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THE ROLE OF SHARED CONTEXT IN GROUP STORYTELLING

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Abstract. Information about the real context that has surrounded a past team activity can help their members to understand better situations at hand. However, knowledge transfer can only be successful if a common interpretative focus and its context are set up. We argue that a combination of group storytelling techniques and a groupware tool can support the elicitation of context shared by a group. Moreover, our goal is to discuss how groupware can structure and formalize the contextual information behind the scenes of a story, making it easier to understand, interpret and reuse the knowledge intrinsic to it.

Keywords: Context, group storytelling, knowledge management

1 INTRODUCTION

Knowledge is frequently defined as 'the capacity for effective action' [18, 29]. Therefore, knowledge *per se* is not directly of interest in business environments; primarily, knowledge becomes valuable in its application. Procedures can not be dissociated from the way they have been accomplished in practice and learning a work process is not just being trained to, but also to observe different alternatives for doing it, and understand the reasons behind the choices according to specific circumstances [24]. The ultimate purpose of knowledge sharing is to promote and disseminate 'effective action', either in the performance of specific tasks or in general behavior [32].

Eliciting and re-using knowledge within an organization requires an elaborate communication process among its employees in order to avoid misunderstanding and confusion. The transfer of knowledge among actors can only be successful if a common interpretative focus and its context are set up and shared [2]. So far, information about the real context that has surrounded a team's past activities can help their members to understand better situations at hand. This is called tacit knowledge, because, for the most part, relies on people's minds and is not registered in formal documents. It is necessary to capture and organize it in order to be useful.

However, extracting contextualized knowledge from teams and making it explicit is not an easy task. Moreover, people do not have time to spend in providing information, and they are also not motivated since organizational protocols have a tendency to be dry and lacking in inspiration. We suggest that a story is one possibility of registering full-bodied collective context. Stories can be a powerful approach to represent and convey complex, multi-dimensional ideas. "Well-designed, well-told stories can communicate both information and emotion, both the explicit and the tacit, both the core and the context" [31].

Storytelling engages people by means of amusing narrative structure with a more authentic language. Recently, the group storytelling technique has been proposed within the community of Computer-Supported Cooperative Work [1, 20, 30, 36]. It is a collective sense-building activity, with several individuals contributing with their recollections and interpretations about shared experiences.

In this paper, we argue that group storytelling technique allied with a groupware tool with specific functionality can help re-building a group-shared context. Moreover, our main goal is to discuss how groupware 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. Therefore, we focus on the structuring context feature.

This paper is organized as follows. Section 2 explains the concept and dynamics of shared context building. Section 3 presents the research in group storytelling in order to elicit knowledge. Section 4 reports the functionally of Tellstory, a group storytelling tool. In Section 5 we discuss the results of a case study made with this tool and analyze the way context was made explicit and structured by participants. Finally, Section 6 concludes the paper and points to the next steps.

2 RELEVANCE OF CONTEXT IN COLLABORATIVE WORK

An action is executed or an event occurs in a context. While an event is a real-world occurrence that can be distinguished, context can be defined as 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 action or the event, but will constrain the execution of the action or the interpretation of the event [2]. It is thus necessary to have access to important contextual information for the total understanding of several actions and events.

2.1 Types of Knowledge

At a given task performing or decision making step, context is the sum of all the knowledge possessed by an actor on the whole task. Brézillon and Pomerol [4] distinguish between the part of the context, which is relevant to 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 connections with the current focus, although not directly considered in it. This contextual knowledge can be mobilized by the actor if necessary.

Contextual knowledge is evoked by situations and events, determined by the actor's focus. Always at a given focus, the actor considers, more specifically, a subset of the contextual knowledge. Contextual knowledge is then grouped, assembled, organized and structured in a so-called proceduralized context [4]. This *proceduralized context* is like a "chunk of knowledge" [27]. Figure 1 depicts this view about the different types of knowledge and context.

Although the contextual knowledge exists in theory, it is actually implicit and latent, and is not usable unless a goal (or intention) emerges. When an event occurs, the attention of the actor becomes focused on it and a part of the contextual knowledge will be *proceduralized*. When the task proceeds from one step to another, there is a movement between the contextual knowledge and the *proceduralized* context because a new item enters or leaves the focus of attention. Thus, context is dynamic along the accomplishment of a specific task.

Context is relative to a focus of attention, and focus and its context are intertwinned. The focus determines what must be in its context, and the context, on its part, 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 method X to build the solution for problem Y". The focus was building the solution for problem Y by applying method X. Nevertheless, the context related to that event (not explained in the sentence) was as follows: one of the team members was a specialist in method X; methods W and Z had been tried before but did not succeed; and, the supporting tool for method X had been recently bought by the company. Contextual knowledge, proceduralized at the time the focus arose, can now explain it.

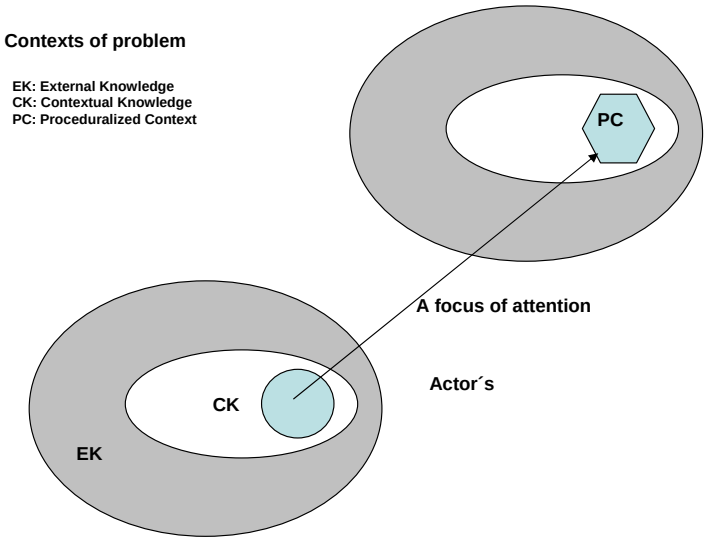

Fig. 1. Types of knowledge and context

Once the right proceduralized context satisfies the current focus, this "chunk of knowledge" goes in the contextual knowledge of the actor associated with its elements and the way in which the elements have been assembled in the proceduralized context. This leads to two observations. Firstly, this corresponds to a better organization of the actor's knowledge (and illustrates the difference between a novice and an expert facing a same problem). Secondly, the proceduralized context is stored with its elements and the relationships between the elements established in the proceduralized context. Thus, it is possible to provide explanations on the way in which the current focus has been satisfied, and the reasons why some alternatives were abandoned. Indeed, the focus and its validity context are available.

