Contextualized knowledge management

Brézillon, Patrick – Pomerol, Jean-Charles

LIP6, University Paris 6,
104 avenue du Président Kennedy,
75016, Paris, France)
Patrick.Brezillon@lip6.fr - *Jean-Charles.Pomerol@lip6.fr*

ABSTRACT. The distinction between what is planned and what is done is well known. One contrasts the prescribed task (the task model) to the effective task (the activity model), the logic of functioning to the logic of use, procedures to practices, etc. KM designers claim to address the second ones when they deal only with the first ones because there are as many practices as contexts in which a given procedure must be applied. The large number of effective tasks comes from the multitude of contexts in which one may accomplish the task. We propose a solution, thanks to a uniform representation of elements of reasoning and of contexts, called Contextual Graphs. This formalism allows us to introduce the notion of contextualized task model that is an operational intermediate between task and activity models. Using such a contextualized task model leads to developing more robust procedures as we do it in applications.

KEYWORDS: Context, contextual graphs, prescribed and effective task, procedures and practices, driver modelling

1. Introduction

At the end of their studies at the university, students realize suddenly that they possess a large body of theoretical knowledge but they have never applied it in real-world applications (often internships just allow to realize this gap). They discover that they know what the needed knowledge is, but not how to transform it in operational knowledge for using it. They have not learnt how to develop processes of contextualization to reach their objective with efficiency. They learnt, but they don't learnt how to learn. Here, the key point for an efficient KM is to move from a domain-oriented organization of the knowledge in an experience-oriented organization. The former corresponds to the procedures elaborated by organizations, when the latter emerges from the activities developed by actors accomplishing their tasks in a given situation and at a given moment.

Bazire and Brézillon (2005) discussed the different ingredients to consider in link with the context. As a consequence, practices appear as the result of the contextualization of procedures. Such a view represents an extension of the case-based reasoning because the system would retrieve the past problem and its solution, but also (1) the context of validity of the solution, and (2) the alternatives to the solution that have been abandoned at the time of the building of the past solution because their validity contexts were not similar to the context at hand at that time. The solution to the new problem could be not the past retained solution, but a rejected alternative that is in a context close of the context of the problem at hand. This is generally totally ignored by the KM community. We have established a conceptual framework for our research initiated by a working definition of context (Brézillon and Pomerol, 1999) and the clarification of the relationships between a focus and its context. Then, we have designed a formalism of representation that has been implemented in a piece of software called Contextual Graphs (Brézillon, 2005). The formalism allows a uniform representation of elements of reasoning and of contexts, and a "context-based management of contextualized knowledge". This formalism has been already used in several applications described in different papers.

Leplat (Leplat and Hoc, 1983) pointed out the gap between task and activity. Similar observations were made in other domains to differentiate logic of functioning and logic of use (Richard, 1983), and procedures and practices (Brézillon, 2005). Numerous examples were exhibited to illustrate this gap, some explanations were proposed to explain the gap, but no practical solution was offered to fill this gap, a key point in knowledge management.

This paper proposes an intermediate solution between the task model (prescribed tasks, logic of functioning, procedure) and the activity model (effective tasks, logic of use, practices) called the contextualized task model. The contextualized task model offers a concrete approach of the results in cognitive psychology (concerning the gap between the prescribed and the effective tasks) through the contextual-graphs formalism. First, we recall briefly our conceptual framework and the software that makes it concrete. Second, we discuss the modeling of task and activity models by summing up our previous works and by providing an example in problem solving. Third, we discuss the articulation of the different models, i.e. the task and activity models, and the contextualized task in a real-world application in road safety. This allows us to introduce the interest to distinguish good and bad practices and how to use them in training.

2. A conceptual framework and an implementation

2.1 *The conceptual framework*

In a previous piece of work on incident management for subway lines (Pomerol et al., 2002; Brézillon et al., 2000), we showed that context-based reasoning has two parts: diagnosis and action. The diagnosis part analyzes the situation at hand and its context in order to extract the essential facts for the actions. The actions are undertaken in a predictable order to realize the desired task. Sometimes, actions are undertaken even if the situation is not completely analyzed (or even not analyzed at all). For example, a driver puts a vehicle into gear before any action or situation analysis. Other actions are carried out before the proceduralization of a part of contextual knowledge. Thus, diagnosis and actions constitute a continuous twofold process, not two distinct and successive phases in context-based reasoning. Moreover, actions introduce changes in the situation or in knowledge about the situation, and imply a revision of the diagnosis, and thus of the decision making process itself. As a consequence, a context-based formalism is needed for a uniform representation of diagnosis and actions.

Brézillon and Pomerol (1999) considers that context is "what constrains something without intervening in it explicitly." We now consider the “something” by extension as a focus for an actor. Several elements justify this definition, the three main elements being that (1) context is relative to the focus, (2) the focus evolving, its context evolves too, and (3) context is highly domain-dependent. As a consequence, one cannot speak of context in an abstract way.

