Using Project Wiki History to Reflect on the Project Process

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Abstract
In this paper, we address the potential of project wikis to support reflection on the project process through participants’ reconstruction of the project trajectory. Drawing on a case study of software engineering project work, we illustrate how information on project history can be found in a project wiki and may be used to support recall of and reflection on the process. We discuss implications for postmortem project reviews by considering how the utilization of project wikis could address some challenges to successful reviews. We also propose extended wiki functionality that can be used to make a more selective review of project history based on user-tagged contents.

1. Introduction
Software engineering (SE) work is acknowledged to be complex, as elaborated in the literature [1, 2] on computer-supported cooperative work (CSCW) and demonstrated by the frequent SE failures [3]. Understanding the history of a SE project is essential to SE practice in two ways: In day-to-day coordination and project management, and in learning from the project experience. Such learning can be seen both as an intrinsic aspect of work [4, 5] and as means for achieving organizational learning within and across projects [6-8]. We might also add that in the field of education, project work is acknowledged to be a particularly effective setting for learning [9].

This paper addresses how project wiki history can support postmortem reflection on the project process. The paper does not address why a team should choose to use a project wiki, or how project wikis compare to other project management tools. We take as a starting point the acknowledgement that many teams currently do use project wikis for lightweight project management. We argue that there is more to these wikis than what can be seen in day-to-day project management: there is a lot of historical information with a potential to shed light on the project history.

In proposing this approach to improving SE postmortem reviews, we address some recognized challenges to making such reviews successful. We also present the design of a wiki extension which can be used to support the approach. A prototype of the wiki extension has been developed and is briefly presented in the paper along for a scenario of its use. We do not provide complete guidelines for a postmortem review utilizing wiki history.

Theoretically, we lean on the work of A. Strauss and the concept of trajectory. We see an SE team’s reconstruction of its project trajectory as essential to reflection on the project process.

The paper is structured in the following way: The Background section addresses some core concepts and related work. In Section 3 we present our case and research method. In Section 4 we draw on a case study to show that project wikis have a potential to support reflection on the project process. In Section 5, we discuss how project wikis can be used to address some challenges to postmortem reviews. A tool to improve the usefulness of project wikis in such reviews is described in Section 6. Section 7 addresses limitations and further work and concludes the paper.

2. Background

Three issues provide a background for the following chapters and are addressed in this section: How trajectories play a role in reflection, the practice and challenges of postmortem reviews in SE, and the use of wikis as lightweight project management tools in SE projects.

2.1. The role of trajectories in reflection

Dewey defined reflective thought as 'active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions in the direction of which it tends' [10, p.133]. In this paper, we consider reflection as a process of assessing something (e.g. a product or a sequence of events) in
respect to some quality and with respect to alternatives. For instance, in reflection on a process, the congruence with, or deviation from, some other process, whether real (e.g. the process of a previous project) or imagined (e.g. an alternative course of the same process, or the ‘ideal’ process as prescribed in a model) will typically be considered.

We subscribe to the view that human activity is basically social [10, 11] and that reality is socially constructed [12]. Individual members of a social world, such as a project team, belong to different social worlds and have varying degrees of involvement in these worlds over time [11, 13]. Reflecting on project experience involves the alignment of different participants’ perspectives.

Strauss [11] refers to Mead on the issue of how a social world reflects on its history: “The temporal spans of group life mean that the aims and aspirations of group endeavor are subject to reviewal and recasting. Likewise past activities come to be viewed in new lights, through reappraisal and selective recollection. ...History, whether that of a single person or of a group, signifies a ‘coming back at self’ (Mead 1936).” Strauss uses the term ‘trajectory’ to denote “the course of any experienced phenomenon as it evolves over time”. Events as they unfold, e.g. in a project, form a trajectory, and from each point in time there are many possible trajectories onwards.

Taking the “experienced phenomenon” into consideration, different individuals’ trajectories will be different even when they largely comprise the same events. What ‘actually’ happened, is a question of interpretation and reconstruction. Also, trajectory is given meaning in a particular situation of use [14]. For instance, the same sequence of information elements presented after an intermediary deadline in a project will be seen in a different way if used for purposes of coordination rather than to learn from the process. In sum, there is a lot of trajectory context which is not available from its representation (e.g. a textual description). Strictly, then, a trajectory is not a sequence of single elements of information as (re)presented, but as used. For practical purposes in what follows, however, we will frequently refer to ‘trajectory’ as the trajectory as represented, e.g. a set of information elements, chronologically ordered. Doing so, we keep in mind that the representation will gain meaning through situated sense-making – the essence of the sought-after reflection.