What is discussed here for an actor accomplishing a task remains valid for a group of actors performing collaborative work, although the situation becomes multidimensional with several actors because, for example, once the proceduralized context goes in a part of the contextual knowledge that is shared by all the actors intervening in the collaborative work. Thus, a shared context is partially built from the larger context in which the actors are (the context of the enterprise, the context of the market in which the enterprise evolves, etc.), and partially built from interaction among actors (e.g. with a sharing of the tasks based on past interaction).

2.2 Shared Context Associated with the Focus

Context is essential to an effective communication and collaborative interaction. It is a shared knowledge space explored and exploited by actors in interaction. We

now have to distinguish each actor's contextual knowledge and the shared context part of actors' common contextual knowledge. For example, the goal of a project or past interaction belonged to the shared context. Each actor in the interaction has to deal with his/her contextual knowledge to feed the proceduralized context collaboratively built and the shared context that acts as a filter defining, 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. In a collaborative work, the subset of contextual-knowledge pieces, from which the proceduralized context is built, is comprised from the contextual knowledge of each actor. This means that a piece of contextual knowledge introduced by an actor must be accepted by all the other actors (eventually after a negotiation). Again, note that the goal is not to have an identical viewpoint of all the actors on the proceduralized context under construction, but only compatible or shared viewpoints because each actor has a mental representation that could be quite different from the mental representations of the other actors.

These proceduralized contexts then become part of the shared context of actors, even if they do not remain within the current focus as shown in Figure 2. We easily imagine 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 [3] calls *explanation* in the context of the interaction among a user and a system in a decision-making process. This aspect is considered by CSCW area within the *awareness* research [9].

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 hard to be explained, understood and communicated. Eliciting and re-building shared context is not an easy task, being one of knowledge management area challenges [19]. We claim that the group storytelling technique could be used for this purpose.

3 GROUP STORYTELLING APPROACH

Storytelling is a long-established means of passing on wisdom and culture. In recent years, the role of narrative within organizations has increased due to the fact that the harder forms of knowledge which can be classified, categorized, and analyzed are the most valued [32].

A story can be defined as "a narrative of an event chain told or written in prose or verse", while the word narrative means "to pass knowledge" [36]. A story "lives by itself", while the narrative of a story is just comprised of explicitly-told facts. The narrative of a story helps to humanize the environment, involving emotions and provoking personal commitment [14]. Besides, telling a story is also an easier way

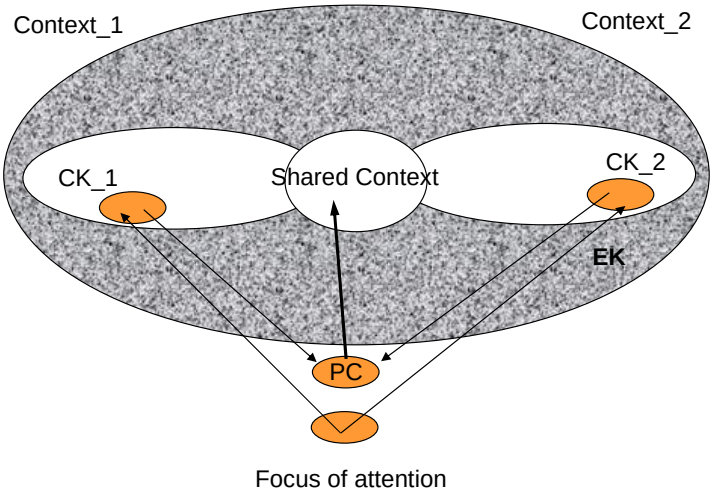

Fig. 2. Building shared contextual knowledge

to explain things informally, because of the needs for contextual cues to underline it, as, for example, to explain how to ride a bike.

3.1 Storytelling Related Work

The popularity and the importance of the stories caused the storytelling technique to be studied and applied in many fields and for various purposes, such as education and learning, knowledge management in business, linguistics studies and artificial intelligence. Methods and tools have been developed to support story capturing, recording and retrieving.

Narrative Intelligence research [16] develops systems in which a large number of stories is stored using complex indexing schemes in order to match stories relevant to the domain. Schank [28] built a training system with a story database about common problems; these stories are triggered by the system when a trainee faces a similar situation.

In education, storytelling has been largely used to foster creativity [7]. Collaborative technologies and interfaces allow apprentices to build stories sustained by constructivist theories [10, 33]. For example, in the *NICE* project [22], children plant a garden and construct stories about their activities, supported by intelligent agents.

Thomas et al. [35] claim that storytelling is useful in creating, capturing, disseminating and internalizing knowledge simultaneously. According to these authors, "storytelling is also a representative knowledge socialization process that includes both instrumental and expressive aspects". Thus, there are many uses for stories

and storytelling in business to promote knowledge management and organizational learning [23]. Some examples are given.

Shell International Exploration and Production's program for managing technical and business knowledge is focused on gathering and disseminating expertise within the geographically and multi-disciplinary distributed company. Storytelling helped them circulate employee *know-how* to the places it was most needed [15]. Post [21] discusses that for NASA's project managers to be able to carry on demands, they used a storytelling tool called ASK Magazine for converting tacit to explicit knowledge. Fröhlich and Karandikar [8] describe the work undertaken in ABB, which deals with organizational process improvement by means of goal-oriented stories derived from experts and recorded in a story-base.