Next, the focus allows the division of context into external knowledge and contextual knowledge (Brézillon, 2005). The latter constitutes a kind of container where contextual elements are to some extent related to the focus in a flat way, whereas the former has nothing to do with it at the considered moment. The focus evolves because a new (or unpredicted) event occurs or as a result of a decision made at the previous stage of the focus. Consequently, the notion of context has a dynamical dimension and impacts more on the relationships between knowledge pieces than upon the pieces themselves.

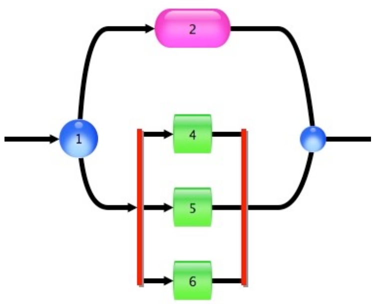
2.2 *Contextual Graphs*

The Contextual-Graphs formalism (Brézillon, 2005) proposes a representation of the combination of diagnosis and actions. (A contextual graph represents a problem solving or at least a step in the process.) Diagnosis is represented by contextual elements. When a contextual node is encountered, an element of the situation is analyzed. The value of the contextual element, its instantiation, is taken into account as long as the situation is under analysis. Afterwards, this instantiation does not matter in the line of reasoning that can be merged again with the other lines of reasoning corresponding to other instantiations of the contextual element. Thus, contextual graphs allow a wide category of diagnosis/action representations for a given problem solving process.

Contextual graphs are acyclic due to the time-directed representation and guarantee algorithm termination. Each contextual graph (and any sub-graph in it) has exactly one root and one end node because the decision making process starts in a state of affairs and ends in another state of affairs (not necessarily with a unique solution on all the paths) and the branches express only different contextually-dependent ways to achieve this goal. This gives the general structure of a spindle to contextual graphs. A path represents a practice developed by an actor, and there are as many paths as practices known by the system.

The elements of a contextual graph are: actions, contextual elements, sub-graphs, activities and parallel action groupings (Brézillon, 2005). An action is the building block of contextual graphs. A contextual element is a pair of nodes, a contextual node and a recombination node; a contextual node has one input and N outputs (branches) corresponding to the N instantiations of the contextual element. The recombination node is [N, 1] and represents the moment at which the instantiation of the contextual element does not matter anymore. Sub-graphs are themselves contextual graphs. They are mainly used for obtaining different displays of the contextual graph by aggregation and expansion, as in Sowa's conceptual graphs (Sowa, 2000). An activity is a sub-graph identified by actors in different contextual graphs. An activity is a kind of complex action that permits interaction among actors at different level of discourse. For example, "Make the train empty of travelers" is considered as a simple action by the responsible of a subway line when it is a complex sub-graph for the train driver that executes this activity.

In the following, we use the syntax defined in Figure 1 for all the figures representing a contextual graph.



1: Contextual element (circles)
branch-1 2: Activity (ovals)
branch-2 3: TB (vertical lines)
branch-1 4: Action
branch-2 5: Action
branch-3 6: Action

Figure 1. *Elements of a contextual graph (TB stands for Temporal Branching).*

3. Modelling of the task and activity models

3.1 *The distance between the task model and the activity model*

Enterprises establish procedures based on their experience in order to guide reasoning in identified situations. Procedures are collections of secure action sequences developed to address a given focus in any case. These procedures are decontextualized in order to cover a large class of similar focuses (generally differing by their contexts of occurrence), such as the procedure that a car driver must follow when arriving at a crossroads, whatever the specificity of the crossroads and the current status of the driver. Such procedures describe the behavior that actors would adopt to address the focus, a kind of theoretical behavior for the actors. We call it the **task model**.

Generally there are different methods for the task realization. For example, there are several ways of traveling from Paris to attend a conference in Copenhagen. One method consists of going by car with colleagues because it is the cheapest way. Another method is to take the train because you have time and would like to take time to produce a bibliography and/or to stop in Kaiserslautern first to visit a friend. A third method is to take a plane. Thus, there are three methods for the task “Attend the conference in Copenhagen.” The task model, which would describe the actions to execute in this task, will retain a relatively high degree of generality (e.g. register, book an hotel, buy your ticket for the journey) and is not concerned with the choice of methods available to realize the task.

Conversely, the **activity model** corresponds to the effective behaviors displayed by actors facing the task at hand (the focus) in a specific context. Differences between the task model and the activity model arise mainly from a difference in the actors' perception due to different backgrounds. For example, everybody uses a refrigerator without difficulty (an activity), but few people are aware of the concepts behind the functioning of a refrigerator (i.e. the second principle of Thermodynamics).

The choice of a method for accomplishing a task depends, on the one hand, on different contextual elements, and, on the other hand, on the values (instantiations) that these contextual elements have when the task must be realized (i.e. in the context at hand). For example, I may pay for my air ticket with an order from my university or with my credit card, depending on what I have in my bank account because I know that my university generally reimburses 3-4 months later (i.e. after the conference, not when I pay, 3 months before the conference). Generally, this level of detail is too fine for a procedure but could be essential for the actor (Brézillon and Brézillon, 2007).