2.2. A case of reflection: SE postmortem reviews

We now turn to reflection as part of software engineering (SE) work practice. SE work is typically performed in teams and structured as projects. The trajectory of a SE project is typically guided by a lifecycle model incorporating phases and iterations. Options range from strictly and moderately structured models (e.g. traditional waterfall, RUP) to agile approaches (e.g. XP, SCRUM) [15]. A process model typically specifies or recommends a division of labor and a set of artifacts to be used and produced. Generally, deadlines for project deliverables heavily impact on the day-to-day experience of SE project work.

To cope with the complexity of work and avoid the all too frequent failures in SE projects, efforts are needed to understand project history beyond the status information needed for day-to-day articulation work. We will point to three major activities for which it is useful to review project history for purposes of reflection. First, capturing and making explicit the design rationale has been seen as important to developers’ understanding of the system and as a source of learning for new team members [16, 17]. Second, postmortem reviews are conducted to learn from experience within and across projects in an organization [18]. Third, supervision of SE project teams in educational settings involves gaining understanding of, and providing advice for, the project process [19].

In what follows, we will focus on postmortem reviews. What is commonly known as a postmortem review is a collective learning activity organized for a project that has either finished a major activity or phase or has ended. Postmortems are conducted to reflect on what happened in the project in order to improve practice for individual participants and for the organization as a whole. A post mortem report is part of the review result. Several approaches to postmortems have been proposed in the literature and taken into use in industry. The process typically takes from half a day to three days and is guided by a facilitator. Different approaches diverge over issues like homework or not, structured vs. open discussion, presence of management, appropriate output (e.g. how to make a useful report) and learning focus (tacit or explicit knowledge). The approaches provide lists of steps in the review process [18]. A problem with postmortem reviews is that they are not heavily used in industry despite the recognized need to learn from software engineering failures [20]. IT (Information Technology) specialists point to a number of barriers relating to set-up, data collection, data analysis and knowledge sharing. Some of these challenges relate to the availability of relevant information on the project process and the means available for structuring that information. Three of the barriers [20] (pp.77-78) are:
1) “Insufficient integration with existing learning systems: [...] (e.g. reporting systems, quality control systems, and informal knowledge sharing).”

2) “Simple information and complex issues: Information used in post mortem evaluations is limited and simplified compared to the complexity of the issues involved in system development.”

3) “Information overload: Post mortem evaluations are overwhelming because there is too much to reflect on.”

2.3. The use of project wikis as lightweight project management tools

To address current usage of project wikis and the types of information contained in the wikis, we refer to a case study reported in [21]. The case is an undergraduate project course in software engineering (SE). The projects are organized to be as close to industry SE projects as possible. Teams of 3-5 students work half time on their projects throughout their sixth (and last) semester in a Bachelor of Informatics study program. Each team has an external customer providing a development task unique to that team. The customer is responsible for providing necessary information on requirements and feedback on the development of the product. Further, each team has a supervisor from course staff providing guidance on the project process. The project deliverables includes a report in three versions, as well as a working software solution for the customer. Strong independence on part of the students is required. The teams are responsible for managing stakeholder communication and project organization as well as choosing an appropriate process model and development and collaboration tools. Four out of the nine teams in the 2007 cohort of our case made use of project wikis, and three teams were active wiki users throughout the entire project. Two different wiki tools were used in the 2007 teams: DokuWiki and MediaWiki.

An exploratory case study was made by this author on the role of the wikis in these projects [21]. The researcher was course coordinator, but did not evaluate the projects. Access to the wikis was granted for purposes of research. Data for the study also comprised interviews with the teams as well as various project documentation. In the study, the project wikis were found to serve an integrative role along several dimensions of project work, enabled by the flexibility and automatic support for capturing history offered by the technology [21]. These findings demonstrated that the project wikis simultaneously served as knowledge repositories, means for staging the projects, coordination mechanisms, and shared workspaces.

The more purposes for which a project wiki has been used, the greater the potential to find useful information there about the corresponding aspects of project work. For instance, if day-to-day coordination and allocation of tasks to team members is done with the aid of to-do-lists on the wiki main page, it is possible to use the wiki to reconstruct who did the work in various areas over time. If emotional expressions related to the experience of project work have been added to the wiki, the wiki may be used to reconstruct at least part of the story of what it was like to work in the project over time.