Most storytelling approaches applied in business are based on individual interviews made by a professional storyteller, who synthesizes the events collected and writes his own interpretation into a single text [12]. 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. Following this perspective, some authors propose the group storytelling technique [1, 20, 26].

Group storytelling is more appropriate when there are several people involved in the setting that is being constructed. Groups build a story about a work performed or a situation experienced by its members. Since each participant has performed a role in the scenario, stories written by a team will probably contain more valuable details and everyone has the opportunity to present their view on what had happened.

A few groupware prototypes have been developed to support group storytelling. The diverse approaches are based on: texts [20]; graphics [1]; documents [30]; and images [26]. Although using different media, they all allow participants to add their contributions and discuss the facts told in a collaborative manner. Authors agree that some structure and aspects to sharpen memory should be offered. Most of them mentioned context as fundamental matter, but no one was specifically concerned about structuring the shared context.

3.2 Stories, Knowledge and Shared Context

In group storytelling activity, the focus is the purpose of the story [24]. If it is an actual past story, participants should express their memories about the events experienced by all of them. In a story, events are real world occurrences that can be distinguished among their subject, which is the focus. They are usually expressed in a single natural language statement. These events or facts constitute pieces of knowledge that should be tied together, through explicit the relationships (e.g. causal or temporal) among them, to build the story body.

A knowledge-sharing story offers a surrogate experience, as Sole and Wilson [32] explain. The narrative layout offers the reader an opportunity to experience the situation described by the storytellers in a replacement fashion. The listener can

acquire understanding of the situation's key concepts and their context, even though he did not directly experience the story circumstances as-is.

Brooks [6] affirms that context means "seeing from a point-of-view", often from somebody else's point-of-view. When readers distinguish the context of a story, they are able to adopt and accept the point-of-view of the storytellers; in other words, they become aware of "the new world" made available to them.

Meech [17] states that contextualization and narrative are active processes composed of quite a few elements. Narrative is seen as the story representation (Story) and presentation (Discourse). The Discourse is the reproduction of the story onto some form of media. To this author, the Story is divided into events and entities; each one can be examined in terms of the contextualization that it is capable to provide.

Events illustrate parts of a story and many times are presented alone. However, a story is not just a collection of isolated events, but rather it embodies many elements, called global context, which link these facts transmitting to the reader a meaningful body of knowledge. Events are framed by context including politics, economy, sociology, and also, personal interpretation, background and culture. The connotation of an event is not isolated, but requires relating it to others around, which express prior experiences or larger context. Just as knowledge, stories draw meanings from their contextual information [30].

Characters are also an important element of storytelling. The context can be provided using the story actors as the representation of social hints. "Setting the scene" is akin to context providing [17]. In this way, a narrative can be viewed as a conceptual framework for providing its actors with awareness about contextual constraints that were once shared by them. Furthermore, the readers of the story should be able to identify these contextual elements as well.

Based on these conclusions, we claim that the shared elements of context from a task performed by a group can be elicited and represented through group storytelling. Therefore, some formalization is necessary and we suggest that a groupware can help to organize and structure this information by making it able to be reused [24, 25]. In Section 4, we describe Tellstory, a groupware tool that supports group storytelling and context capturing.

4 TELLSTORY GROUPWARE

Tellstory [20] is a groupware that supports collaborative stories' building [34]. It is a web application where any registered member can start a story and invite new participants to join in, recollect and link important facts about a situation they have accomplished together.

A story is a sequence of events tied to each other by a full conducive thread of meaning, built by a causality relationship between a fact and its successor [11]. Tellstory uses that definition to model the construction of the story in group. Each user can insert one or more events which are facts that happened throughout the

story, and which s/he remembers. These events should be linked in a temporal flow. Tellstory's main interface is shown in Figure 3. A map of events indicating event sequence and a description of each event is highlighted.

Individuals can participate in narrative construction by performing one of the following roles:

(i) moderator: responsible for the coordination of the actions about the story;

(ii) teller: the member able to contribute with events;

(iii) editor: the person who will write the final text; and,

(iv) commentator: responsible for the identification of tacit knowledge externalization on the story.

More than one person can take on the same role, as well as each role can be taken on by several people.

The 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, yet the fragmentation of the event divides it in two, when necessary. This configures the tool as a flexible environment, where people can express themselves freely [20].

The core of this research is to discuss the means to communicate correctly contextual information that surrounds events told in order to make them clear and understandable for all group members and mainly for future consumers of the story. Tellstory helps users externalize context in two ways: implicitly embed in the text and comments about the events and explicitly through a framework.

The first manner to express context is informally, through the users' contributions (events) and the notes (comments and discussions) about the other parties' contributions. Groups need support to express their thoughts and to solve conflicts in order to produce real, interesting and useful stories. Once tellers have included events, they can discuss them within Tellstory, through adding comments in a forum format. The unstructured comments may complement the information presented, as well as generate conflicts. Individual contexts are proceduralized, allowing a shared and collective context to be built.

We notice that many times a fact description is naturally mixed with its context. On one hand, it reveals the intention of explaining and detailing the whole story, besides the natural language stimulates free performance. On the other hand, some structuring would be required, in case further interpretation of the situation might be necessary to retrieve a specific facet.

The second way to elicit context is an attempt to extract information apart from the text of events in a structured format. Therefore, it provides users with a Complementary Information (Context) Framework to stimulate externalizing specific contextual information related to each event of the story.

