

Stories with Emotions and Conflicts Drive Development of Better Interactions in Industrial Software Projects

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ABSTRACT

An earlier study shows that stories with dialogue, emotions and conflicts – similar to fiction writing – give a better understanding of user needs and the situations in which an interface is used when compared to conventional scenarios. This paper describes how stories with emotions and conflicts were accepted as inputs to the definition of requirements in two industrial software projects, and how managers regarded stories as more credible than concise reports. The paper describes how it is possible to use stories with emotions and conflicts in industrial software projects, characteristics of the most useful stories, and how stories can be used to facilitate a dialogue between users and developers.

Categories and Subject Descriptors

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design, Human Factors

Keywords

Stories, human-centred stories, scenarios, software development, emotions, requirements, conceptual design, Sense-Making

1. INTRODUCTION

The value of scenarios in software development is generally agreed and has been documented a number of times. As examples Campbell [2] describes how scenarios may be used to illustrate what it is like to use a system and as a design tool for designers, Rosson and Carrol [20] describe how scenarios may be used through the entire design process, Robertson [18] describes how scenarios may be used to generate requirements, Potts [17] describes how they may be used to validate and illustrate requirements, and Hertzum [10] and Nielsen [16] present empirical studies that show how scenarios were used to create and illustrate a common understanding of the interaction with an interface.

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However, conventional scenarios do not give a realistic view of how users actually may interact with a system. That is a problem when scenarios are used to generate or validate requirements, and it is a problem when scenarios are used to demonstrate the goal of the development process to customers and users. This paper therefore describes how it is possible to write stories that are similar to conventional scenarios, and where it is possible to give a realistic view of users' interaction with a system, and how such stories can be used successfully in industrial software projects.

2. LIMITATIONS OF CONVENTIONAL SCENARIOS

In order to present an alternative to scenarios, it is necessary to discuss why conventional scenarios often give an unrealistic and overly optimistic view of a user's interaction with an interface.

According to Young et al [24] scenarios describe only events, not the motivations or emotions of the actors in them, and Rosson and Carrol state [20] that scenarios are work driven. In contrast, Go and Carrol [8] state that scenarios contain information about user goals or objectives and they use the following as an example of what they apparently consider a good scenario:

Marissa was not satisfied with her class today on gravitation and planetary motion. She is not certain whether smaller planets always move faster, or how a larger or denser sun would alter the possibilities for solar systems. [8]

However, this example contains nothing about the user's goals or objectives. It is simply assumed that the main character wants to learn about planetary motions. There is nothing that describes her motivation for wanting to learn about them, even though it is essential to understand her motivations and personal goals in order to make a design that suits her. At the same time it is obvious that the designers want to include something about planet sizes and movements and about a larger or denser sun in the interface. That is a common problem with scenarios: Grudin and Pruitt [9] criticise that scenarios often are created to justify particular features, and a review of 21 scenarios [22] finds that their plots focus on demonstrating the use of different functions.

When scenarios are used to generate or evaluate requirements, they may turn into a sort of self-fulfilling prophecy. They are written to demonstrate how a particular feature or function may be used, and they are then used to argue that the particular feature or function is useful and can be used as intended by the designers.

Another problem is that scenarios may not be very engaging. They may even be monotonous to read. This will easily lead to a more superficial reading, in particular by people who only are asked to comment on the problems or the future system described in a scenario.

Grudin and Pruitt [9] state that scenarios are dull, because they are not based on engaging characters. They also state that it is possible to create more engaging and realistic scenarios, by basing the scenarios on personas that contain user information from field studies.

However, it is more difficult to use a scenario, if the reader shall refer to a separate persona in order to understand the motivations behind the specific actions in the scenario. In addition, engaging writing requires both an engaging writing style and a plot that can keep the interest of the reader, so even scenarios based on personas may be monotonous to read and not very engaging.

Rodriguez et al have added pictures to their scenarios in order to increase the user involvement [19]. However, their scenarios still appear to be fairly monotonous. Once more, the problem appears to be the writing style.

