

“Objectivity” and “Situativity” in Knowledge It Artifacts

Incommensurable but Sensible Dimensions in Different Contexts

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Abstract: The main claim of the paper is that in order to design Knowledge IT Artifacts it is necessary to uncover the Knowledge Artifacts that are currently in use (situativity) and to make the related technology respect the practices around them. The alternative dimension (objectivity) can be leveraged when such KA are not recognizable but in this case the tools characterizing this dimension can be used but with different purposes. This claim is based on a series of empirical studies in real settings that show how the local conditions play a fundamental role in the identification of the requirements of a technology supporting learning and problem solving.

1 INTRODUCTION

Following the framework proposed in (Cabitza and Locoro, 2014) as a results of a survey on the concept of Knowledge Artifact (KA), we adopt the two dimensions, namely “objectivity” (i.e. “the capability of a KA to represent true facts in an objective, crisp, and context-independent manner, as well as the extent it can be transferred among its users as an object carrying some knowledge with itself”), and “situativity” (i.e., “the extent the KA is capable to adapt itself to the context and situation at hand, as well as of the extent it can be appropriated by its users and exploited in a given situation”), to articulate our reflection on the concept of KA and its possible computational counterpart (KITA).

The choice to consider both KA and KITA separately is based on the need to avoid any undue contamination between reflections on an artefact that can exists in a not digitalized form and those on its possible translation in a piece of technology.

We like to start from a question that shows an example of the potential contamination we mentioned above: Can objectivity and situativity be seen as dimensions which can be present at different degrees in each KITA? While a KITA, interpreted as those specific IT artifacts, i.e., applications and software platforms, that specifically support knowledge creation and sharing, might contain objective and situated (to put it shortly) components that can

suitably be present in a comprehensive technology affording a unique interaction point, a KA as a logical construct (possibly reified in a not computational support) can hardly encompass both dimensions: in our opinion they are fundamentally incommensurable but more importantly potentially risky to be mixed without a focused reflection. Unless specified, we will use the acronym KA to refer to a web of artifacts (Bardram and Bossen, 2005) that are somehow interdependent and can be seen as a unique logical construct.

2 KNOWLEDGE AND KNOWLEDGE ARTIFACTS

To support our claim it is worth clarifying what we consider as a KA (as there are many contradictory definitions of this term) before considering its possible computational counterpart. Our position is as follows. First, knowledge belongs to the individuals and cannot be separated from them: it is not and cannot be transformed in an object out there; moreover knowledge has an irreducible social nature since it is the outcome of a social construction (McDermott, 1999; Berger and Luckmann 1967). Then, what is not constructed in this way cannot be considered as knowledge and then be related to the theme of learning (or to use a buzzword, of

Knowledge Management (KM)): what is often, after (Nonaka and Takeuchi, 1995), called explicit knowledge is nothing else than a representation that can be shared only as mutually accessible information (Blackler, 1995; Kakahara and Soerensen, 2002).

On the basis of this premise and in order to make our argumentation coherent, it is necessary to characterize what a KA is since this term has been defined in contradictory ways as aptly discussed in (Cabitza and Locoro, 2014). Moreover, and in accordance with the above premise, this characterization should be rooted in the practices of knowledgeable professionals. On the basis of a number of empirical studies, (Cabitza et al., 2013) discussed the nuanced facets that characterize a KA “in action” and proposed the following definition that we will adopt in our argumentation: a KA is a physical, i.e., material but not necessarily tangible, inscribed artifact that is collaboratively created, maintained and used to support knowledge-oriented social processes (among which knowledge creation and exploitation, collaborative problem solving and decision making) within or across cooperative settings and to support their actions according to its negotiated structure, contingent content and interpreted affordances; moreover, the representation language and the representations shared in such a KA allow for an affordable, continuous and user driven maintenance and evolution of both its structure and content at the appropriate level of underspecification.

The first implication is that it is not sufficient for an artifact to contain some pieces of information that can be related in some way to the (social) construction of a professional knowledge to be a KA. Second, between the two dimensions, situativity is the one that fits the above definition of a KA; objectivity instead is incompatible with this characterization.

The next implication is that to recognize an artifact as a KA it has to be considered from a perspective that considers in an integrated way what it contains and the process that lets the KA survive in the collaborative setting where it plays its role. In accordance with the above characterization of a KA this setting can be naturally related to the notion of CoP (Wenger, 1998) as the effectiveness of a KA is based on a continuous “negotiation of meanings” of its contents: indeed, a KA is a typical part of the “common repertoire” that supports the joint action of the community members; its usefulness and survival in the community depend on the “joint enterprise” and “mutual commitment” that bind the community members. In (Cabitza et al., 2013) examples can be found of CoPs and of the KA they have constructed to support their practices in domains such as the

design of technical products and the hospital care: we will refer to them in a following section.