A final difference between task and activity models is when a new situation arises. This supposes the revision of the whole structure within the task model, when in the activity model this necessitates the addition of a few elements such as a new contextual element and a few actions. Thus, the activity model is incrementally enriched, but may move away from the task model. This allows to point out that generally KM is task-based, not activity-based.

We are not concerned here by the theoretical aspects of these notions, only by their use, from a user-centered viewpoint. Thus, an actor never accomplishes a task in isolation but interrelated to other tasks. For example, Brézillon (2007) discusses a diagnosis task on a DVD player that is triggered if a problem occurs when the actor wishes to see a movie. Moreover, there is an intensive use of contextual cues in any task. For example, the movie you wish to see may be on the two sides of the DVD or on several DVD. The author shows that the main difference between task and activity models is a difference of structures. A task model has a parallel structure (as established by the designer in the DVD player example) with exclusive options: the problem is mechanical, power, video or audio. Conversely, the activity model developed by actors has a sequential structure (one first switch on the power to see a DVD, and after one may encounter mechanical problems when we want to introduce the DVD in the player. However, task and activity models are not to be opposed. The task model comes from a top-down approach of the engineer (i.e. a hypothetical-deductive reasoning), but the activity model is transverse to this approach, not bottom-up.

The actor accomplishes a task when he is implied directly, not “offline” as reading a user’s manual. (Moreover, the languages of the logic of functioning (e.g. change of AV) is different of the logic of use: there is a need for a shared context.) Thus the actor has to match the procedure with his problem at hand and has to make compatible two understandings: the manual and the real problem. Actor’s background plays an important role in this process. Actors’ context also is different. For example, the actor will pay attention if his device is under warranty or not. The risk of permanent damage to the device generally stops users from intervening personally, especially if the advice in the manual is written in incomprehensible language.

3.2 *An example*

Tijus and Brézillon (2008) present the example of a simple problem of surface calculus and the different way to reach the solution. The problem is to find the surface of the black part of the rectangle (see Figure 1).

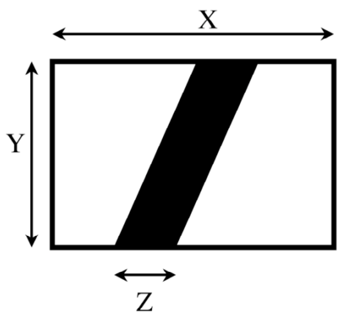


Figure 1. The problem of finding the surface of the black part of the rectangle.

The different ways to solve the problem are presented in Figure 2. The direct solution consists of identifying the black part of the rectangle as a parallelogram and of applying the formula (the task model). Indeed there are three main options: (1) You know the formula for computing the surface of a parallelogram (S = Y • Z); or (2) You mentally put together the two white parts of the rectangles and you compute the difference of the two rectangles; and (3) you find that the initial black part (the parallelogram) can be transformed by constituting a white rectangle, a rectangle that you can compute directly.

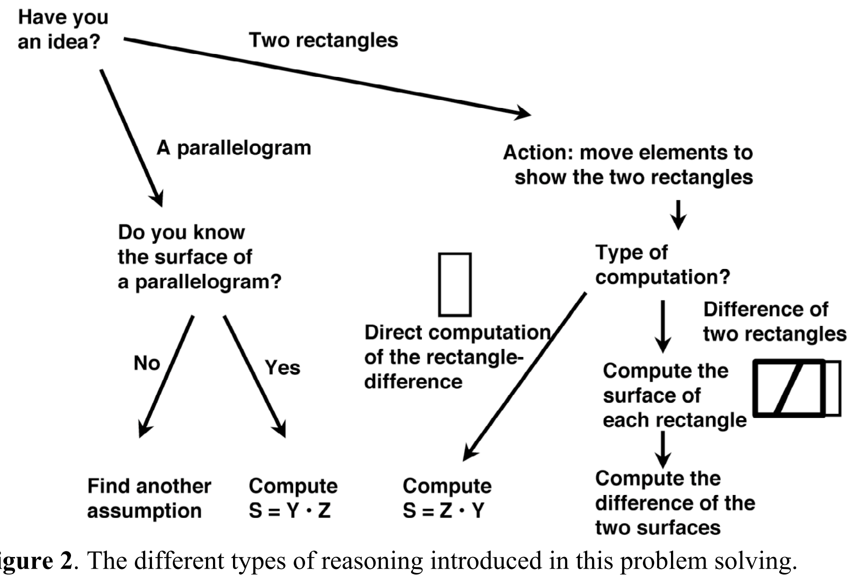
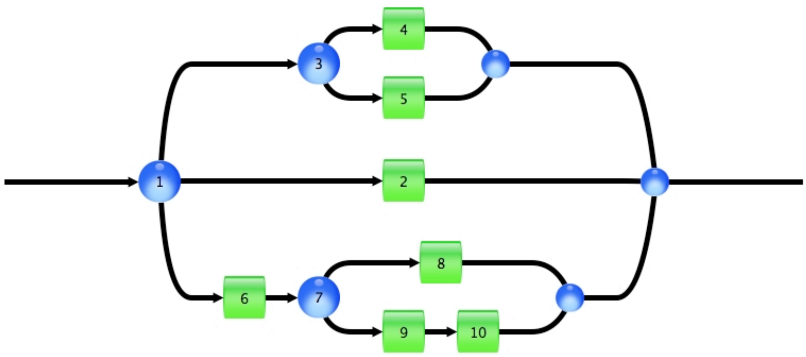


Figure 2. The different types of reasoning introduced in this problem solving.