Rodriguez et al have used role-playing to involve designers in scenarios [19], and Marquis-Faulkes et al have used drama on video to involve users [15]. Both video drama [15] and role-playing [19] created involvement and engaged the audience. However, role-playing may be difficult for designers in some settings – for instance when working alone – and the production cost of a video in sufficient quality is high.

This means that there is a need of a method that is cheap and flexible, that can create engaging descriptions of situations of use, and where the descriptions of the user's emotions and motivations are integrated in the description of the actions done by him or her. Fortunately such a method exists. It consists of applying the techniques that fiction writers have used and perfected over several hundred years.

3. USE OF HUMAN-CENTRED STORIES

I have earlier described how methods from fiction writing can be used to describe interactions with a specific interface [21, 23].

The plots in most fiction writing are driven by the emotions and conflicts experienced by their characters, when they try to overcome obstacles [12]. The writer is then forced to think about what the characters want to accomplish, and not only about which functions to demonstrate, and the conflicts experienced by the characters create a tension that may engage the reader.

The personalities and emotions of the characters are shown directly in the story by describing details of the characters' actions and by using quotes and dialogue as in this example:

When Marissa was small she used to watch television with her older brother and ask him “Why don't the moon fall down?” or “What would happen if we lived on the sun?” She is now in high school. She is interested in astrophysics, but she is afraid to be considered a brainy girl and to become unpopular. [23]

It is possible for the reader to understand Marissa's motivations and emotions, and it is easy to evaluate whether the description of them is realistic or not.

Fiction writing is a familiar genre for most readers, which means that they are used to read and evaluate it. Two earlier studies show in particular that software designers and decision makers in general were used to read and evaluate

fiction literature, and that they preferred stories with conflicts and emotions [21, 23]. In addition, fiction stories normally include dialogue, which assists the evaluation. It appears to be easier to judge the credibility of a dialogue than of a description of a series of events [22], because we are used to judge the credibility of what other people say.

I will describe stories that are driven by the emotions and motivations of their characters as human-centred stories [18] in contrast to conventional scenarios.

An earlier controlled study shows that human-centred stories compared to conventional scenarios offer a number of benefits [23]. Compared to conventional scenarios, the writing of human-centred stories generated 40 % more ideas for new functions and features, because the conflicts in the story forced the writer to think about problems experienced by the user and how they may be solved. The study [23] also shows that the reader of human-centred stories had fewer misunderstandings about the situation of use compared to readers of conventional scenarios. That is probably because the motivations and emotions add another aspect that makes it possible for the reader to create a more reliable understanding of the described events [23].

This seems promising. However, it has not been tested whether human-centred stories can be used in industrial software projects. This study shall therefore investigate whether:

- It is possible to write human-centred stories based on field studies.
- Participants in software projects accept that human-centred stories are used in them.
- Human-centred stories can influence the goals of a software project. If they can do that, it is possible for them to add value to the project.

4. BASIS OF FIELD STUDIES AND WRITING

In order to understand the use of human-centred stories in the present study, it is necessary to know the assumptions and concepts they are based on.

Hughes [11] and MacKenzie [14] see technological development as a process where designers for each version try to identify where the largest improvements are possible with the least effort. When the improvements are made, new deficiencies are identified and new improvements made. This fits my own impression of how software development often is done. It is then not necessary to describe all parts of the interaction with the same amount of details. In contrast, it makes sense to focus on the parts where the largest improvements may be made, and treat other parts of the interaction in a more superficial manner.

This is similar to the focus of stories where the plots are driven by the emotions and conflicts experienced by their characters. Such stories will naturally focus on the situations where their characters experience the biggest problems.

I used Sense-Making methodology [6, 7] during the field studies that provided material for writing the stories. Similar to the concepts of software development and human-centred stories, this methodology tends to focus on the situations where users experience the largest problems. One way of applying the methodology is by asking users to describe situations in their work where they faced a problem, what they wanted to accomplish in the particular situation, the information they found useful to solve the problem and what they afterwards believe could have helped them to

Table 1. Overview of the two projects and the activities in them.