We note in passing that uncovering “true” CoP is not easy as they often are hidden (purposely or unaware) from the more evident and explicit organization and its operational rules. Too often this notion has been misused by calling any group of professionals a CoP and then by misinterpreting their very nature and drawing undue implications on the supportive technology. In this respect, looking for a KA can be a fruitful way to uncover them, as it is a symptom of a candidate CoP where collaborative learning is at the basis of the common practices. Moreover, according to the situative approach we claim that CoPs cannot be built but are truly emergent structures that can be at most facilitated by favourable individual and organizational conditions (De Michelis, 2012).

To sum up, the two dimensions of situativity and objectivity are incommensurable when knowledge is concerned; consequently, this holds for all the other notions that refer to knowledge in their definition. Then the question is if there is room for the objectivity dimension and under which conditions. Before answering this question, we consider the features of a KITA that translates a KA in a corresponding technology.

3 GENERAL FEATURES OF A KITA

Which are then the characteristics of a KITA supporting the life of a KA within a CoP? primarily, the full respect of the nature of its contents and of the practices around it. This means coping with underspecification and bounded openness, avoiding exogenous models and structures, avoiding undue “optimization” of the way in which a KA is constructed and maintained: in a word, respect the actual users and their practices. These are the outcome of a negotiation process whose effectiveness cannot be overtaken by any external technological and/or organizational intervention. The designer of the technology has to take a humble position and avoid any autonomous interpretation of the given reality. She has to construct a “light” KITA in relation to the typical knowledge management technologies (ontologies, inference rules, sophisticated and exhaustive knowledge representations and related manipulation algorithms); but at the same time deal with a demanding conceptualization of a KITA to seriously respect the

practices of the target CoP (how to support underspecification in an effective way? how to make the KITA flexible enough to support its co-evolution with the related CoP?). The KA actually in use should be a precious and fundamental source of inspiration for such design.

4 RELATING KA AND KITA

We are now in the position to consider the relationship between KA and KITA by illustrating some examples of how the definition of a KA can be instantiated in a real context and how a corresponding technology can be conceived.

The empirical work has shown that different kinds of documental KA. The first kind encompasses artifacts that include self-contained representations. Examples of this kind of KA are the schema that the designers of technical products mentioned above have collaboratively constructed to support their problem solving and re-use of previous solutions. We refer to (Cabitz et al., 2013) for a detailed description; here is sufficient to recall the main tenets underpinning the adopted schemas. Irrespective of the complexity of the related domains (software production and the definition of the composition of the rubber component of a tire, respectively) the designer defined very concise (that is highly underspecified) schemas and used them to discuss new products and to leverage the experience gained in the construction of past solutions. These schemas are made of a very limited number of basic concepts (kinds of software components in one case and ingredients and performances in the other case) and of a limited kind of relations connecting them: for example the kind of dependency among software components or the degree of correlation between the amount of an ingredient in the compound and a specific performance (typically, grip, duration, cost and the like). These highly qualitative and symbolically represented relations were able to evoke in the mind of these professionals the specific knowledge to put to work to transform them in fully specified quantities and solutions. In the case of the design of the chemical compound the formalization of this kind of knowledge in a knowledge base was considered almost useless during the creative phase and was instead appreciated as a sandbox for the purpose of training newcomers. For the designers, the used and useful part of the whole application, that is their KITA, was a light support to share the schemas recording the choices made during each design effort.

Another example of self-contained KA is the

Daily Work Sheet (called “report” in (Munkvold et al., 2007)), an unofficial document where nurses write information (clinical data, examination requests and remarks/observations) that is used by the nurses of the next shift for sake of coordination (which relevant actions have to be done for critical patients) but more importantly contextual information that helps the incoming nurses to interpret the clinical situation they have to manage. These notes are textual, with conventional terms and symbols that make them sufficiently concise and informative. Here the KITA requested by the nurses was a collaborative editing tool that should allow the flexible use of conventional symbols and text structure.

The second kind of KA encompasses artifacts that integrate existing information structures: the latter are typically imposed from the top through various kinds of Information Systems (IS). An example are the various forms of annotation that are widely used in the architectural design (Schmidt and Wagner, 2004) to express hypothetical solutions and links to other documents produced by a CAD system (Figure 1).

