Towards the Narrative Approach to Collect Group Knowledge and Context

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Abstract. Reusing knowledge within an organization is still a challenge in the Knowledge Management area. The context of use is as important as the knowledge itself, since knowledge cannot be separated from its use in practice. We suggest that the group storytelling technique supported by a groupware tool can help the elicitation of a shared context. Our goal is to discuss how a group storytelling tool can help the externalization of the contextual information behind the scenes of a story told by a group, making it easier to understand, interpret, and mainly to reuse the knowledge and context intrinsic to it.

1. Introduction

Most part of an organization's knowledge relies in people's mind, previous experiences and background, and offers many challenges to be represented and stored in order to be learned, reused and applied in similar situations, besides helping on the decision process. Contributing with eliciting and using knowledge is a communication process among organization's members. As a communication process, the transfer of knowledge among actors can only be effective if there is a common interpretive focus and context where they can understand each other and communicate.

A professional can not use the knowledge that exists in the organization if he is not able to understand the context, the environment, and the conditions that surrounded that knowledge when it was produced and under what conditions it might be reused. Conversely, one can attempt to reuse incorrectly the knowledge if its context is not conveniently explained. Yet, knowledge intensive working processes are intrinsically produced by collaborative efforts. Thus, context plays an important role in collaboration, especially on what is concerned to facilitate communication, interaction and knowledge sharing (Brézillon 1999).

Providing supporting methods and tools for groups to capture, explicit and understand the real context of past activities will also help them better understand the situation they could be facing at moment. This impacts the group productivity, satisfaction, knowledge management and, finally, learning within the organization. However, extracting contextual knowledge from teams and making it explicit is not an easy task.

Storytelling has been studied in a number of disciplines, including linguistics, sociolinguistics, anthropology, sociology, management science, psychology, education and artificial intelligence. This technique is commonly used to elicit and communicate knowledge and also to stimulate learning. Group storytelling has been recently proposed within the Computer-Supported Cooperative Work field (Perret et al. 2004; Schäfer et al. 2004; Fraser at al. 2003). It is a collective activity of sense-building, with many individuals contributing with their own recollections and interpretations about shared experiences.

In this paper, we argue that group storytelling technique allied with a groupware tool can help the eliciting and building of a shared context. Our goal is to discuss how a groupware, specifically a group storytelling tool, can provide support to the externalization of the contextual information behind the scenes of a story told by a group, making it easier to understand, interpret and also to reuse the knowledge intrinsic to it.

The organization of this paper is as follows. Section 2 tells the importance of contextual information for sharing knowledge in group work. Section 3 presents the research about group storytelling and how it has been applied to elicit knowledge. Section 4 reports TELLSTORY, a groupware aiming at supporting group storytelling and the way it deals with context. Finally, Section 5 concludes the paper and discusses the next steps.

2. A View on Context in Group Work

In the real world, context is a complex description of the knowledge shared on physical, social, historical and other circumstances where actions or events happen. All this knowledge is not a part of the actions to execute or the events that occur, but will constrain the execution of an action or event interpretation (Brézillon 2003). For the total understanding of several actions and events, it is necessary to have access to important contextual information.

2.1. Types of knowledge

At a given step of a task performing or decision making, context is the sum of all the knowledge possessed by an actor on the whole task. Brézillon and Pomerol (1999) distinguish between the part of the context, which is relevant for the current focus of attention, and the part, which is not relevant. The latter part is called *external knowledge*. The former is called *contextual knowledge* because it has strong connections with the current focus although not directly considered in it.

Contextual knowledge is evoked by situations and events, determined by the actor's focus. Always at a given focus, part of the contextual knowledge is proceduralized. This *proceduralized context* is a part of the contextual knowledge, which is invoked, organized, structured and situated according to the focus and used in the task step which is in this focus.

Context is relative to a focus of attention, indeed, the focus and its context are intertwined. The focus determines what must be in its context, and the context, on its side, constrains the focus. For example, when telling an event occurred during the developing of a project in an organization, a professional might say "we used the method X to build the solution for the problem Y". The focus was building the solution for the problem Y applying the method X. Nevertheless, the context related to that event (not explicated in the sentence) was: one of team members was a specialist on method X; methods W and Z were tried before but did not succeeded; and, the supporting tool for method X had been recently bought by the company. The contextual knowledge, proceduralized at the time the focus arose can now explain it.

