

About Some Relationships between Knowledge and Context

J.-C. Pomerol and P. Brézillon

LIP6, Case 169, University Paris 6, 4 place Jussieu, 75252 Paris Cedex 05, France
{Jean-Charles.Pomerol, Patrick.Brezillon}@lip6.fr

Abstract. Many attempts have been made to capture, on the one hand, the very nature of knowledge, and on the other hand, the nature of context. In this paper, we compare the two concepts of context and knowledge which, obviously, share some common aspects. We review the main characteristics of both concepts and while we conclude to a large overlapping of the two concepts, we also emphasize their differences as regards decision making and action. We start by reviewing the most famous views and definitions of knowledge. Then we give some characteristics of knowledge that appear important to us. We also introduce the notion of context with its main components. Then, we stress the differences between knowledge and context.

1 Introduction

On the one hand, many attempts have been made to capture the very nature of knowledge. These analyses come from different fields: philosophy, cognitive science, artificial intelligence, etc. On the other hand, there is now a renewal of the studies on context and several proposals to represent and implement the context in "intelligent" systems.

Up to now, there were, as far as we know, few attempts to compare the two concepts of context and knowledge, while they obviously share some common aspects. In this paper, we review the main characteristics of both concepts and, while we note a large overlapping of the two concepts, we also emphasize their differences as regards decision making and action.

This paper represents a viewpoint in artificial intelligence. As such, it is certainly open to criticism, but can also bring some new insights and fields applications.

Our contribution is the object of a full paper available from
<http://www-poleia.lip6.fr/~brezil/Pages2/Publications/CXT01/index.html>.

2 Different Types of Knowledge

We first introduce the classical distinction between data, information and knowledge. Data are the stimuli that enter an interpretation process. Information is then data with meaning. Information is also the input to a knowledge-based process of decision making. Knowledge is used: (1) to transform data into information, (2) to derive new

information from existing ones, and (3) to acquire new knowledge pieces. It follows that knowledge is both a means and a result of this complex process.

Across domains, there are different forms of knowledge:

- *Know how* versus *know that*. The term *know how* refers to the knowledge that people use to operate or behave as opposed to *know that* which is related to the profound, ultimate and often hidden causes of the on-going phenomenon.

- *Deep* versus *surface knowledge*. *Deep knowledge* refers to models and causal explanations that goes back to nature laws, whereas the *surface knowledge* is represented by practical rules that can be acquired from people performing efficiently a given task (human experts).

- *Procedural* versus *declarative knowledge*. *Procedural knowledge* is a knowledge which is expressed, in expert systems by rules or, in organizational life, by procedures. *Declarative knowledge* refers to more descriptive knowledge represented by objects or agents in the new programming languages.

- *Tacit* versus *explicit knowledge*. *Explicit knowledge* is easily shared whereas *implicit knowledge* is highly personal. (Nonaka [2] describes four types of movement between the two types of knowledge: socialization, externalization, combination and internalization.)

Comparisons among the different forms of knowledge are made in the full paper. Note only that the AI approach is close to many approaches in cognitive science.

3 Context

There is already a large amount of discussion about context (see Brézillon [1] for a survey in AI). We suggested to consider three types of contextual knowledge [4], namely external and contextual knowledge, and proceduralized context. The *contextual knowledge* is a backstage knowledge whereas *proceduralized context* is immediately useful for the task at hand. In our representation of context, the *contextual knowledge* is largely tacit, mainly because it is the context that everybody knows without expressing it.

An important issue is the passage from *contextual knowledge* to *proceduralized context*. This proceduralization results from the focus on a task. Thus, it is task-oriented just as *knowing how*; it is often triggered by an event or primed by the recognition of a pattern. We also observed that the construction of the *proceduralized context* from *contextual knowledge* is often a process of communication in the operator community.

Ozturk and Aamodt [3] proposed a quite similar distinction between external context (our *contextual knowledge*) and internal context (our *proceduralized context*). The main difference is that they do not consider the dynamics between the two types of context but only inside the internal context. In a similar spirit, Hewitt (see Tiberghien [5]) distinguishes between *intrinsic* and *extrinsic* context, the former denoting a synthetic interaction and the latter denoting surroundings of the effective stimulus.

4 Discussion

To sum up the discussion presented in the full paper, the differences and analogies between context and knowledge, are:

- context and knowledge can be *explicit* or *implicit*, but both can be explicit except for some parts of *know how*
- context can contain *deep* and/or *surface knowledge*,
- the *contextual knowledge* is loosely task-oriented not reduced to *know how*, because it may contain *deep knowledge*
- the *contextual knowledge* is mainly concerned with this part of knowledge which is useful for describing the nature state preceding decision making or action; as such a given *contextual knowledge* may have several realizations.
- the proceduralization of a *contextual knowledge* piece is a process which may take place in a community of practice and is anyway a mandatory step on the road to action. As such, it has a role in priming action or practice. In some sense, it is the preliminary step for the activation of *knowing how*.
- the *proceduralized context* is task-oriented or/and recognition-primed and subjective like *know how* or *situated knowledge*,
- the link between *proceduralized context* and action is either explicit or implicit (compilation of the *proceduralized context*). As such, the *proceduralized context* is relevant to the so-called externalization process. This externalization process is a more or less a social process.
- whereas the knowledge is fixed, the *proceduralized context* changes during action.

Finally, we do believe that knowledge is a too vague concept to be really operant in the analysis of decision making and of task undertaking. On the contrary, the notion of context which is entirely task oriented offers a shrewder concept to model the relationships between knowledge and action.

5 Conclusion

The *contextual knowledge* is certainly not all the knowledge. The notion of context offers an alternative view to *knowing how* to capture that part of knowledge which is related to decision making and action. *Contextual knowledge* is subjective and yet can be shared by many individuals. One of the main difference between context and knowledge is that context and its proceduralization offer a model to understand the links between decision making and/or action and the backstage knowledge. The notion of context does certainly not explain *know how*, but it help to understand how experienced people with a recognized *know how* adapt their behavior according to the circumstances. In some sense, context is knowledge about the instantiation of *know how*, it is the framework which reveals *know how*.

References

1. Brézillon P. and Pomerol J.-Ch. (1996) Misuse and nonuse of knowledge-based systems: The past experiences revisited. In: *Implementing Systems for Supporting Management Decisions*, Humphreys P. et al. (Eds.), Chapman and Hall, London, 44-60.
2. Nonaka I. and Takeuchi H. (1995) *The Knowledge-Creating Company*. Oxford University Press, New York, NY.
3. Ozturk, P. and Aamodt, A. (1998) A context model for knowledge-intensive case-based reasoning. *Special Issue on Using Context in Applications. International Journal on Human-Computer Studies*, 48(3): 331-355.
4. Pomerol J.-Ch. and Brézillon P. (1999) Dynamics between contextual knowledge and proceduralized context. *Modeling and Using Context (CONTEXT-99)*. In: *Lecture Notes in Artificial Intelligence*, N° 1688, Springer Verlag, 284-295.
5. Tiberghien, G. (1986) Context and cognition: Introduction. *Cahier de Psychologie Cognitive*, 6(2): 105-119.