Project	First	Second
Application	Call-centre	Information terminal
Product	Upgrade	New
Project type	Customer	Market driven
Existing user information	Collected by expert users	From user interviews
Field study interviews	7	3
Total number of pages in stories	18	13
Story type	Problem	Vision
Meetings with project members	5	3
Follow-up interviews	Two participants	One participant

solve the problem [6, 7]. The users will then naturally focus on the parts where they experience the largest problems and where improvements may offer the most benefits. (This is in contrast to Contextual Enquiry [1] where all steps of the work process are described with the same amount of details.)

The stories are what Cheney [5] describes as creative non-fiction or new journalism, where dialogue and other methods from fiction writing are used, but where all details are based on precise field studies. (An outstanding example of this type of writing can be found in Capote [3]. Another example is Casey [4] who uses the same methods to illustrate problems that have occurred with software and different technical systems.)

Even though the stories use methods from fiction writing, they will in most cases not be fiction stories in the normal sense of the word. Fiction is a designation of something that does not exist: something imagined.

The stories may have different types of realism. A story may be strictly non-fiction, so all persons and events are described as precisely as possible as they have occurred. A story may be contextually and emotionally realistic, so the work environment and the conflicts and emotions that may be experienced by users are described as precisely as possible, whereas the dialogues and specific situations described are composites based on a number of events and characters. This makes it easier to focus on the most critical situations experienced by users than if a story is strictly non-fiction, and it eliminates any problems that may arise if real users are described in a story that later are discussed in the user group. Finally, a story may be functionally realistic. In that case, for instance delay times and other problems experienced with a system are described as precisely as possible.

The different types of realism can be combined in different manners. A realistic description of the interaction with a piece of software will normally require that a story is both functionally and emotionally realistic. As described earlier, a conventional scenario, where the functionality of a piece of software is realistic, may be a good illustration of a possible use of its functions, even though it is not emotionally realistic.

Similar to Rosson and Carroll's [20] concept of vision scenarios it is possible to write stories that describe how the

situation of use may be with a new interface that solves some of the problems. The story will give a realistic description of the context of use and the emotions of the users, but it will include a new non-existent interface that may be more or less realistic, depending on the extent it is based on information about what is technically feasible.

5. METHOD

I participated in two industrial software projects in 2005-2006. The projects were done by two companies with different cultures; they covered different types of interfaces and user tasks, the first one was customer specific and the second was a standard market product. Table 1 shows an overview of the projects and activities.

The first project was the definition and implementation of improvements in a new version of a call-centre application. The application was part of a highly automated system for processing customer orders. It was used by operators who received customer enquiries and did other operations that required a human intervention. The second project was the development of a new hand-held terminal to give managers access to information from a company's system when they were away from their desk or computer.

5.1 My involvement in the projects

I was contacted by one of the managers of the first project, whereas I established contacts with the second project through an intermediate. In both projects I negotiated with the managers and agreed on a plan and the goals of a study. The stated goals were limited in both projects, because the managers felt they already had a substantial amount of information about the users and their needs. In the first project I should provide information to prioritise an existing list of suggested improvements, whereas in the second project I should identify additional features that could increase the value of the product.

Both projects had collected some information about the users and their needs when I became involved. In the first project a number of expert users in the call-centre over a three-week period had produced a list of the improvements they felt were most necessary. The members of the second project had talked with fifteen or twenty different customers and in addition collected a large number of pictures of analogue instruments and displays as inspiration.

This meant that neither of the projects depended on my work. The managers could choose to discard the stories I wrote and complete their projects with the information they already had about the users and their needs.

My work in both projects progressed in a similar manner. After having agreed on the goals and a plan for each study, I conducted field studies and wrote human-centred stories based on them. Both the field studies and the writing of the stories followed the earlier described principles. The human-centred stories were linear with focus on the actions of the characters, and with so many details that it was easy for the reader to imagine each situation of use. During and after the writing of the stories I had a number of meetings with other project members and as in other development projects we were in contact by phone and E-mail.

My involvement in the projects was close to what Kristiansen and Krogstrup [13] describe as ideal for participant-observation. My involvement gave me access to meetings and informal conversations in each project while being regarded primarily as a participant in it, and I was still so much of an outsider that it felt natural that I asked questions about what I noticed. (The participants in both

Table 2. Overview of results from the two projects.