2.2. Sharing context associated with the focus

Context is essential to an effective communication and collaborative interaction. It can be considered as a shared knowledge space that is explored and exploited by a participant in the interaction. Contextual knowledge acts as a filter that defines, at a given time, what

knowledge pieces must be taken into account (explicit knowledge) from those that are not necessary or already shared (implicit knowledge).

The proceduralized context contains all the pieces of knowledge that have been discussed and accepted (or at least made compatible) by all the agents. These pieces of proceduralized context then become part of the shared contextual knowledge of each agent, even if they do not remain within the focus of the proceduralized context as shown in Figure 1.
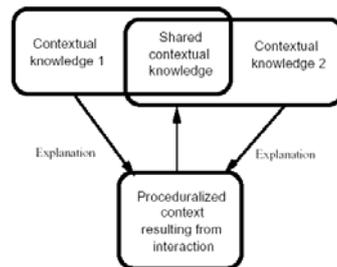
Figure 1 Building shared contextual knowledge

We imagine easily that there can be as many contexts as there are situations in the world. We argue that in a collaborative interaction where participants aim at sharing knowledge, they must also share their contexts. That is what Brézillon calls *explanation* in the context of the interaction among a user and a system in a decision-making process (Brézillon 2003); and the groupware research area calls *awareness*(Dourish and Belloti 1992).

People share knowledge and build a collective context while working together in a task or in a project. We observe that many times the shared context among actors remained tacit, not registered, and consequently difficult to be explained, understood and communicated. Eliciting and re-building shared context is not an easy task, being one of the challenges of Knowledge Management area (Raybourn 2003). We claim that the group storytelling technique could be used for this purpose.

3. Group Storytelling

A story can be defined as "a narrative of an event chain told or written in prose or verse", while the word narrative comes from the Latin *narrere* that means "to pass knowledge" (Valle et al. 2003). A story "lives by itself", while the narrative of a story is composed of all facts explicitly told. Therefore, the narrative of a story is a mechanism of knowledge transmission and sharing.

3.1. Stories and knowledge

Events illustrate parts of a story and many times can be presented alone. However, a story is not a just collection of isolated events, instead it embodies many elements, named context that links these facts transmitting to the listener or reader a meaningful body of knowledge. We can make a parallel with the definition of data, information and knowledge used in Computer Science.

Data are symbols perceived by a subject whether already structured either by the perception device or by the machine which conveys them. From data emerges information which is

data with a strong semantic content. Facts can be compared with data and information, since they identify and register the isolated portions of a subject from a story.

Knowledge is information incorporated in an agent's reasoning and made ready either for active use within a decision process or for action. It is the output of a learning process. Thus, the roles of knowledge are to transform data into information, derive new information from existing ones, and acquire new knowledge pieces. Events are framed by *context* including politics, economy, sociology, art and literature, and also, personal interpretation, background and culture. Just as knowledge, stories draw meanings from their contextual information (Shen et al. 2002).

3.2. Storytelling: goals and typology

Telling stories is as old as the human being history and has been used as an important technique of knowledge propagation (Scholes and Kellogg 2003). Organizations, families, institutions evolve a shared culture and history. Groups can use digital recordings to communicate stories from generation to generation, help new members to integrate into the organization and enhance the sense of culture and community within the organization (Shen et al. 2002). While stories can be considered a nice way to report past experiences, it can also be an essential part of the organization memory.

Since people like to read and hear stories, the storytelling practice works attractively over the members of the institution in the organizational memory construction. The stories have the capacity to build the collective memory of communities, to facilitate the communication, to accelerate organizational changes, to stimulate the innovation and to transmit knowledge. Mateas and Sengers (1999) argue that narrative is a fundamental organizing principle of human experience. It is an old human ability applied to a new context: knowledge management.

The stories help to humanize the environment, and since the narratives involve emotions, thus they also provoke the personal commitment and stimulate the externalization (Lelic 2001). Besides, telling a story is also a way to explain things informally, because of the needs for contextual cues to underline, as for example, to explain how to ride a bike. This is usually called tacit knowledge.