To some authors [26, 30, 6], four questions are essential to storytelling: who? when? where? and what? These categories provide contextual information expected

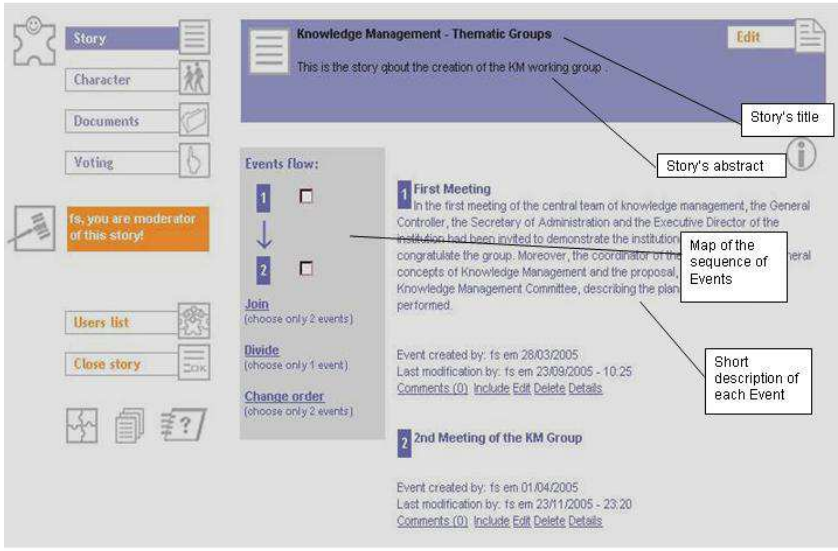

Fig. 3. The flow of a story in Tellstory[20]

to be captured together with the story. Based on studies about awareness in groupware, we introduce two more questions besides the *how*? and *why*?

The contextual information that surrounds an event in a story should explain it. The answers to these six questions are supposed to provide that information. Therefore we suggest that they have to be represented and organized. A framework based on these questions is made available while a participant is editing an event. The teller can use this space to inform particulars about the event as well as create proper relationships among them.

The framework draws the users' attention to the typical characteristics of a narrative structure; in fact, working as a guide for the tellers, stimulating their memories and helping them to better structure their thoughts and expand contribution, giving more details about the event. The subjects pointed out in Table 1 comprise the Context Framework asking the tellers to post some specific information related to the six questions mentioned.

The level of structuring the information proposed allows for identifying relationships among the events declared and retrieving them later. Participants are also stimulated to describe the details about each *Character* of the story (general description, professional background, technical abilities, interpersonal relationship with the group, task involvement) and associate to a specific event the ones who performed in the event. After telling important information about each character

Subject	**Asks the teller to:**	**Addresses:**
Character	Detail the players and their roles on the story **(General description, Professional background, Technical abilities, Interpersonal relationship with the group, Task involvement)**	"Who?"
Period	Write date or period when this event occurred.	"When?"
Classification	Indicate to what part of the story this event belongs **(Exposition, Complication, Climax or Outcome)**	"When?"
Place	Describe the place and scenario where this event occurred.	"Where?"
Causes	Discuss what caused this event (events might be related to the previous events)	"Why?"
Effects	Type the consequences of this event (events might be related to the coming events)	"What?"
Emotions	Describe perceived feelings while this event had occurred and associate them to each participant of the story	"How?"

Table 1. Subjects on the Context Framework

of the story the whole list of characters is made available to be linked to a specific event.

The same procedure is followed concerning the *Place*, which the participants should depict and incorporate into a list. Besides, they indicate the exact *Period* when that event has taken place, along with its position in the progress of the story (Exposition, Complication, Climax or Outcome). This information may possibly determine the repercussion of a specific event on the whole set of results of the experience described.

The *Causes* and *Effects* clarify the non-temporal links among different events. It is important to realize that one fact had contributed to others even though they might have apparently no relationship at all. If someone wants to reuse this decision in a similar situation, it would be helpful to notice that some previous facts had contributed to it.

Finally, the personal feelings of people influence the outcome of several settings. By attempting to capture some of them, we seek to deepen in the explanation of how things happened. We let the tellers associate an iconic representation of *Emotions* to each actor involved in an event told.

The attempt to extract contextual information apart from the story makes it possible to start a formalizing context process. The Framework provides structured lists for all the contextual elements described, including the graphical icons to represent the emotions felt by the actors in the course of an event. Establishing formal relationships among the various contextual elements makes it possible for the readers of stories to search for information related to the circumstances s/he deals with and so s/he can learn with the story accomplishment, by reusing knowledge.

5 CASE STUDY: ANALYZING SHARED CONTEXT CAPTURED THROUGH GROUP STORYTELLING

We present extracts from a case study [19] made at a Brazilian government organization in order to analyze how the shared context was made explicit by the story

tellers. The institution was the Rio de Janeiro City Hall, which comprises a number of agencies (organizations associated to the City Hall) that deal with public administration specific matters (some of these are mentioned in the story).

A group of five members (called here M1 to M5) were invited to tell the story about one mission they took part together: the constitution of the central knowledge management team in that institution. The story told was about the planning and execution of the first knowledge management seminar, which was the starting point of the initiative. The real names of the story characters were omitted.

The group worked together using Tellstory application during one month, and pointed out the important events, reconstituting their shared context which had not been recorded until that time. The group was trained in the process of telling stories and in the application usage just before the case study begun. Each participant contributed asynchronously, using the "Adding Events" functionality of Tellstory.

Eleven events were told and linked by the group using Tellstory, resulting in a final text presented in Portuguese in Perret [19]. Most events reported their meetings, the contents of discussions, the decisions made by them at the time the events took place. The final story explains how the group was structured from the time the work had been proposed until it became stable, showing that the context, under which the flow of events occurred, interfered in the results. We examine some parts of the story in this paper. Our intention is to discuss that it is possible to identify the focus and context in the events told by the participants.

5.1 Identifying Context in the Text and Comments

Table 2 presents the text of the events, including name, author, description and comments made by the tellers. We observed the dynamic of the group while the focus in each event is the action performed by the group. The context associates the events and helps readers to learn from the story. Taking the model described in Section 2, which classifies types of knowledge provided by contextual information, we checked the opportunity to extract it from the text in order to create a structure of the story based on context.