Project	First	Second
Use of stories accepted	Fully	Fully
Stories were distributed to	Managers Developers	Managers Developers Users Superiors
Story contents accepted	Yes	Yes
Influence on software dev.	Decisive	On some features

projects were informed that my activities also were part of a research project.)

5.2 Capture and processing of results

I noted down all events and my own reflections during each project from my first contact and until my involvement was completed. In addition, I conducted an interview with the project manager and the leading software designer in the first project and an interview with the project manager of the second project. These interviews gave information about the impression and use of the stories that it was difficult to get during my participation in the projects. The interviews were arranged after the stories had been used in the projects, in order to avoid that the interviews influenced how the stories were used. Each interview took about forty minutes, and both interviews were recorded and transcribed.

When the projects were completed, I compared the results from the participant-observations and the follow-up interviews, and I analysed the special circumstances that appeared to have influenced the results in the two projects.

6. RESULTS

The methods section describes the settings of the testing of the method and how the evaluation was done, whereas this section describes the method that actually was tested. The first part describes the feasibility of the method, whereas the second and third parts describe how successful it was. Table 2 shows an overview of some of the results.

6.1 Writing of stories based on field studies

Before writing the stories I had attended a creative writing course and written stories that were used in earlier studies [21, 23]. This means that I had some writing experience without being a professional fiction writer.

In the first project I had studied the operation of the system in advance, whereas I had not had an opportunity to get acquainted with the operation before doing the interviews in the second project. This meant that one of the users had to spend a substantial part of the interview explaining his department's operation to me. However, there was still sufficient time to identify the most serious problems experienced by him.

In the first project, I spend one day interviewing seven users and in the second project I spent about three hours interviewing three possible future users of the terminal. When using Sense-Making, it appeared that the users in each project agreed about the most serious problems, so these fairly low numbers of users were sufficient.

The interviews were all done at the users' workplaces. This made it easier for them to explain the problems they

The next call sounded as a tired woman's voice. Kristine entered the woman's phone number and the bar at the bottom of the screen started to move slowly from left to right. She could feel the silence in her headset. Thomas stared intensely at his screen without moving.

"What shall I do?" she whispered.

"You must make small-talk until it gets through. That is when the system is slow."

"How?" she asked.

"Just say something."

"The system is searching," she said. "It is a little slow."

"I know that," said the voice in her headset. "When it is busy, you cannot get through."

Whew, thought Kristine. A little sympathy instead of another blow-out.

The bar reached the right side of the screen and the woman's status information came up. Kristine scrolled down through it.

"There appears to be a problem with the contract. I just need to open it."

"Then we will have to wait again," said the voice in Kristine's headset.

"Now something is happening. I think it is coming."

Kristine could hear that the voice in the headset was talking to someone else. A moment later it was back.

"Are you still there?" it asked.

An electronic copy of the contract appeared on Kristine's screen, like a curtain being pulled down slowly.

"Yes, I have to look down here," said Kristine. She scrolled down. "It looks as if you have forgotten to sign the contract. I will have to send you a new one."

The other one said something inaudible and continued: "Then I have to return it again."

"Yes, then it should be all right."

Box 1.: Part of story used in the first project (translated from Danish)

experienced to me. In addition, I found that the writing of credible and engaging human-centred stories required that I had seen the environment with all its details and had an impression of the general atmosphere of the workplace. This means that it is not possible to write a credible human-centred story based on a factual report from a field study. Such a report will normally leave out most of the details required for writing a credible human-centred story as for instance what the furniture looks like, how people dress in the workplace, ways of speaking and details in their interactions that are not directly related to their work.

In both projects I typed up my notes immediately after the field study, created the general structure of the story and then inserted details about the work environment based on my notes. The writing of stories in each project took about two days. In the first project I wrote a continuous story with a number of episodes that each illustrated a specific problem; in the second project I wrote two shorter stories that illustrated different situations of use. Part of the story used in the first project is shown in Box 1.