Thomas and Kellogg (2001) claim that storytelling is useful in creating, capturing, disseminating and internalizing knowledge and that it accomplishes all of these simultaneously, not sequentially. According to these authors, "storytelling is also a representative knowledge socialization process that includes both instrumental and expressive aspects". Thus, there are many uses of stories and storytelling in business.

Different types of stories can be identified and classified related to time (past, present or future), genre (real or fictitious) and number of tellers (mono-teller or multi-teller) issues. For example, one person alone can tell a fictitious story that happens in the future time, or a family can tell the story about a real trip they made two months ago. There will be certainly different styles of speech, depending on the type of the story and on who the teller (s) is.

An individual or a group can tell a story. In the first case, one single person is responsible for the narrative of the story, although he can use collecting methods to discover or invent the story facts. In the later case, members of a team, distributed or in the same place, contribute to create a story, synchronously or asynchronously (Valle et al. 2003), jumping in with additions, questions, corrections, comments, protests, etc. (Lawrence and Thomas 1999). A negotiation process among the members of the group will generally take place.

Providing the context of a claim could help other members to accept the claim and a change in the collective story, or to reject the claim in an augmented way.

In this research, we are interested in providing support to teams to tell real stories experienced by them, discussing the facts, expressing their perspectives about the performance of a collective task done, decisions made, solutions developed according to some reasoning, and thus, capturing, making explicit and registering a shared context.

3.3. Storytelling: methods and tools

The popularity and the importance of the stories for the individuals have turned the storytelling a technique studied and applied in many fields and for various purposes such as education and learning, knowledge management in business, linguistics studies, artificial intelligence and investigative activities. Methods and techniques have been developed to support the stories capturing, registering and retrieving.

Researchers on Artificial Intelligence, specifically in Narrative Intelligence (Mateas and Sengers 1999), develop systems in which a large number of stories are stored and indexed using complex indexing schemes in order to match input stories with other stories which are similar in a way that is relevant to the domain. Schank (1999) has built a training system that contained a database of stories describing how people have handled commonly occurring problem situations; these stories were triggered by the system when the trainee faces a similar situation. In intelligent systems, the approach is single human users interacting and being helped by computing agents to build the stories.

In Education, storytelling has been largely used to foster creativity and develop expression in diverse languages. Collaborative technologies and interfaces allow apprentices, mainly children, to collectively build stories sustained by constructivist theories (Guerrero et al. 2003; Staton et al. 2001). For example, in the *NICE* project (Roussou 2001), an educational Virtual Reality environment, children could collaboratively plant a garden and construct stories about their activities. Intelligent agents were conceived to act as mentor, by helping the students to complete tasks, as well as characters to progress a story. Such methods and tools are mainly designed for young children.

Most storytelling approaches used in business is based on individual interviews made by a professional storyteller, who synthesizes the events collected and writes his own interpretation into a single text (Kleiner and Roth 1997). In this case, the story represents fractions perceived by each individual and joined in accordance to the viewpoint of the teller.

Nevertheless, real stories in organizations are generally experienced by teams. In this context, some authors propose the group storytelling technique (Perret et al. 2004; Schäfer et al. 2004; Fraser at al. 2003). The group storytelling is a more appropriate method than the individual storytelling when there are several people involved in the scenario that is being constructed. The group will build collectively a story about a work performed or a situation experienced by its members. Since each participant performed a role in the scenario, stories written by a team will probably contain more valuable details and everybody has the opportunity to present their viewpoint on what had happened.

A few applications have been proposed to support group storytelling. One example is presented by Shen et al. (2002). The PDH prototype was designed as a single-display multi-user piece of furniture containing a circular tabletop display. The story is built through the construction and layout of hierarchical groupings of documents. The documents are

positioned using a polar coordinate system, and users can re-orient individual documents or rotate the entire display.

All the approaches based on storytelling consider and mention the contextual elements as fundamental pieces, but none of them are specifically concerned about capturing the shared context from a group. In the next section, we establish the relationship between the concept of context and group storytelling.