A content page from a project wiki is shown in Figure 1. This is the upper part of the main page of the wiki referred to in Section 4, and the particular page revision is from April 16, 2008 at 12:13. A project main page typically contains overview information about the project, e.g. news bulletins and to-do-lists, and links to various information useful to the project team.

Below the header there are links to previous and next versions of the page, making it possible to chronologically traverse page versions. Surrounding the user-created contents of the page are menus providing access to various functionality, e.g. to switch to editing mode, contribute to a discussion of the page, or view its history. Whereas this type of functionality is representative of wikis in general, the exact design shown is specific to DokuWiki.

![Wiki content page (Main page of team A)](image)

Figure 1. Wiki content page (Main page of team A)

On basis of contents pages, the links between them, and the various page revisions, wiki tools offer meta-pages with synthesized information. This includes overviews of all pages, the history of changes to one
page, all revisions of a page, and the difference between two specified page revisions. The upper part of a history page is shown in Figure 2. The page revisions are listed chronologically, with links to each of them. From the list, it is possible to see who edited the page, when it was done, and what part of it was edited (if specified). Also, it is possible to see the difference, e.g. changes, between any two versions of the page.

Figure 2. History page of the main page in Figure 1

For purposes of day-to-day project management, for which timely status information is essential, functionality for extracting synthesized information from the project wiki is useful. For instance, all the teams in our 2007 study reported that the history function in the wiki was occasionally used during the project to identify team members’ contribution.

When the purpose of extracting information is to have a review of project history and reflect on the project process, the numerous content page revisions and the history pages providing overviews of these revisions are an interesting resource. In what follows, we will investigate the potential to use this resource for such a purpose.

3. Case and research method

Two of the post-mortem interviews conducted in the case study referred to in Section 2.3 were facilitated by the use of the team’s project wiki. These interviews turned out to shed light on the wiki as a means to support recall and reflection on the process after project completion. This issue was singled out as a separate research topic, and the resulting research is described in this paper.

To present and substantiate our findings on wiki-facilitated reflection, we have chosen to focus on one of the wiki-aided interviews. By focusing on a single case, we aim to provide a coherent account of how the traversal of wiki contents can shed light on a particular project process. The interview was conducted with the team manager of Project A one month after project completion. An interview guide with a number of questions was used as a checklist in the interview, but issues were generally explored as they emerged in the conversation. The 96 versions of the wiki main page were chronologically traversed during the interview, starting with the first revision dated February 1, 2007, and ending with May 23, 2007, the day of project delivery. The project wiki was a DokuWiki [22].

As the main page was the central page in the wiki in terms of project status information and coordination, the revisions of the main page became the basis for the interview. Links to other pages were followed whenever suggested by the interviewee and in some cases the interviewer. The interview lasted for 2 hours and was partially summarized in detail, partially transcribed. Wiki screenshots were added to the summary/transcript to make a coherent basis for analysis. Interview excerpts considered relevant for publication were translated from Norwegian to English at need. The wiki contents were originally in English.

Data sources used in the analysis include the researcher’s thorough examination of the project wiki, various other project documentation from the team, a post-mortem interview with the team supervisor, the customer’s project evaluation, and an interview conducted with the entire team earlier in the semester. During analysis of the interview, we identified excerpts reflecting the interviewee’s recall of, or reflection on, the project trajectory with reference to wiki contents. The findings reported in the next section are based on these excerpts and the referred to wiki pages.

4. Recall and reflection through project wiki traversal

In the interview with the Project A manager (hereafter called TB), the interviewer went chronologically through revisions of the wiki main page, visiting other pages (content and history) as need. Interviewer and interviewee were sitting next to each other in front of the interviewer’s computer screen.

In this section, we provide examples from the interview illustrating how information from the wiki is actively used in a process of recalling and reflecting on the project process. In each example, one or more
content pages, history pages or a combination of both are used.

The following contextual information may aid comprehension of the first example: The customer was located in another city throughout the project. As the team was to develop a module in a larger system, it was important that the team follow the customer’s coding conventions.

4.1. Example 1: The introduction and use of the customer’s page

On the wiki main page, under the headline ‘News bulletin’, there is a bullet point with a link stating: “Useful information and tidbits! Step right up and get it while it’s hot, folks”. As TB clicks on the link, he enters the customer’s page. On top of the customer’s page is a contents list with the header “Information from <Customer Name>”. The contents mainly address technical issues such as coding conventions. For instance, the first section is called “If, foreach etc.” and starts with “Always use curly braces when writing blocks.” A code example is given in the section.