The problem presented Figure 1 can be analyzed in the following way (see Figure 2). First, the actor identifies the black surface to compute as a parallelogram, and either the actor remembers the formula of the surface of a parallelogram or not. In the latter case, he must find another assumption to compute the black surface from a substitute of the parallelogram. In the former case, the actor just applies his theoretical knowledge. Second, the actor identifies as a substitute to the initial problem (a way simpler for him to compute the black surface than from the parallelogram surface) by considering that the two white parts of the rectangle constitute a smaller rectangle and that the black surface corresponds to the difference of the global rectangle (a second assumption) and, eventually, the difference between the two rectangles is itself a rectangle (a third assumption). Under the second assumption, the actor computes effectively the difference of the two rectangles (theoretically or numerically), while under the third assumption, the actor identifies the new difference between the two rectangles (i.e. the initial black parallelogram) as a rectangle easy to compute. As a side effect, the actor may retrieve the formula of the surface of a parallelogram. The different methods for this problem solving can be represented in a contextual graph (see Figure 3).



1: Have you an idea for computing?

A parallelogram — 3: Do you know the formula?

No — 4: Try another assumption

Yes — 5: Compute S = Y • Z

No — 2: Give no solution and begin with new assumption

From two rectangles — 6: Constitute the broken rectangle

7: Which type of computation?

Direct computation

8: Compute S = Z • Y

By difference of the two rectangles

9: Compute the surface of each rectangle

10: Compute the difference of the two surfaces

Figure 3. Representation of the problem solving in Contextual Graphs.

The interest of this context-based representation comes from the fact that it is possible to enrich the representation solving. For example, the computation of the difference between the two rectangles can lead either to a numerical version of the black surface (the actor computes separately the surface of the two rectangles and then computes numerically the difference) or uses the theoretical expression of the surface of the two rectangles to retrieve, as a result, the surface of the parallelogram.

In the same way, by using the rectangle corresponding to the difference of the two rectangles, the actor can retrieve the fact that a rectangle is a special parallelogram and thus deduce the theoretical surface of a parallelogram. Thus, we could add in Figure 3 just after Action 8 a new contextual element such as “Do you see a relationship between this rectangle-difference and the initial parallelogram?” with a branch “No” with nothing and a branch “Yes” with “the surface of a parallelogram can be computed as those of a rectangle.”

This example shows that the knowledge used in a problem solving relies heavily on the mental representation that the actor has of the problem solving. This knowledge is highly contextualized. The task model would lead to apply the formula for computing the surface of a parallelogram. The activity model offers a larger spectrum of methods for problem solving. Among the new ways captured by an activity model, note that there is a practice where the solution is given without knowing the task model (i.e. by computation of the difference of two rectangles that is radically different of the formula of the parallelogram surface. In some sense, the activity model covers all actors from the expert to the novice, with different graduation between them. As a side effect, the actor can benefit of this problem solving to learn new ways or to retrieve the known but forgotten formula for the surface of a parallelogram. The activity model allows the generation of richer explanations, while the exact solution (the surface of a parallelogram) appears as a kind of minimal explanation.

A representation such as Contextual Graphs opens the door to a new type of KM in which , in the one hand, the knowledge is captured with its context of validity, and, in the other hand, the KM can be itself as a process of contextualization.

3.3 *Lessons learned*

The paradigm “Divide to conquer” is not applied in the same way in the task model and in the activity model. In the former, the problem is divided up according to its nature, i.e. domain knowledge (there is a formula for computing the surface of a parallelogram, the causes of a mechanical problem and of an audio problem are exclusive). In the latter, the problem is considered chronologically along the normal temporal sequence of actions to be carried out in the task at hand (one first switches on the TV and then the DVD player and implicitly one checks whether there is a power supply problem). In the latter situation, actors may also use substitutes to accomplish with efficiency their activity. By some ways, the task model is goal-based while the activity model is task-based (Gonzalez and Brézillon, 2008).

When an actor has to understand a document (e.g. a user’s manual) written for a large audience, he must face a shared language between engineers and users that is very limited, especially in technical domains. For example, AV1 (audio-video channel 1) and V-SELECT do not belong to the users’ language. This is an argument for users to take the DVD player directly to the repairer. Indeed, technical terms are introduced in the rest of the manual and supposed to be shared by the engineer and users, when users read separately (1) the manual for the installation of the device and to learn about its functioning, and (2) the part of the manual concerning troubleshooting on a different day, when it is needed. Moreover, users do not need an extensive knowledge of mechanics, video, etc. to see a movie on a DVD. This is a striking gap between the two viewpoints.