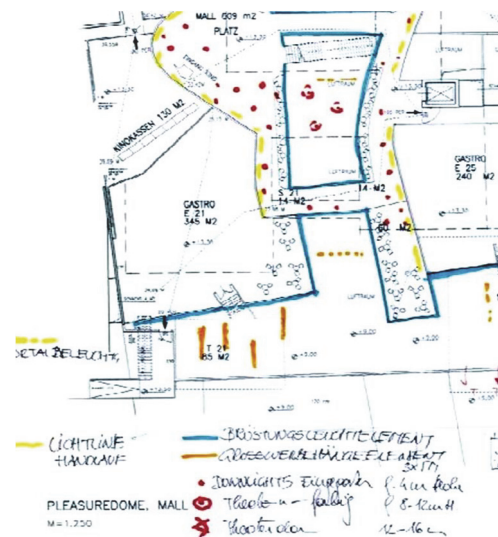


Figure 1: Plan of a floor and its annotations.

An intermediate case is offered by the use of Clinical Pathways (CP), that is representations of clinical care procedures that can be added to the patient folder (EPR) and annotated by the doctors to express the actual execution of the care plan with the critical points and deviations from the standard path. CPs can be defined by the doctors working in a ward (as in (Cabitz et al, 2013), see Figure 2) or by external institutions on the basis of some recognized evidences.

In any case, the endogenous or exogenous representation of the care procedure is augmented

with information that expresses the choices made, the criticalities meet and the workarounds followed during the situated performance of the care procedure and that constitute the inputs of a learning process for whom has access to these pieces of information.

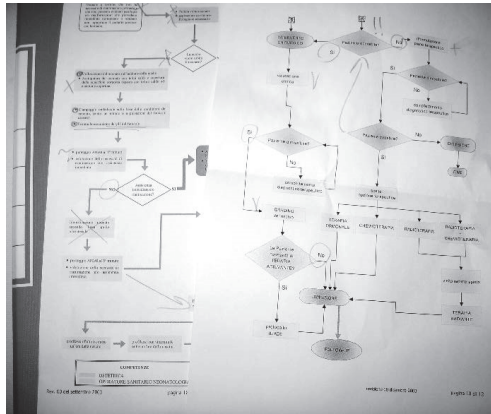


Figure 2: Clinical Pathways and their annotations.

In the last cases the pertinent KITA is an application that offers the affordance of rich and flexible annotation functionalities to enrich those documents with information that contextualizes their contents and that can evoke individual knowledge in the mind of who writes and possibly in whom reads, these annotations (Cabitz et al., 2005). In fact, this contextualization can link annotations with specific steps of the processes where the documents are used or generated; it can convey information about the applicability of some organizational rules and about the workarounds that they generate in a given situation; and so on.

We can generalize the use of flexible annotations by considering them in combination with applications that can be grouped under the umbrella of (computational) supports where documents can be archived, tagged, organized according to a (top-down) strategy that can leave some possibilities to be locally adapted; and where people can upload their documents to be shared with (selected) colleagues and look for and start conversations with them. These are the typical affordances of the Enterprise Social Media (ESM) that are increasingly introduced as light KM tools within organizations. These ESM (or any other technology that shares the same affordances) could be constructed so as to facilitate the creation of a common repertoire by the target group through the introduction of functionalities that support the negotiation of meanings, of which the annotations proposed above are just an example.

The above examples show that the information that collaborative professionals (that are engaged in a

collaborative learning process as part of their activities) use and share can be separated into two categories: the information that they collaboratively construct and is fully under their control, that is what we have characterized as a KA; and the information that is made available to them “from outside”, that is when the rules governing its creation (internal logic) and maintenance (who is in charge of its changes and updates) are defined by people outside the above learning process (e.g., the management or some professionals temporarily playing the role of innovators who propose to modify the KA and the related practices: these changes have still to be appropriated by the other professionals).

In the first case, as already mentioned, the technology should fully respect the situated practices, avoiding any computational mechanisms that introduce any sort of prescription in the aim to guarantee “correct” behaviors and correct the “bad” properties (such as underspecification, redundancy, possible ambiguity). The competent professionals know not only how to leave with them but especially how to leverage them to understand (possibly by additional negotiation of meanings) complex and not yet experienced situations and to collaboratively find the optimal solutions. Instead, when the available information comes “from outside” it has to be interpreted by the collaborative professionals under the affordances and constraints of their current situation. Here the rules governing the creation and the maintenance reflect the logic of who is in control of their definition: the receiving professionals have to decide if they agree to comply with. As the examples show, the KITA in this case should both support the negotiation of meanings of what the given information is about and help creating a connection with the information managed by the component that makes the local KA computational. The above mentioned annotation functionality can be one, but not the only one, typical example of such a support.