TB goes to the history page. Looking at the information there, it can be seen that the page was created by TB in February, and that it has been updated by the customer only, in the period until early March. TB explains that he created the first version of the page based on an email from the customer with some guidelines for development. Then he had provided the customer with access rights to the wiki and a link to the customer page. After this, the customer continued using the page to provide the team with information, mostly non-functional system requirements and guidelines about how to use a framework written by the customer. The interviewer asks why there is no more information in the later phases of the project, and TB explains that the team knew how things were to be done then.

In this example, TB uses the content and history of the customer page to account for a form of collaboration with the (remote) customer and how it was successfully initiated by the team. The interviewer’s follow-up question leads to reflection on the status of the project halfway in the project period: in TB’s opinion, the team at that point was in control of non-functional requirements and mastered the way of doing development required by the customer.

4.2. Example 2: Conveying urgency

TB looks at the main page on May 3. at 22:36. The first item in the News bulletin starts with the words “UN-FREAKING-BELIEVABLY URGENT” in upper case, red, boldface letters immediately drawing attention to that part of the page. In the next page revision, created 23:31, the font size is even larger. When the interviewer comments on this, TB says that the change shows the development and “a few psychological reactions, sort of”.

In this example, changes between page revisions are a source of recall and reflection. Changes made from one hour to the next conveys a snapshot of the project; a taste of the experience of doing project work under conditions of perceived urgency. In the example, TB points out how the web site reflects the feelings involved – his feelings at the time, as it were.

4.3. Example 3: A developing to-do-list

TB looks at the main page as it looked on May 3. In the news bulletin, there is a new item on top with a link to a Final Report to-do list. TB explains that they had to branch out a task list. He goes to the ‘Final Report TODO’ page and then to its history page. He notes that all revisions have been created by another team member and comments that this team member had main responsibility for updating the page. The interviewer traverses many revisions of the page from the period May 3.-8. In these versions, new to-do-list items are steadily added and at one point the list is restructured to contain sub tasks. The tasks gradually become marked with strikethroughs. TB comments that some structural changes can be seen from the development of the list. He comments on the adding, removal and crossing out of tasks, and laughs while explaining that “it isn’t that funny when things get added”.

On the page of May 9. a list of team members’ names followed by their initials have been added at the top of the list. In subsequent page revisions, the tasks become appended with initials. TB explains that this is about distribution of responsibility.

As the interviewer browses more page versions, it is apparent that there are many versions from May 9. TB says that maybe the team at the time had “some mock-arrangement to hand in”. He explains that their supervisor liked to have the team make deliveries of preliminary versions to him before the big deadlines, and that the team appreciated this “because there was an extreme time squeeze towards the end when we had to work on the project, the code, and we had as good as finished the report then. And that was ...very good. Or else we would not have been able to finish.” The interviewer asks if this means that their supervisor had stressed them a lot to get going with the report. TB confirms this and says that he would in fact recommend to supervisors to stress the handing in of
intermediary reports. Also, he would recommend that teams conduct mock presentations.

This example shows how the wiki documents project management practice (e.g. the active use of to-do-lists) and the status of task completion over time. The ‘distribution of responsibility’ indicates how the management of remaining tasks became more meticulous towards project deadline. Some feelings associated with this process and phase are reflected upon by TB: the frustration of having to add new tasks at a point when one would wish to see the list shrink. The number of revisions of the page on a particular date, and the amount of changes done then, reflect to the team member that there was something particular going on. He reconstructs (rather than recalls) that most likely there was an intermediate delivery going on, explaining this as an established collaboration practice between the team and their supervisor. TB reflects on the adequacy of this practice, arguing why it was beneficial to the project. He also draws the perspective further, generalizing to supervised project work (e.g. in the course) when recommending supervisors to require intermediate, mock-up deliveries to help project teams complete important work on time.

4.4. Example 4: Project work during final spurt

TB and the interviewer are looking at the main page from May 23. This is the very last phase of the project, two days before delivery. There is an item on top of the News bulletin list, with a link: “Smarty stuff contains some Smarty functionality to be used in our templates”. The interviewer asks what this is. TB starts explaining what he thinks it means, but then remembers and corrects himself: TB: “It is in fact.. It was the last night, that one. When we sat fixing the code. And added functionality that we had not had the time for yet. So it is really just.. things that should have been there some months before. To put it that way. Not a day before. But what to do…”