3.4. Stories and their context

In group storytelling activity, the focus is the purpose of the story told by group. If it is a real past story, participants should express their memories about the events that were experienced by all of them. Theses events or facts constitute pieces of knowledge that should be tied together, making explicit the relationships (e.g. causal or temporal) among them, to build the body of the story.

According to Meech (1999), narrative and contextualization share many attributes. They are both active processes, and they may be composed of several different elements. Narrative is seen as a representation (Story) and the presentation of the story (Discourse). The discourse essentially becomes the rendering of the story onto some form of media. The Story, in turn, is divided into Events and Entities. Each of these elements can then be examined in terms of the contextualization it can provide.

Each event told is embedded by contextual information. The meaning of a sentence (event) is not determinable in isolation; but requires relating the sentence to sentences around it, to prior experiences, and to some larger context. In a formal way one transmits the focus in a de-contextualized way, when in a storytelling, one tries to transmit simultaneously the focus and its context as a whole.

For example, character is viewed as an important element of storytelling, and the relationship with believable agents is obvious, as is the context that can be provided using characters as the embodiment of social cues. In a similar way, "setting the scene" is synonymous with providing context. Events may be compared with the concept of tasks, the sequencing, structure and composition of which provide vital contextual information (Meech 1999). In this way, narrative can be viewed as a conceptual framework for providing its inter-actors with contextual constraints.

Based on these conclusions, we claim that shared context of a task performed by a group can be elicited and represented through group storytelling because it helps to identify, represent and explicit the contextual elements related to the events of the task story in order to establish the right relationships among them. Another type of context can also be remarked: the conditions under which the narrative of the story is built. While telling the story, the participants have their current context that will certainly be reflected and aggregated to it, making new possible discussions to start and negotiation to be made, influencing the final product generated.

In the next section, we present Tellstory, a collaborative application that supports the group storytelling dynamic. We exemplify the issues discussed here and how we begin to capture and represent context.

## 4. Making Context Explicit with Tellstory Groupware

Previously presented by Perret et al. (2004), Tellstory (TELLSTORY) is a web application, implemented under the Zope platform (ZOPE) which aims at supporting collaborative stories building and thus explicit and contextualize knowledge shared by members of group.

Individuals can participate on a story performing the following roles: moderator- creator of the story and responsible for the work coordination; teller- members able to contribute with the story; editor- person that will write the final text; and, commentator- responsible for the identification of tacit knowledge on the story.

A story is a sequence of events that are tied to each other by a full conductive thread of meaning, built by a causality relationship between a fact and its successor (Holloway 1979). We used this definition to model the construction of the story in group. Each user can add the events he remembers. Tellstory interface is depicted in Figure 1.

According to Shen et al. (2002), a story-sharing system must support flexible narrative. The content must have enough structure so that new members of the group can understand and re-tell the stories, but not so much structure that people are locked into one way of describing the relevant events. The possible actions along the construction of the story are: inclusion, edition, exclusion, union and fragmentation of events. The union happens when two events can be considered as a single one and the fragmentation divides it in two.

Once the tellers have included the events, they can discuss them within the system, through adding comments in a forum format, and, eventually, decide certain subjects through a voting process organized by the moderator. For example, in case there is no consent about the occurrence of a certain fact, the tool allows the story to have two versions. This flexibility allows people to express themselves freely.
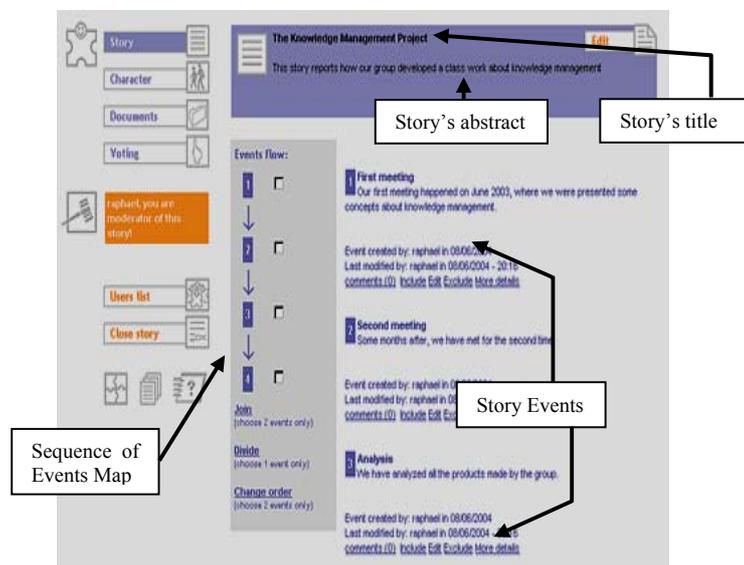
Figure 1 The flow of a story in Tellstory (Perret et al. 2004)