All the examples, which have been developed in Contextual Graphs, allow to understand quantitatively the differences between a task model and an activity model (see Brézillon, 2007, for details). First, there is a difference of structures, parallel in the prescribed task and sequential in the effective task. Second, a human actor accomplishes a task (i.e. realizes an activity) with respect to an objective at a upper level. Here, the objective of the actor is to see a movie on a DVD, and the task of diagnosis is embedded in this task, when the designer imagine all the alternatives at the same level, in an abstract way.

4. Assembling the different models

In this section we go one step further. We have pointed out the differences between the task model and the activity model, show that Contextual Graphs allow to represent all the activities developed for a problem solving. Here, we show that it is possible to use good practices as well as bad practices in order to train actors not only on how to do but also on how to correct with detailed explanations a bad behavior. We present this aspect of our study on a real-world application in road safety in which we are designing a system for modeling drivers' behaviors and proposing a support to self-training of drivers.

4.1 *Example of a T-intersection crossroad*

Consider the following crossroad with a T-structure (Figure 4) presented in (Brézillon and Brézillon, 2008). The situation concerns two cars, a black car (called here car-A with driver-A) going straight ahead and a white car (called here car-B with driver-B) at a "Give way" sign on a right-hand road. The study is lead according to the viewpoint of the driver-A (and not from the "external" viewpoint of an observer), and thus with his partial viewpoint. Driver-A is supposed to stay on the same road, and arriving at the T-intersection, he knows that he has priority on any car coming eventually from the right road. Thus, the procedure (i.e. the task model discussed previously) given by the Highway Code is summed up by a unique action: "You have priority, you can cross the T-intersection". Note that this task model is opposed to the most usual task model "Let the priority to cars coming from the right."

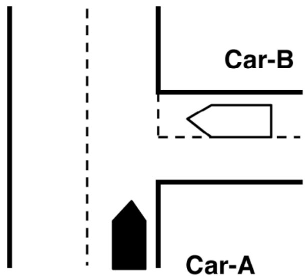
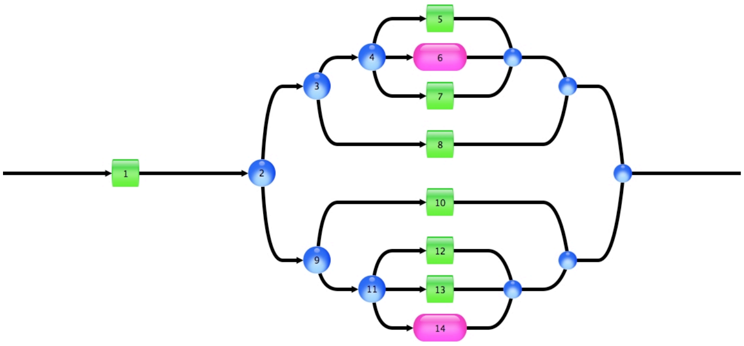


Figure 4. *A T-intersection situation*

Now, driver-A can be any individual, some will look anyway on the right with the strong impact in his mental representation of the rule “I must let priority to cars coming from right”, even if knowing that this procedure is inhibited by the fact that driver-B has a “give way.” (We can observe such an automatism when an European pedestrian must cross a street in London. Even with a sign on the pavement as “Look right”, we automatically look at the left side.)

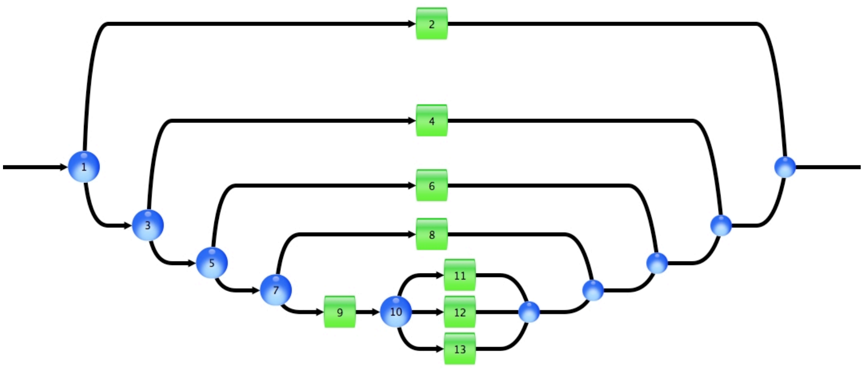


(a) 1: Arrive to a T-intersection with the priority
(b) 2: Look at right?
(c) Yes 3: Is there a car at right?
(d) Yes 4: Pay attention to Car-B?
(e) No 5: Cross the T- intersection
(f) Yes 6: Activity « Car-B Management »
(g) Stop 7: Brake strongly
(h) No 8: Cross the T- intersection
(i) No 9: Is it a normal situation?
(j) No 11: What is your decision?
(k) Stop 12: Brake strongly
(l) Keep priority 13: Cross the T- intersection
(m) Take care 14: Activity « Car-B Management »
(n) Yes 10: Cross the T- intersection