Tellstory functionality provided a shared space for the participants to express freely the way they remembered the facts (events or focuses), concomitantly time making contextual knowledge explicit (proceduralized to the focus). This knowledge became part of all members' context. We call attention to two issues: establishing relationships and classifying these pieces of knowledge.

Taking the first seminar organization and performance as the big focus, we examined the text of all events written by the participants. We observed the facts that surrounded the focus, trying to isolate each one that could someway explain it. Certainly, text interpretation is subjective, but it was a preliminary approach to test our ideas and proposal.

1st Event by M2: First Meeting of the Knowledge Management (KM) Central

In the first meeting of the central knowledge management team, the General Controller, the Secretary of Administration and the Executive Director of the institution had been invited to demonstrate the institutional support and to greet the group. Moreover, the coordinator of the group presented general concepts of knowledge management and the proposal, drawn up by the Knowledge Management Committee, describing the plans for the work to be performed.

2nd Event by M1: 2nd Meeting of the KM Group

In December 2002 the second meeting of the central knowledge management team was carried out. On that occasion, C.S., the Manager of the Corporate University of one of the institution's units, presented his project. In this meeting, the number of participants was reasonably higher than in the previous one.

Comments made about this event in the forum:

M1: Do you have any suggestion for what the consequences of this event were?

M3: One important outcome was that the participants had been distributed in 3 thematic groups (organizational learning, organizational culture and information technology), to start the work of identifying already existing cases in the institution.

3rd Event by M3: Third Meeting of the KM Group

In this meeting, M1 and M2 presented the City Health Department's capability data bank along with the intentions and objectives of the KM project. Some participants showed a skeptical attitude towards the project because they compared it to a previous initiative of implementing Total Quality Program, but hope was somehow evident as well. People had a chance of choosing among three thematic groups (Organizational Culture, Organizational Learning and Information Technology). A questionnaire on the possible actions to be performed was handed out.

4th Event by M4: IT Group Formation

The IT group was comprised by the following participants: AM, AP, M4, M3 and LM. M1 and M2 also participated on the meetings of this group. They discussed existing tools to be used in the project. Later on, they prepared presentations of each one of these tools (generally GED) in order to choose a pattern for the institution. In the seminar, they described the Lotus Notes. The work was divided among members: LM took the conceptual part, M3 and M4 were responsible for drawing up the model and AM wrote the conclusion. The others should criticize and add pertinent information to the work.

Comments made about this event in the forum:

M4: Group, which is the last name of Marta (it is with or without "h")? And to which agency does she belong?

M4: Dear friends, I have already discovered the name and the capacity, and I modified the text of this event.

5th Event by M5: The Organizational Learning Group Formation

Initially the components of this thematic group were: AF, BR, TS, PS, PL, LE, HG, AP and M2. M2 and PS presented Comlurb's strategic plan to their colleagues, and the actions in the KM area that it had already been performing. Aware of that information, the thematic group decided to focus on that company. Nonaka's knowledge spiral was used to explain the organizational learning in KM processes. Along the weekly meetings the group elaborated on that KM case study.

Moreover, the members participated on the development of a text. This text was revised many times, in order to make the language accessible to all interested people. The KM case study was successfully presented in the seminar.

6th Event by M3: Organizational Culture Group Formation

The group was initially formed by AM, DS, DP, DM, LA, ME, OA, RP, RM, SD, TL and VP. SO, MM and M2 also participated in the meetings. We spent a period reading and studying, preparing ourselves for the work that should be developed afterwards. M2 brought us the book Leading Change by John P. Kotter that was read and commented by the members of the group, for some weeks. This publication was the basic reference for the organization of the case study, which made it possible for us to evaluate the cultural change in the company over the last the 10 years.

7th Event by M4: Change of the João Goulart Foundation General Controller Coordination

Perceiving that the KM initiative was aligned with the intentions of the João Goulart Foundation (JGF), the General Controller suggested that the president of this institution changes the coordination for this work.

8th Event by M2: Tryouts for the Case Studies Presentation

Appraisals for the seminary presentations were made by the thematic groups. They were carried out in different institutions. Comments made about this event in the forum:

M5: Before the appraisal, we should meet more times in order to describe the experience of each thematic group, don't you agree?

M4: Fully. In the case of the IT Group, there have been quite a few meetings, mails and phone calls before the general appraisal of the presentation.

9th Event by M2: Meeting of the Central Team for the Definition of Actions

The meeting was mediated by a consultant. Twenty five people participated. They first heard the presentations the coordinator, the president of João Goulart Foundation and the coordinator of the Administration department of City Institutional Development. In the second part of the meeting, the KM Central Team actions proposals were raised.

10th Event by M1: The Organization of the Seminar

Since the representative members of the central team belong to municipal agencies, the infrastructure for the first Seminar was provided by the City Hall secretariats, companies and foundations. Amongst them, I highlight João Goulart Foundation which received registrations, sponsored material and certificates, besides hiring the catering service; the Culture Agency, which provided the place for the event; Multirio, which recorded the presentations in films; the Financial Agency, which drew up the Seminar advertising poster and Riotur, which helped in the venue decoration.