When the group understands that the story already provides enough flow of events, the moderator can conclude it. At this time, the editor gathers the events and writes a final text based on the sequence. Finally, the commentator tries to identify the tacit elements.

Group sense-building is a valuable function of storytelling and the system stimulates it allowing comments and re-telling. Nevertheless, discussions and disagreements will certainly arise. Thus, the group needs support to express their thoughts and to solve the

conflicts in order to produce a real, interesting and useful story. One of the most important issues is to communicate correctly the contextual information that surrounds the events to make them clear and understandable for all members of the group.

Tellstory helps users to externalize context in two ways. The first one is informally through the users' contributions (events) and the notes they present on others' contributions (comments and discussions). The comments may complement information presented or may generate conflicts. Individual contexts are proceduralized, allowing a shared context to be built.

We reproduced here extracts from a case study made at a government organization in Brazil to illustrate this situation. A group of five members (M1 to M5) told the story about the constitution of the central KM team in that institution. They interacted through the Tellstory application during one month, reconstructing their shared context not registered yet:

> *1st Event by M2: In the first meeting of the central team of knowledge management, the Executive Director, the General Controller and the Secretary of Administration of the institution had been invited to demonstrate the institutional support and to congratulate the group. Moreover, the coordinator of the group presented general concepts of KM and the proposal, elaborated by the KM Committee, describing the plans for the work to be performed.*
>
> *2nd Event by M1: In December 2002 the second meeting of the central team of knowledge management was carried out. In this occasion, C.S., the Manager of the Corporative University of one of the institution's units, presented his project. In this meeting, the number of participants was reasonably superior to the previous one.*
>
> *Comments made about this event in the forum:*
>
> *M1: Do you have any suggestion for the consequences of this event?*
>
> *M3: One important outcome was that the participants had been distributed in three thematic groups (organizational learning, organizational culture and information technology), to start the work of identifying already existing cases in the institution.*

From this point of the story, we can observe that two events were told, related to two meetings of the group where some other people participated and some deals and decisions were made. In the first one, the goal was to formalize the group and establish its objective. M1 explained his Contextual Knowledge (CK) about it: (*CK1*) Some executives were present; (*CK2*) The executives gave credibility to the event.

In the second one, the focus was the speech from C.S. Nevertheless, M1, the member who told this event could not retrieve one piece of knowledge from his memory. Thus, the comments that M3 shared with the group helped to identify important contextual information related to this event: (*CK3*) Thematic groups were started; (*CK4*) Thematic groups should identify KM initiatives within the institution.

We can notice that while the participants tell their memories they also explain the situations by proceduralizing their contextual knowledge, re-building the shared context of the whole group.

The second way supported by Tellstory is extracting context apart from the event text through a Context Framework. The answers for these six questions should provide that information: **who**? **when**? **where**? **what**? **how**? **why**?. The framework works as a guide for the tellers, stimulating their memories, helping them to structure their thoughts and expand their contribution by giving more details about each event told. The framework is composed by the subjects in Table 1.

Table 1 Subjects on the Context Framework

Subject	Asks the teller to:	Addresses:
Character	Detail the personages and their roles on the story	"Who?"
Period	Write date or period where this event occurred.	"When?"
Classification	Indicate to what part of this story this event belongs	"When?"
Place	Describe the place and scenario where this event occurred.	"Where?"
Causes	Discuss what caused this event	"Why?"
Effects	Type the consequences of event	"What?"
Emotions	Describe how your feelings were while this event was occurring.	"How?"