Figure 5. *Contextual graph of the T-intersection situation solving*

Figure 5 presents different possible behaviors of driver-A. Normal behaviors conclude on the procedure “Cross the T-intersection” (e.g. lines e and h but not line l) but there are some abnormal behaviors. For example, line (g) driver-A brakes when he has the priority. One reason could be that driver-A does not pay enough attention to the situation, and a strong automatism “Let priority to cars coming from the right” is responsible of this decision. Abnormal behaviors can correspond to “bad behaviors” of Driver-A depending on the context. For example, maintaining his priority (line e) when car-B is moving could lead to a critical situation. It is interesting also to note that a decision can be “good” or “bad” according to the context. For example, braking strongly line (g) can be dangerous because the car behind may have a different interpretation (I follow car-A that would cross), when braking strongly line (k) could be a safe decision.

The two ovals 6 and 14 in Figure 5 represent the activity “Car-B management” that is detailed in Figure 6. Its activation corresponds to a good behaviour of driver-A. Figure 6 presents different interpretations of driver-A on the driver-B’s behaviour (but we will not discuss more on this part in this paper). Note that it is the explanation given by driver-A on what may happen to the car-B. There are different reasons for a movement of the car-B, normal reasons (e.g. the car-B is just arriving to the intersection and its driver is braking to stop at the level of the road sign “Give way”) and abnormal reasons (and thus critical situations) like driver-B thinks to have time to act before the coming of car-A.



1: Status of car-B?
Stopped 2: Cross the T-intersection
Moving 3: Type of moving?
Reducing speed 4: Cross the T- intersection
Accelerating 5: Is braking sufficient?
Yes 6: Brake, stop and let car-B decide
No 7: Where is going car-B?
on my way 8: Reduce collision effect
on the opposite way
9: Car-B cross my roa
10: Overtaking car-B?
Before 11: Overtake on the left

No way 12: Reduce collision
After 13: Overtake behind Car-B

Figure 6. *Details of the activity "Car-B management" in Figure5.*

The different practices described in Figures 5 and 6 could be enriched by introducing additional contextual elements concerning more specifically the driver: "Do you think that Driver-B has seen you?", "Are you in a hurry?", "Do you take usually risks?", "Do you try to impress the other to going first?", "How do you behave if Driver-B is a woman?", etc. This could be done incrementally, the system acquiring new contextual elements and learning new practices. For example, it is possible to add before Action 4 in Figure 6 "Does driver-B look at me?" with possible instantiations "Yes" and the action 4 (i.e. thus he is stopping and I go) and "No" with a new action "Brake now" (i.e. he has not seen me and is ready to cross because he reduces speed to turn). A contextual graph is thus a real base of experience on a specific topic and all the known ways to address this topic. Moreover, a contextual graph may represent good practices as well as bad practices. This is the key point for humans training after.

4.2 *Identification of good and bad behaviors*

We now analyze the different solutions obtained for the problem described in Figure 5 (Crossing a T-intersection with the priority). Table 1 considers again the explanation of the different paths, and we analyze the driver-A behaviour in term of severity, from normal (*) to very dangerous (***).

Line	Legend of items on the Figure 9	Severity
(a)	1: Arrive to a T-intersection with the priority	
(b)	2: Look at right?	*
(c)	Yes 3: Is there a car at right?	
(d)	Yes 4: Pay attention to Car-B?	*
(e)	No 5: Cross the T-intersection	**
(f)	Yes 6: Activity « Car-B Management »	*
(g)	Stop 7: Brake strongly	***
(h)	No 8: Cross the T-intersection	*
(i)	No 9: Is it a normal situation?	**
(j)	Yes 10: Cross the T-intersection	
(k)	No 11: What is your decision?	**
(l)	Stop 12: Brake strongly	***
(m)	Keep priority 13: Cross the T-intersection	*
(n)	Take care 14: Activity « Car-B Management »	**

Table 1. Establishment of the contextualized task model "Crossing a T-intersection" with a degree of severity of the driver-A's behavior for critical variants of the situation (between correct with one star to very dangerous with 3 stars)

We consider different lines of interest (the main practices of driver-A).

Line (e): Driver-A looks at right, sees car-B but does not pay attention to car-B.
Driver-A has the priority. However, it is important to stay vigilant because a problem with car-B is always possible. This is a “bad” behavior generally not dangerous.

Line (f): Driver-A looks at right, sees car-B, pay attention to car-B and take care of car-B.
Driver-A has the priority but stays vigilant about car-B in order to adapt to an eventual unpredicted event. This is a “good” behavior.