In order to drive the plots of the stories it was necessary to describe extreme but realistic situations of use. In the first story that was accomplished by focusing on a new operator who should learn to use the system. This approach made it possible to include dialogue by letting the operator ask for advice. In the second project the work situation was so demanding that just getting through the day provided a good plot for a story.

Sense-Making focuses on the users' subjective impression of problems. It is therefore essential that their information is validated by information from other sources. In the first project I visited the call centre together with the leading software designer, and during our discussion with users we found that three of the apparent usability problems had occurred because the users had not learned how to do the tasks properly. This means that what the users' comments indicated were usability problems, turned out to be training problems.

6.2 Acceptance of stories

A good indication of the acceptance of the stories is how widely they are distributed in projects. In the first project the manager and the leading software designer decided that all software designers who were going to work on the project should read the story in order to experience the system from the users' point of view. In the second project the manager and all members of the development teams had read the story and part of it had been used in a presentation of the project.

The participants in both projects liked the writing style of the stories. They agreed that the stories were easy to read, and that it was easy to understand the situations of use. The leading software designer in the first project observed during the follow-up interview that the writing style was similar to a good suspense novel without any "long fussing around" with "pictures, metaphors and an anecdote before we continue." This was in agreement with the writing style I had intended.

Even though the stories gave a good description of the interactions and situations of use, my contact persons all agreed that they also would like to have pictures of possible interfaces or situations of use.

The stories were regarded as credible descriptions of situations of use. The story in the first project had a fairly long introduction that described what the call-centre looked like. Both the leading software designer and the project manager commented that they were surprised that the story did not start directly with the use of the system, but they agreed that the introduction made the following parts more credible.

The manager expressed that she accepted all problems described in the story as real because of the dialogue, the detailed descriptions of the events and the consistency of the stories. The leading software designer said that he would have rejected most problems if he had seen only a list of them: "I had said, I know that problem, I have heard about it before... If you get a number of points [a list of problems], system knowledge means that you tend to be prejudiced. The stories give you another view."

The story in the first project included boxes with information about the number of users who had commented on each problem. However, the information in the boxes did not seem to have any influence on the credibility of the story.

In the first project the leading software designer commented that the story made him feel that he already knew the call centre and that the story made him see the problems from the users' perspective. One consequence was that when we visited the call centre, he had already accepted the problems before we had met the first user, so our meeting could focus on finding ways to solve the problems.

In the second project the manager said that he had worked with the stories for a total of one full day, and that he had used them as an inspiration for new features. They were clearly accepted as working documents in the project.

The stories were accepted as credible and useful for communicating information about situations of use, but I was also told that they were not so systematic and detailed that they could be used to document the actual software design. The project manager and the leading software designer in the first project stated clearly that they needed a list of required changes or another type of condensed and systematic information as a basis for designing and implementing the improvements. They said that the story gave credibility and a lot of associations, but that it was not suitable as a working document during the development process. In a similar manner, the manager of the second project explained how he had translated the contents of the stories into a format that could be used in the design of the software.

It is not feasible to do software development through an iteration of stories. Information from meetings and comments shall instead be added as notes or comments to the story used in the project. The leading software designer in the first project stated clearly that he wanted to read a story that described the background and situation of use when he started on a new project, but he did not want to spend time reading a new story describing each new iteration in a project.

6.3 Influence on software development

In the first project the story had a decisive influence. It turned out that only one or two of the problems I had identified and described were related to the improvements that expert users earlier had collected over a period of three weeks.

However, after having read the story the leading software designer and other managers decided that it was necessary to do something about nineteen of the twenty problems described in my story, whereas the list of improvements collected by expert users were discarded. The leading software designer added that it was very unusual, that he agreed something should be done about such a large proportion of the problems that were presented to him.

In the second project the stories had a general influence and lead to the addition of some new features. When I became involved, the design focused on the display of numerical information. However, the participants in my field studies described situations where they needed notes and other text that explained the numerical information. That was included in the software of the terminal.