Retaking the example, while describing the events, the tellers also used the Context Framework proposed to detail and organize the information provided:

1st Event by M2

Place: The event occurred at an ample and comfortable auditorium that belongs to the Strategical Planning Department. The audience was composed of employees' representatives from all the units of the institution (public companies). (M2)

Period: 14.11.2002, from 15:30 to 17:30. (M2)

Causes: As in Decree 21,683, 04.07.02, the representatives of the municipal agencies would have to participate on specific or general meetings. All of them had been invited by an email posted by the work Coordinator. (M1)

Consequences: People heard the words of the authorities supporting the initiative, learned the KM subject and the team proposal. (M3)

Emotions: Most of the audience did not demonstrate in their faces credibility on the proposal. Many people were confused, not sure of what was happening. Some people had questioned the work success possibilities in face of the complexity and the institution cultural characteristics. However few other people demonstrated excitement with the perspectives of sharing among institution's agencies. (M1)

Classification: Exposition (M1)

Adding such information based on the framework, allowed the group to increase even more their collective knowledge about the event and their relationships. M1, M2 and M3 revealed to the group new contextual knowledge that helped to explain how and why things took place at that time: (*CK5*) There is a decree that compels the employees of the institution to participate in such meetings; (*CK6*) The Coordinator invited people by e-mail. As the result or Proceduralized Context (PC), they agreed with the fact that: (*PC1*) People were not receptive to the proposal at first moment.

The attempt to extract contextual information apart from the story makes possible formalizing context. If we interpret the pieces of knowledge provided, it would be possible to write the following statement:

> If (CK3) and (CK5) and (CK6) and (CK1) and (CK2) then the Event 1 took place (focus) and resulted in (PC1).

We observed that after the interaction, the group has registered much of the knowledge about the work they performed together. It was very natural for them to formalize the events and contextual information that surrounded them through storytelling. The next step is to organize the context elicited to reuse in similar situations.

5. Conclusions and Future Work

We believe that the stories, narratives with beginning, middle and end, are an appropriate way of telling what happened and, at the same time, can externalize the tacit knowledge of the group. Therefore, we developed TellStory, a groupware that supports collaborative

story building. The tool allows a group to tell a story, starting from the contributions of each member. Even the contributions they are introduced in a disordered way, the environment determines roles that guarantee the coordination and the organization of the events, discussing and, if necessary, voting to decide which direction will be taken.

Due to the characteristics of this process, we claim that this is a useful way to capture and explicit the context shared by a group while performing a task or a project in an organization. Some case studies have been done with Tellstory showing the viability of this proposal (Perret 2004). Nevertheless, there are some issues that still need to be discussed and implemented as future works.

Narrative is a structure for conveying a series of related events. We observed that the story may omit details, but important agents, events, causes and results are relayed. A narrative of a task or project describes its history and evolution over time. It may not be as complete as, for instance, videotapes of the entire design process, but it does communicate compactly and effectively how a project came into being. By relating the project changes, problems faced and decisions made over time, a narrative can help make explicit some of the implicit knowledge the participants used to understand and implement the interventions, in other word, the whole context built. Thus, one might infer whether the results were applicable elsewhere.

The template provided by Tellstory is one initial attempt to solve the context externalization problem. The information captured needs also to be structured in order to be used. The need for capturing context is related to direct actions according to constrains and restrictions. Therefore it is necessary to associate them. Now we begin to study how to provide a more formal structure for the pieces of knowledge captured.

Another issue that should be deeply discussed and developed is the identification of the appropriate roles and what their contribution in terms of contextual elements in the collective context linked to the focus could be. Appropriate interventions made by individuals with specific assigned roles may result in a story even more rich in details. In the current version, Tellstory provide some basic roles. We believe that they could be increased.

Because stories occur under a cultural and historical context, facilities to bring out background and contextual information could be provided, e.g. relevant news clippings, to assist the user to interactively reflect on and share past experiences of the group. This could help participants to remember important facts, including personal ones, which might probably have affected the story. The current version allows users to upload documents associated to the story.

Besides working on functionality for the Tellstory application, other case studies should be made in order to confirm the results obtained and raise new ideas to improve the shared context eliciting approach.

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