Line (g): Driver-A looks at right, sees car-B, but does not interpret correctly the situation
Driver-A either is not confident in driver-B or confuse on who has the priority. Moreover, mental representation of driver-A of the situation does not include the possibility of a car behind him and the risk to brake suddenly without reason for the follower. This “bad” behavior is dangerous because driver-B does not take enough contextual elements into account.

Line (i): Driver-A looks at right, sees no car-B.
Driver-A has the priority and checks that he can cross safely. This is a “good” behavior.

Line (j): Driver-A does not look at right and will cross the intersection with a very reduced mental representation of the situation.
Driver-A applies strictly his priority and clearly acts based on incomplete knowledge about the situation. This could be justified if there is no car-B (and thus be a non dangerous bad behavior) because no critical situation will arrive. An exercise to help driver-A to correct such a behavior would be to introduce an unpredicted event, because then (see line j) the bad behavior will become dangerous (line l) or conclude on another bad behavior like to brake strongly (line k). Only the management of information related to car-B (line m) could reduce risks, if not too late.

We can sum up the different solution on Figure 7.

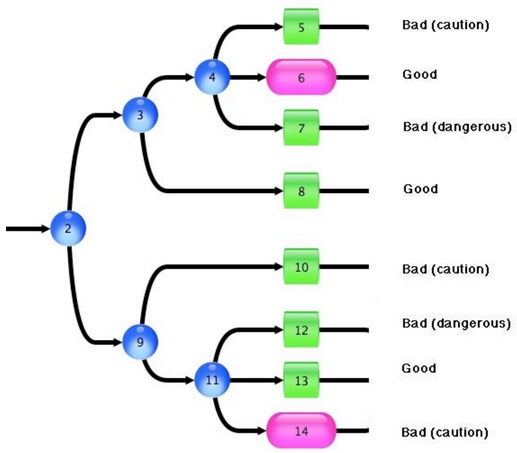


Figure 7. *A contextualized task model with the different types of behavior.*

A given action or activity may be normal (safe) or dangerous according to the context (see activity "Car-B management" numbered 6 and 14). Beyond the expected behaviour deduced from the law texts (Here, "You have priority"), the **contextualized task model**, on the one hand, allows (1) to exhibit different behaviours according to the fact that there is or not a car-B, (2) to prevent some reactions of drivers, (3) to distinguish good and bad behaviours of a driver, and (4) to help a driver to understand why his behaviour is bad and how to correct it (e.g. by focusing more on the instantiation of some contextual elements). Thus, a contextualized task model can be used either directly by drivers for self-training purposes because the driver can know what is his mistake and how to correct it, or indirectly by an intelligent assistant system for generating the dressing of situation where some bad behaviour may appear and the corresponding scenario for training purpose to drivers (Brézillon and Brézillon, 2007).

4.3 *A contextualized task model*

It seems to have a general rule to design and develop contextualized task models. An important reason depends on the nature (more or less) formal of the domain. In the last five years, contextual graphs have been used in several applications.

In the application "Buy a Ticket for the subway in Paris", we studied more specifically the identification of practices in the task model from the knowledge that users had of the subway (ranging from an American boy leaving his country and coming to Paris for the first time, to an experienced user living and working in Paris). Here the task model is known exhaustively (from the Web site of the company, http://www.ratp.fr), and we hoped that the activity model was totally included in the task model. We nevertheless discovered that, even if the activity model was built with the same elements of the task model, users organized differently the "building blocks" of the task model and eventually added new irrelevant ones (a young American student was looking for a taxi to go to the subway station ignoring that the distance between two stations is less than 500 meters).

Another application focused on the different ways a user can make use of the contents of a web page (Brézillon, 2005). The focus here was on the activity model, not on the task model. The reason was that users' objectives for information retrieval were beyond the simple task model, which could be summed up as (a) click on the link, (b) look for the keywords, and (c) copy the interesting part. Depending on what the user wants to do with the information, the user can copy just the text, a figure, or the entire page if he/she does not currently have the time to read the web page. In a similar way as for the first application, the task model can only be built a posteriori, from the activity model.

An application was developed as part of a national project with seven partners in order to identify how it was possible to improve web sites presenting French scientific and technical culture on museum web sites (WebCSTI, 2005). In this application, we entered the domain of engineering, as we did for the second application above, a domain where first the task model can be described in a relatively exhaustive way (the goal was to identify all the paths from the home page to the page where the answer to a question was found), and second the activity model can be identified as a sub-model of the task model (other findings from this study will be discussed elsewhere).

5. Conclusion and Perspectives

A contextual graph represents the different methods by which a task can be realized. Contextual Graphs is clearly an important tool for a KM methodology that has been up to an implementation in a software. This software is used directly by end-users and not by a third part generally not aware of the subtlety of the domain. We have shown that each application leads to special aspects in knowledge representation (the level of detail), man-machine interaction (the need to make different viewpoints compatible), and we have shown the central role played by the human actor, especially when the actor interacts with a system. Other aspects are for future studies.