11th Event by M2: First KM Seminar of the Rio de Janeiro City Hall

In September 2003, the First KM Seminar was carried out under the subject "Public Administration in the Knowledge Age". The event mobilized great part of the City Hall. Around 600 people were enrolled, but since the Theater of Brazilian Literary Academy only had 370 places, many municipal employees were not able to participate. Some authorities were also present at the event. The Mayor was invited to open the event; however he could not go because of a pressing commitment. The Administration Secretary opened the lecture cycle, speaking about the changes in structure and the communication channels increase in the institution. The FJG president, who mediated the presentations, made his exposition based on knowledge theories. M2, coordinator of the

KM team, presented the strategic goals, such as project continuity, independent of elective mandates; the modernization of the works in the agencies and the innovation as culture. Moreover he presented the applicability of KM concept in the City Hall, considering the following issues: organizational memory; best practices; dissemination and qualification in KM, highlighting the decree detached as landmark of KM in the City hall that created the "Organizational Carrousel". In the second part, the thematic groups presented case studies on some agencies' experiences. Using Kottler's methodology, the Organizational Culture group presented its study about the cultural change at *Comlurb* along the last ten years, inferring that the investment in knowledge was the main reason for such a change. It is important to notice that one of the most emotional moments of the event was at the end of this presentation, when one of the participants recited a poem and invited the public to repeat the last strophe: "$\cdots$ cultural change is a process, but, after it starts, it is impossible the take the way back!". The Organizational Learning group concentrated its study in *Municipal Guard*. PS, Human Resource director, demonstrated by means of the "knowledge spiral", Nonaka's theory, how organizational learning has been developed in that organization. The Information Technology group described the case of *Previ-Rio*, showing how a tool helped them in the identification, capturing and dissemination of knowledge in legislative area.
Comments made about this event in the forum:
M3: In this seminar, groups' build-up showed an interesting unit consist position over diversity or vice versa, which means, everyone cheered for and celebrated the common success, but each group in particular worked as a team. That has proven to be true since the upkeep of the distinct groups later on was considered a vital element for the project.

Table 2: Content of the Story

We can observe that eleven events were told. The first three are related to the initial meetings of the group in which some other people participated and some deals and decisions were made. The 4^{th}, 5^{th} and 6^{th} events describe the formation and encounters of the sub-groups installed to study specific themes; the 7^{th} tells a decision made by one of the managers of the institution, the subsequent ones talk about the preparation and execution of the seminar.

In the first event, the goal was to formalize the group and establish its objective. Teller M2 explained his following Contextual Knowledge (CK), the pieces of knowledge related to the event: (*CK1*) Some executives were present; (*CK2*) The executives gave institutional credibility to the event.

In the second event, the focus was on C.S. speech. M1, the member who told this event, could not retrieve one piece of knowledge from his memory: the meeting which led to the creation of thematic groups. Thus, the comments that M3 shared with the group helped identify important contextual information related to this event: (*CK3*) Thematic groups were started; (*CK4*) Thematic groups should identify knowledge management initiatives within the institution. Other contextual information was pointed by M1: (*CK5*) The number of participants increased.

From the third event, it was possible to observe the next contextual information related to that meeting: (*CK6*) Participants were skeptical; (*CK7*) They have undergone an unsuccessful quality program; (*CK8*) Some participants were hope-

ful. Other important information could be learned from the texts with focus on the events:

Event 4: (*CK9*) M1 and M2 also participated in the IT group meetings; (*CK10*) The IT group work was divided among members; (*CK11*) Someone was responsible for each part;

Event 5: (*CK12*) The thematic group decided to focus on the Comlurb company; (*CK13*) Nonaka's knowledge spiral was used. At this point, we observed that another focus had emerged although described at the same event: "The participants wrote a text", and then there was a context associated to it: (*CK14*) This text was revised many times;

Event 6: (*CK15*) SO, MM and M2 participated in the meetings; (*CK16*) They spent a period reading and studying, (*CK17*) The book "Leading Change" by John P. Kotter was read and commented;

Event 8: (*CK18*) The tryouts were carried out in different institutions; (*CK19*) There was a suggestion to meet more times;

Event 9: (*CK20*) The meeting was mediated by a consultant; (*CK21*) Twenty five people participated;

Event 10: (*CK22*) The infrastructure for the first Seminar was provided by the City Hall's secretariats, companies and foundations;

Event 11: (*CK23*) Around 600 people were enrolled; (*CK24*) Since there were not enough places, many municipal servers were not able to participate; (*CK25*) Some authorities were present; (*CK26*) The Mayor of the City was invited but he could not come; (*CK27*) One of the most emotional moments was when one of the participants recited a poem; (*CK28*) The formation of the groups showed an interesting composition over diversity; (*CK29*) The maintenance of the distinct groups was considered vital element.

We represent the relationships among the contextual knowledge in Figure 4. The dynamics of exchanging knowledge about the focus can be formalized as long as it is possible to re-build it. We can infer for example that the combination of one or more CKs shared by the participants reveals a proceduralized context (as a resulting action) understood by the group which, in turn, is going to be part of the shared context as well.

By analyzing the pieces of knowledge content, we were able to classify them in subjects such as: participants characteristic (CK1, CK5, CK9, CK15, CK20, CK21, CK23, CK24, CK25), political issues (CK2, CK26), consequence of the action under review (CK3, CK4, CK10, CK11, CK14), participant expectation (CK6, CK8, CK27), past fact (CK7), decision made (CK12, CK29), explanation about a decision (CK13, CK28), method performed (CK16, CK17, CK19), characteristic of the place (CK18), infrastructure elements (CK22).

The identification of that kind of information gives hints on what should be formalized within the application. Thus it would be possible to represent context

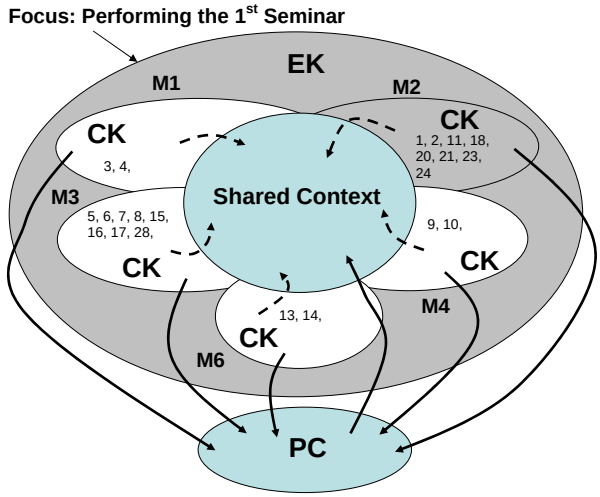

Fig. 4. Construction of the Shared Context

formally as well as search and retrieve stories, and furthermore, get to know how to apply its results in similar situations.

