systems research: Contemporary approaches and emergent traditions*. Amsterdam: North Holland.

Brézillon, P. (2011). Context-based management of practices. In *International workshop on modeling and reasoning in context, Karlsruhe, Germany*. Berlin, Germany: Springer.

Bricon-Soufa, N., & Newman, C. R. (2007). Context awareness in health care: A review. *International Journal of Medical Informatics, 76*, 2–12.

Büscher, M., Gill, S., Mogensen, P., & Shapiro, D. (2001). Landscapes of practice: Bricolage as a method for situated design. *CSCW, 10*, 1–28.

Button, G., & Harper, R. (1996). The relevance of 'work-practice' for design. *CSCW, 4*(4), 263–280.

Chaiklin, S. (2011). The role of practice in cultural-historical science. In M. Kontopodis, C. Wulf, & B. Fichtner (Eds.), *Children, development and education: Cultural, historical, anthropological perspectives* (pp. 227–246). Dordrecht: Springer.

Coutaz, J., Crowley, J. L., Dobson, S., & Garlan, D. (2005). Context is key. *Communications of the ACM, 48*, 49–53.

Davenport, T., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know*. Boston: Harvard Business School Press.

Dey, A. K. (2001). Understanding and using context. *Personal and Ubiquitous Computing, 5*, 4–7.

Dourish, P. (2004). What we talk about when we talk about context. *Personal and Ubiquitous Computing, 8*(1), 19–30.

Endsley, M. R. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors, 37*(1), 32–64.

Fitzpatrick, G., & Ellingsen, G. (2013). A review of 25 years of CSCW research in healthcare: Contributions, challenges and future agendas. *Journal of CSCW, 22*, 609–665.

Foot, K. A. (2014). Cultural-historical activity theory: Exploring a theory to inform practice and research. *Journal of Human Behavior in Social Environment, 24*(3), 329–347.

Gabbay, J., & le May, A. (2011). *Practice-based evidence for healthcare: Clinical mindlines*. London: Routledge.

Harrison, M. B., Légaré, F., Graham, I. D., & Fervers, B. (2010). Adapting clinical practice guidelines to local context and assessing barriers to their use. *Canadian Medical Association Journal, 182*(2), E78–E84.

Hopwood, N. (2010). *Dwelling in complexity: Relational-ecological understandings of context, space, place, and the body in professional practice*. Presented at the AARE international research in education conference, Melbourne.

Kaenampornpan, M., & O'Neill, E. (2005). Integrating history and activity theory in context aware system design. In *International workshop on exploiting context histories in smart environments, pervasive '05*, Munich, Germany.

Kirsh, D. (2001). The context of work. *Human Computer Interaction, 16*(2–4), 305–322.

Kofod-Petersen, A., & Aamodt, A. (2009). Case-based reasoning for situation-aware ambient intelligence: A hospital ward evaluation study. In *International conference on case-based reasoning ICCBR'09* (pp. 450–464). Berlin, Germany: Springer.

Kuziemsky, C.E., & Varpio, L. (2010). Describing the clinical communication space through a model of common ground–you don't know what you don't know. *AMIA Annual Symposium* (pp. 407–411).

Leidner, D., Alavi, M., & Kayworth, T. (2006). The role of culture in knowledge management: A case study of two global firms. *International Journal of e-Collaboration, 2*(1), 17–40.

Mejia, D. A., Favela, J., & Morán, A. L. (2010). Understanding and supporting lightweight communication in hospital work. *IEEE Transactions on Information Technology in Biomedicine, 14*(1), 140–146.

Nardi, B. (1996). *Context and consciousness: Activity theory and human-computer interaction*. Cambridge, MA: MIT Press.

Newell, A. (1981). The knowledge level. *AI Magazine, 33*, 1–20.

Nicolini, D. (2008). Managing knowledge in the healthcare sector: A review. *International Journal of Management Review, 10*(3), 245–263.

Reckwitz, A. (2002). Towards a theory of social practices: A development in culturalist theorizing. *European Journal of Social Theory, 5*(2), 243–263.

Sackett, D. L., Straus, S. E., Richardson, W. S., Rosenberg, W., & Haynes, R. B. (2000). *Evidence-based medicine: How to practice and teach EBM* (2nd ed.). New York: Churchill Livingstone.

Saltmarsh, S. (2009). Researching context as a 'practiced place'. In B. Green (Ed.), *Understanding and researching professional practice* (pp. 153–163). Rotterdam: Sense Publishers.

Schatzki, T. R. (2012). A primer on practices: Theory and research. In *Practice-based education*, *Practice, education, work and society series* (Vol. 6, pp. 13–26).

Simon, H. (1991). Bounded rationality and organizational learning. *Organization Science, 2*(1), 125–134.

Szymanski, M. H., & Whalen, J. (Eds.). (2011). *Making work visible: Ethnographically grounded case studies of work practice*. Cambridge, UK: Cambridge University Press.

Tawfik, H., Anya, O., & Nagar, A. K. (2012). Understanding clinical work practices for cross-boundary decision support in e-health. *IEEE Transactions on Information Technology in Biomedicine, 16*(4), 530–541.

Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. Cambridge, UK: Cambridge University Press.

Whittaker, S., Frohlich, D., & Daly-Jones, O. (1994). Informal workplace communication: What is it like and how might we support it? In *Proceedings of the SIGCHI conference on human factors in computing systems: Celebrating Interdependence (CHI 1994)* (pp. 131–137), Boston, MA.

Wickramasinghe, N. (2009). Healthcare knowledge management: Incorporating the tools, technologies, strategies, and process of knowledge management to effect superior healthcare delivery. In R. Bali, & A. Dwivedi (ed.) *Healthcare knowledge management: issues, advances, and successes*, (pp. 87–103). Berlin: Springer.

Wickramasinghe, N., & Davison, G. (2004). Making explicit the implicit knowledge assets in healthcare: The case of multidisciplinary teams in care and cure environments. *Health Care Management Science, 7*(3), 185–195.

Wilson, T. D. (2006). A re-examination of information seeking behaviour in the context of activity theory. *Information Research, 11*(4), 11–14.