At a political level, the question is "Can we say everything in an activity model when actors know that the Head of the company does not permit certain actions (e.g. for safety reasons, the subway employee must switch off the power before going onto the tracks. For personal reasons, the employee does not do it to avoid writing an incident report.)

This series of lessons learned from the use of contextual graphs as a uniform representation of elements of reasoning and contexts must be situated within the second part of our work concerning context as an interface to tailor domain knowledge for a given focus. This second part of the work is presented in (Brézillon and Brézillon, 2007) within the framework of the "situation dressing" of a crossroad. Here the link is that we need to consider contextual elements and their instantiations, and then we have to deal with integrity constraints (e.g. at night there is no sun) and with inference rules describing the prescribed behaviour of actors in the specific context (provided by instantiations) of the situation. The set of inference rules is certainly related to what is called the task model.

This paper gives a new vision of the classical dichotomy "task versus activity." We have shown that the contextualized task model leads to a more realistic approach than the task model. The contextualized task model relies on the contextualized situation, not an abstracted situation alone. This is important, for example, in terms of drivers' behaviours because if the Highway Code addresses the situation, the contextualized task model that arises is able to adapt to a larger spectrum of contextualized situations and include bad and good behaviours. Thus, the driver will learn more easily a set of operational rules instead of a general rule. In other words, our approach is a means for users to develop an efficient activity model instead of a task model (i.e. a theoretical model). It is more important to learn how to use a rule rather than just to learn the rule.

Acknowledgments. The work presented in this paper is ascribed in the ACC project, which is supported by PREDIT and the French Ministry of Transport, mainly in terms of the funding of a Ph.D. Thesis.

References

Bazire, M. and Brézillon, P., Understanding context before to use it. Modeling and Using Context (CONTEXT-05), A. Dey, B.Kokinov, D.Leake, R.Turner (Eds.), Springer Verlag, LNCS 3554, pp. 29-40, 2005.

Brézillon, P., Task-realization models in Contextual Graphs. Modeling and Using Context (CONTEXT-05), A. Dey, B.Kokinov, D.Leake, R.Turner (Eds.), Springer Verlag, LNCS 3554, pp. 55-68, 2005.

Brézillon, P., Role of context in social networks. Proceeding of the 18th International FLAIRS Conference, Invited Special Track "AI for Social Networks, Social Networks in AI", AAAI CD Rom, pp. 20-25, 2005b.

Brézillon, P., Context modeling: Task model and model of practices. Proceedings of the 5^{th} International and Interdisciplinary Conference on Modeling and Using Context, CONTEXT-07 (2007).

Brézillon, P. and Brézillon, J. (2008) Contextualized task modeling. Revue d'Intelligence Artificielle, (To appear).

Brézillon, J. and Brézillon, P., Context modeling: Context as a dressing of a focus. Proceedings of the 5th International and Interdisciplinary Conference on Modeling and Using Context, CONTEXT-07, 2007.

Brézillon P. and Pomerol J-Ch., Contextual knowledge sharing and cooperation in intelligent assistant systems. Le Travail Humain, 62(3): 223-246, 1999.

Brézillon, P, Cavalcanti, M., Naveiro, R. and Pomerol, J.-Ch., SART: An intelligent assistant for subway control. Pesquisa Operacional, Brazilian Operations Research Society, 20(2): 247-268, 2000.

Della Noce, M.: Report for the examination of the course "Management of Contexts";, Promotion, 2007.

Gonzalez, A.J. and Brézillon, P.: Integrating two context-based formalisms for improved representation of human tactical behavior. The Knowledge Engineering Review, 23(2): 1-21, 2008.

Leplat, J., Hoc, J.M., "Tâche et activité dans l'analyse psychologique des situations", *Cahiers de Psychologie Cognitive*, 3, 49-63, 1983.

Pomerol, J.-Ch., Brézillon, P. and Pasquier, L., Operational knowledge representation for practical decision making. Journal of Management Information Systems, 18(4): 101-116, 2002.

Richard, 1983 Richard, J.F., Logique du fonctionnement et logique de l'utilisation. Rapport de Recherche INRIA no 202, 1983.

Scott, Owner's manual. Lecteur plt de DVD/VCD/MP3/CD, Model N° DSX510, 2005.

Shefferd, A., Hierarchical Task Analysis. London: Taylor & Francis, 2001.

Sowa, J.F., Knowledge Representation: Logical, Philosophical, and Computational Foundations. Brooks Cole Publishing Co., Pacific Grove, CA, 2000.

Tijus, C. and Brézillon, P.: A contextual approach for a fake-centered rationality. Proceedings of the Third International and Interdisciplinary Conference on Human Centered Processes (HCP-08), Delft, The Netherlands, June 8-12, 2008, Telecom Bretagne Publishers, ISBN: 978-2-908849-22-6, pp. 199-212, 2008.

Wang, X.: Report for the validation of the course "Management of contexts", Promotion 2007.

WebCSTI (2005) Rapport d'avancement des Travaux Lutin.

http://www.lutin.utc.fr/pdf/rapport_intermediaire_WebCSTI_Oct_2005.pdf