5.2 Organizing Context through the Complementary Information Framework

Back again to the example of our case study, while describing the events, the tellers also used the Context Framework to detail and organize the information provided. Part of this information is presented in Table 3.

Adding such information based on the framework allowed the group to increase even more their collective knowledge about the event and the relationship among the others. M1, M2 and M3 revealed to the group new contextual knowledge that helped explain how and why things took place at that time: (*CK30*) There is a decree that compels the employees of the institution to participate in such meetings; (*CK31*) The coordinator invited people to the meeting. As a result or Proceduralized Context (PC) reached at that time, they agreed that: (*PC1*) People were not receptive to the proposal at first moment.

If we interpret the pieces of knowledge provided, it would be possible to write the following statement:

If *(CK3) and (CK30) and (CK31) and (CK1) and (CK2)*
Then *Focus* ← *Event 1*
Result ← *PC1*.

They stated the following as a cause for 8th event: (*CK32*) Direction of the work was changed many times. The emotions recorded also contribute to explain many of

1st Event by M2: First Meeting of the Knowledge Management (KM) Central ; Classification: Exposition Place: *Strategic Planning Department* auditorium. Period: 14.11.2002, from 15:30 to 17:30. Causes: As mentioned in Decree 21,683, of 04.07.02, the representatives of the municipal agencies would have to participate in specific or general meetings. All of them had been invited by email posted by the coordinator. Consequences: People heard the words of the authorities supporting the initiative and learned on the subject of Knowledge Management and the team's proposal. Emotions: Most of the audience did not demonstrate credibility on the proposal in their faces. Many people were tense, confused, without knowing for sure what was happening. Some people wondered about the success possibilities of the work in face of the institution complexity and cultural characteristics. However a few other people demonstrated excitement with the new perspectives of sharing among the institution's agencies.
2nd Event by M1: 2nd Meeting of the KM Group ; Classification: Exposition Place: *Strategic Planning Department* Period: 17.12.2002 Causes: The importance of those meetings was to realize that there had already been a number of successful cases of KM implementation, although this concept is not very known. Consequences: The expectation was that, from the moment those cases turned out to be visible, they could be multiplied within City Hall. The agencies interested in implementing the KM initiative could avoid failures, once they had learned about the problems faced by the pioneers. Emotions: Most people did not know each other, neither what was happening. Nevertheless, some of them demonstrated enthusiasm for the challenging situation.
8th Event by M5: Tryouts for the Case Studies Presentation ; Classification: Complication Place: Not posted Period: A few weeks before the 24-09 event. Causes: Before the assays, there had been a great number of meetings of the three thematic groups, mails and phone calls before the general appraisal. The dynamic in changing and directing the focus of the work, before arriving at a final modeling that could be appraised must also be recorded. Consequences: Since the event schedule had been postponed several times, it was possible to perform some appraisals and to correct the errors; thus the presentation was excellent at the end. Emotions: A light competitive mood between the groups was established, as they wanted to know about the quality of the other groups' work, in order to achieve at least similar results. The criticism that one of the Managing Committee components made on the quality of the case studies constructed provoked a challenge feeling in relation to the success of the event. At that moment, there was already a feeling of pride in the work, generating, therefore, dissatisfaction with the non-constructive critical position. In this phase of the work, a great interaction and friendship among the members started. The interaction during the work contributed with the exchange of experiences among the members and some partnerships between municipal agencies were born during these meetings.
9th Event by M2: Meeting of the Central Team for the Definition of Actions; Classification: Complication Place: *Tijuca National Park Visitors' Center* Period: Not posted Causes: There was a need for the KM central team to present the City hall concrete projects of implementation of KM in the municipal administration. Consequences: The lack of consensus among the members in relation to the main projects and the clear demonstration of power from the sub-groups generated great concern on the part of the members regarding the success of the event. Emotions: The meeting was sufficiently tense. There was not an explicit dispute of sub-groups for projects.

Table 3. Contextual Framework Information extracted from the case study

the results of the actions, such as, (*CK33*) Participants felt challenged by a specific criticism and (*CK44*) There was a great expectation for power demonstration. It certainly resulted on (*PC2*) Seminar was a success.

If *(CK32) and (CK33) and (CK34)*
Then *Focus* ← *Event 11*
Result ← *PC2*

Such statements create relationships among the isolated contextual information given by the teller, providing one more level of structuring. Writing those relationships formally, we start to identify rules. Furthermore, we can use the rules to search and find knowledge within the repository. For example, at first, in the specific instances (stories), we could ask: what contextual information is directly related to the PC2 (*Seminar was a success*)?, and the system would return contextual knowledge associated to it. Moreover, the system could be able to infer, based on the classification of contextual pieces of knowledge, other relationships among those facts and even compare with facts told in other stories.

5.3 Discussion

The storyteller creates the story context in part through the relationship with the audience. "The words the storyteller uses in the story go a long way toward establishing context as well", states Brooks [6]. The relationship is dependent on attributes of the situation or the audiences consist. For example, a woman telling a story to a group of women from her own culture does not need to specify many details about femininity, for instance, because both teller and audience share a common cultural definition. A public institution worker does not need to write about formalities or hierarchical positions in his institution if he is telling a story which took place there to others.

In our case, we would like the storytellers to provide as many details as they can, because the audience is unknown. A reader could be anyone in organization, even from other communities, different from those of the tellers; the purpose is to transfer knowledge that ought to be found as easily as possible. Telling a story is generally simple, but providing an appropriate context is not. Many times tellers assume things based on their own perspective.

We can by far observe that some fine points were omitted in the narrative, as for instance the personal and professional information about the participants of the meetings, the explanation and details about some decisions and the specific participation and contributions on the case study building. Therefore, we conclude that other context elements should be highlighted in the framework, and besides people should be encouraged to fill them.