5 A ROOM FOR “OBJECTIVITY”

Now, as not all the groups of people interacting to perform some interdependent and/or collaborative actions according to a commonly understood purpose can be considered as a CoP, it is likely that a KA cannot be recognized, and even less can be enforcedly introduced, in all collaborative settings. This does not mean that the involved people are not knowledgeable professionals: they simply did not come to the point to be a CoP and to build their shared repertoire accordingly. The reasons can range

from individual attitudes up to organizational strategies in managing human resources, or any combination of them. Whatever these reasons are, the issue is how to promote and support learning under these conditions to achieve all the typical goals of a KM initiative from the management perspective (reuse, preservation, training of newcomers, and so on) without the possibility to leverage any recognizable KA. This question can be rephrased in terms of the two dimensions we have adopted to organize our reflections: since the situativity dimension, or better yet the related (design) practices hinted above, are not practicable/applicable in this case, can the objective dimension be of some help? and under which conditions?

To answer this question we have to consider the typical conceptual framework and tools that come with the objectivity dimension: the knowledge elicitation and representation methods that a knowledge engineer applies to build a knowledge base and the related inferences to support the knowledgeable activities of a group of professionals and the “sharing of the related knowledge”. Are these framework and tools usable for achieving the above goal? In our opinion, the answer is partially positive as this would require some caveats.

6 A CHANGE OF PERSPECTIVE

We can say that those tools are applicable but the conceptual framework does not. In other words, the traditional goal of this “objectivistic” construction has to be restated and the tools used accordingly. The “objectivistic” conceptual framework is rooted in the belief that it is possible to extract the knowledge from the mind of the professionals in the aim to construct a representation of this knowledge that is as complete and coherent as possible. In case of conflicting contents among the professionals the knowledge engineer has to enforce a mediation through a representation that is not so far from each contributors’ perspective and for this reason can be both accepted by them and serve as the basis for the definition of the rules that would check the correctness of the professionals’ actions/choices and possibly provide them with adequate recommendations.

We submit that the goal should be different: namely, to trigger the professionals’ reflection about their often unaware practices and about the artifacts that they use to support them. The representation of the experiences and practices that each professional reports (typically, some representatives of them) does

not aim to a complete and fully coherent description: under-specification, possible ambiguities and conflicting contents with respect to other colleagues have to be considered not as a fault, rather as an occasion to open a discussion, a confrontation, a negotiation of meanings. In this process, the knowledge engineers offer their investigation and representation tools and capabilities to keep trace of what emerges, to highlight discrepancies and to document them in the representations as a valuable source of information to be shared in the whole group of professionals.

Where does this process lead to? The outcomes can be very different as too many factors (at the individual, group and organization levels) can influence this process. The most favourable outcome is that the group comes to the point to collectively behave as a CoP: it could adopt, amend, negotiate, reformulate the above representations in a collaborative way and these can become part of its shared repertoire and be maintained as such. Otherwise, this process can at least lead to various degrees of mutual awareness about the fact that the individual practices follow different patterns and to different degrees and quality of the communication within the group of professionals about these practices: in any case, a potential mutual learning process can start.

7 CONCLUSIONS

The conceptual separation between a KA and a KITA that can potentially incorporate it allows one to avoid the construction of a KITA without paying attention on what are the implications on the work practices of its users. These implications can encompass the refusal or irrelevant usage of the proposed technology; a low level of the ROI that is anyhow necessary in any KM initiative; the hindering of a virtuous learning process by an inadequate technology; the emergence of even more hidden practices to deal with knowledge creation and diffusion in an organization, that is to go the opposite way with respect the goals of any KM initiative; and most importantly the possible waste of precious resources (the KA and the shared practices around them) that have been produced thanks to an almost voluntary and hidden work of the organization members (Suchman, 1995) to improve the learning and the effectiveness of the problem solving needed to reach the organization mission. In all these situations, the balance is negative for both the organization and its members.

We are aware that knowledge can concern different aspects of the organization life and by consequence it can have different value; moreover that this can influence the organization strategy to “manage” them: often “core knowledge” is the term used to refer to the most valuable knowledge (Blumentritt and Johnston, 1999); consequently the management is likely to invest more to protect, reuse and preserve it. While protection is a serious issue that requires a special attention in case of core knowledge, we do not believe that its preservation and reuse would require heavy weighted and “objective” KM technologies to be supported. The knowledge might regard more complex and crucial phenomena, but its genesis and preservation is likely to follow the same mechanism: in this case the practices of competent professionals will be simply suitable to master this complexity and will be possibly reflected in KA that they might conceive accordingly.

The considerations developed in this paper concern a specific kind of artifacts: the empirical work underpinning them considered various kinds of documental artifacts. On the one hand, documental artifacts are spread in many collaborative settings and are used in many domains; on the other hand, it is likely that other artifacts used to support knowledgeable collaborative actions are of a different nature. A further investigation is required to validate the generalizability of our arguments to these kinds of artifacts: however, we submit that the contents could own different characteristics but the practices around them should be almost of the same nature.

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