Other features described in the stories in the second project were similar to the results of earlier interviews done as part of the project. The manager of the second project commented that it was valuable that the stories gave an independent confirmation of their earlier design choices, and that the stories had made him realise that their terminal was a more general tool than they previously had envisioned.

7. DISCUSSION

The projects were small industrial software projects of different types and in different companies. I wrote the stories, but otherwise my influence on the decisions in the projects was negligible, in particular because I clearly had described to the managers that the use of stories was an experiment.

In both projects the managers had other sources of user information, so they could continue without using the stories at all. This means that the results of the current study in that aspect are more reliable than the results of other studies where the evaluated method is the only source of

user information. In this case, with competing information, the tested method could only be successful when the managers felt it made a positive contribution in addition to existing sources of user information.

The comments indicate that the quality of the stories was sufficient, and it appears they are on a level that is attainable by someone who has followed a brief course in creative writing.

The results of the participant-observation and the follow-up interviews in the two projects are in good accordance, so it is possible to determine how successful the use of stories may be in other projects. This means that the present study gives a valid impression of how human-centred stories of the quality used in the projects may be used in other small industrial software development projects.

8. CONCLUSION

The results of an earlier study [23] indicate that a minimal training in creative writing is sufficient to write human-centred stories that illustrate actual situations of use or possible future use of a new interface in the existing usage context.

The results of the present study demonstrate that it is possible to use the method in the requirement phase of time-critical software projects. It may be possible to do a field study as a basis for a story on Monday and Tuesday, and on Friday morning to distribute a completed story that show the most pressing needs of the users or how a new system may be used.

The results show that it is advantageous to study the relevant nomenclature and work routines before doing the interviews. Given that, the results show that from a few hours to one day of Sense-Making interviews combined with a visit to the workplace to experience the atmosphere is sufficient to write a credible story. The story shall be based directly on information from the user study, because a normal report of a user study leaves out details that are necessary for writing an engaging and credible story.

Interviews with users can only give their subjective experience of the different problems. In order to understand the background or causes of the problems, it is therefore necessary to acquire information from other sources or to enter a dialogue about the problems. The results show that human-centred stories may facilitate such a dialogue. They make it possible for developers to see problems from the users' perspective before they meet the users and start discussing with them.

Human-centred stories were accepted in both projects without reservations, and they were distributed to a number of participants and stakeholders in both projects.

The participants preferred stories that were similar to well-written suspense stories, where the plots are driven by realistic conflicts and emotions, and where focus is on the actions more than the emotions of the participants. The plots in such stories may be based on a user's attempts to complete a task in the most difficult realistic work situation.

The stories were considered credible because of their internal consistency, realistic dialogue and detailed descriptions of situations and the work environment. This means that human-centred stories probably are regarded as more credible than scenarios with fewer details and without a realistic dialogue. In particular because it appears that software developers are used to read and evaluate fiction literature. This suggests that a conventional scenario without realistic dialogue and details will not be considered more credible, if personas describing the characters and their

motivations are added to it. It also suggests that badly written stories with emotions and conflicts may be regarded as less credible, in particular because the credibility requires what normally characterise good writing.

Even though the stories described a large number of details, the participants expressed clearly that they would like to have illustrations, for instance pictures of the environment where the story took place or of an interface used in it.

The results indicate that participants find it cumbersome to read an iteration of stories in a project. Therefore it is better to indicate changes or additions by adding notes to the existing story. The participants also indicated that they needed more concise and structured technical descriptions during the development process. It is therefore not feasible to use stories as the only working papers during the actual software development. This is in accordance with Young et al [24] but seems to contradict Rosson and Carroll [20] who describe the use of scenarios as the only working papers through a design process.

Human-centred stories can have a decisive influence on software development. In the first project the development was based on the contents of the story, whereas the earlier produced list of problems was discarded. In the second project the stories influenced parts of the design where their contents were different from what already had been planned.

It is possible that human-centred stories can be used to get feedback on a proposed design from a large group of users and shareholders who find it difficult to evaluate a description of a proposed interface. Human-centred stories are easy to read, they involve the reader, and they make it possible for the reader to experience what the user goes through when using an interface and overcomes obstacles to reach his or her goal.

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