When a participant in group storytelling asserts some fact or makes a comment about some idea presented within the story, he may start a discussion process which can lead to a learning process by the group. Beyond the results, the process of learning is concerned with collaboration. The learning effect is personal to an individual

because it assumes the integration of a new item in the existing mental schema of the individual. Support from another individual (in another mental schema) can only aim at rendering the integration of the new item in their respective mental schemas compatible.

In a group storytelling, not only the story itself is interesting but the way in which the story is built, including opposition and negotiation between people, progressive construction of an episode from fragmented people souvenirs. Generally this entire story building context is lost beyond doubt and the story only presents a minimal dimension with no possibility to be adapted in another context. The shared user context in the writing of a story could be the context (at least part of) of the story. This was not explored in that situation.

The group has recorded most of the knowledge about work they performed together. It was very natural for them to formalize surrounding events and contextual information through storytelling in the level proposed. We could notice that, while participants told their memories, they also explained the situations by proceduralizing their contextual knowledge, re-building a shared context from the whole group.

Besides, participants reported that, after the initial interactions, when they started to learn Tellstory, they reported that it was very easy to use the application. Some restrictions about the interface were related to the visualization of events in the map (when the number of events grows, it is not possible to see all of them in the window) and the comments made to the events (which could be itemized).

The next step is to move the application to an even more formal model such as an ontology which will make it possible not only to explore the relationships among diverse contextual information in deep, but also to infer non-explicit ones. We could think about formalizing the general concepts presented in the current version of Tellstory (characters, place, period, causes, consequences, classification, emotions, keywords) and domain specific contextual concepts (for example, in the domain of the case study: public administration concepts).

6 CONCLUSIONS AND FUTURE WORK

The conditions and constraints of knowledge usage are as important as knowledge itself. Research on context [5] recognizes that the capture, the management and retrieval of explicit organizational knowledge must be considered jointly with the context in which it is captured, recorded and used. The lack of contextualization can lead to knowledge misuse since knowledge cannot be separated from its use.

In this paper, we highlight the importance of identifying contextual information allied to the pieces of knowledge shared within group interaction while performing a task or a project in an organization. Due to the characteristics of this process we propose the group storytelling technique to support context structuring. We exemplify our discussion through the analysis of the data generated in a case study made with Tellstory [19], a groupware supporting collaborative story building, showing the feasibility of this proposal.

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 pointed. A narrative describes the history of a project and its evolution over time. It may not be as complete as, for instance, videotapes of the entire work process, but it does communicate effectively how a project has taken form. By relating changes, problems faced and decisions made, a narrative can help render explicit some of the implicit knowledge the participants used to understand and implement the interventions; in other words, the whole context built up. Thus, one might infer whether the results were applicable elsewhere.

Indeed we recognize there is not a clear distinction between the story and its shared context and this is why the study of context in storytelling domain presents a special interest. Contextual Knowledge could be placed at a meta-level if compared to the narrative, in the sense that it is a framework to classify the pieces of knowledge, enabling the story to be more easily adapted to different situations and also reuse initially abandoned alternatives.

We assume there are different granularity levels for Contextual Knowledge. For example, in our case study, taking the meeting as the focus, at one level, we can notice that the coordinator invited people (a very general context), but at another level, people went there obliged due to a decree (more specific context). The story unifies all the contextual elements providing a global sense to them.

Other kinds of contextual information can be additionally proposed. Asking for other relevant events, but not directly related to the story: What else was happening at the time the event took place? Was that a special date or celebration? (when). Asking for stakeholders: Who else knows about this event or could be interested in this topic? (who). Asking for extending knowledge about the event: What kind of professional information is there about this? What other applications are related to it? (what). Asking for relationships in space: Where else could it have occurred? (where). It would also be interesting to associate Emotions with Causes and Effects.

However, it is important to draw attention not to overwhelm the participants with a large framework and many screens to pass through; otherwise, telling a story would be transformed into a form-filling practice. In our first experiences, we have tried to leave the tellers free to inform just whatever they want, not making any field obligatory.

Besides, there is the privacy problem of providing a detailed and emotional explanation of an event for a broad audience. People may feel uncomfortable to be exposed and thus hide important information about the story. Access to the stories should be agreed among the tellers, so that they will be able to choose what and how to express their impressions.

Formal associations among events (apart of the temporal map of events) have not been exploited yet. The creation of links can provide other dimensions to the same story by allowing increase of shared context dynamics building analysis (as depicted in Figure 4), since the relationships would be formally established.

The template provided by Tellstory is the first attempt to solve the context structure problem. Now we begin to study how to provide an even more formal

structure to the pieces of knowledge captured by adding an ontology format feature to the stories. Ontology will enhance the possibilities of making inferences on the information retrieved and provide the users of the stories with the capability of associating them with their own contexts.

Because stories occur under a cultural and historical context, facilities to bring out background could be provided to assist the user to interactively reflect on and share past experiences with the group, e.g. relevant news that occurred by the time of the event, photographs of the participants and places, reports made about some activity [37]. This could help participants remember important facts, including personal ones, which might probably have affected the story. The current version of Tellstory allows users to upload any kind of documents associated to the story but do not allow classifying them.

Group sense-building is a valuable function of storytelling and electronic storybases can stimulate it by providing facilities such as comments and re-telling. Nevertheless, discussions and disagreements will certainly arise. The forum format provided could be improved using a pre-defined model such as the IBIS [13] as well as the concepts from the Speech Act Theory and its extensions [38, 39]. Thus, information contained in the comments could also be linked and more easily used to group advantage.

Also as a future work, one issue that should be discussed is the identification of the appropriate roles and what their contribution in terms of elements in the collective context linked to the focus could be. Proper interventions made by individuals with specifically assigned roles may result in a story even richer in details. We believe that the basic roles offered by Tellstory could be increased.

Besides, other wide-ranging case studies in time should be carried out in order to evaluate the next step in this process, which is the retrieval of knowledge contained in the stories from the community inside the organizations.

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