In the page version from 04:41 on the same night, the item ‘Sudden realizations’ has been included in the News bulletin, with the following sub item: ‘person_event.paid is currently not considered! How would this fit into our design at all?!’. The interviewer asks a bout this, and TB explains that it refers to a very important thing that they had forgotten. But luckily they managed to fix it on that night. The interviewer asks if they were sitting together in the team at the time. TB says yes, but then corrects himself based on the time of the page revision: “No, that ‘sudden realizations’, that, let’s see, 04:41, it must have been me remembering ‘No! Shit!’ before I was about to go to bed, and then I went into the wiki quickly, because I had to remember it for the meeting the next day.” <..>

“So I guess there’s no more activity that night..” The interviewer goes on to the next revision of the page, in which another bullet point has been added: TB laughs and says that that, too, was remembered suddenly and later fixed.

On the page version of May 23, 22:22, even more ‘Sudden realizations’ have been added. TB comments to the page: “Yes, now we <the team> sit, here we are ..21:56..” B:”Yes, right, there are the things you remembered, now you have had a meeting”. TB:”Yes…eh.. looks like it.. []

In this example, events during the last night and day of the project are reconstructed. TB reflects about work that should have been done earlier, on stress, effort and luck. He uses detailed information from the wiki page (exact time of the revision) to reconstruct how he used the wiki at the time: as a means for capturing his ideas in the early morning hours (in his bed, from his home), to remember for the next day’s team meeting. TB thus accounts for the work practices in the project under the extreme conditions of final deadline approaching. Trying to reconstruct this exceptional phase, TB actively uses the time information on the page revisions. Occasionally the information requires some thinking to make sense. (E.g.,May 23, 04:41 is the workday/night before May 23, 22:22).

4.5. What can be seen from the examples?

The findings show that at project team member’s facilitated traversal of a project wiki leads to recall of, and reflection on the project process. The wiki does not contain a coherent account of the process, but the contents are rich enough for the project manager to reconstruct a project trajectory piece by piece.

Information in the wiki triggering recall and reflection include time data (date and time of day of a revision, sequence of revisions, frequency of revisions), authorship, page content, and page appearance.

Issues being recalled and reflected upon include particular project events, project phases, collaboration within the team and with other stakeholders (e.g. roles and responsibilities, and the use of collaboration technology).

Some more specific observations are:

- Sequences of events are reconstructed with the aid of information about the time of each revision.
- Comments and reflection about the use of the wiki in the project often leads to reflection on the project more generally, e.g. events, phases, practices and collaboration structures.
The development of to-do-lists over time is a good source of information on project management.

In periods in which the density of wiki revisions is high, the changes provide a picture of the ‘there and then’ experience, as in the final project spurt.

Facts as well as feelings are addressed in the review. Contents that appear to have been emotionally laden as they were added to the wiki (e.g. the red, boldface and growing “urgent” message), evokes emotional reaction (in our example: laughter) in the interview situation.

Reflection may extend to SE project work at large, e.g. lessons learned and suggested guidelines for projects or project courses.

5. Benefits of reviewing project wiki history in postmortem reviews

Having seen how a postmortem interview can be aided by the use of a project wiki, we now return to the selected challenges of postmortem reflection listed in Section 3.2. We will have a look at each challenge in turn to see how it can be addressed through suitable use of a project wiki. In doing so, we propose some wiki functionality that would be useful in this respect.

5.1. Using project wikis to integrate with existing learning systems

The project wiki itself as used in our case study can be considered a part of the organization’s learning system. The information about the project process found in the wiki includes elements of evaluation of the process itself, formally or informally produced and conveyed. Examples are project status reports and emotional expressions of state-of-affairs. Later use of this information in a postmortem review is a way of turning to account learning that has already taken place, developing insights further as they are viewed in hindsight and by different team members.

In addition to utilizing the history resulting from day-to-day use of the project wiki, it is possible to use the wiki to provide closer integration between the work process and the identification of issues important to understand and reflect upon the process. A quick and easy way of tagging and/or annotating wiki contents relevant to a particular issue would be useful in this respect. To capture history, the tagging should apply to page revisions and possibly sections of page revisions. For a postmortem review, it should be possible to generate chronological views of the tagged contents to support the reconstruction of a trajectory.

To support learning across projects in an organization, the result of a postmortem review could be stored in the project wiki itself, if the wiki is kept as a knowledge repository about the project. The postmortem review report in the wiki should contain links to wiki elements (page/section revisions) deemed particularly interesting to the project trajectory.

5.2. Using project wikis to avoid oversimplification of complex issues

Whereas a wiki page revision represents a snapshot in time, showing only a particular view of some aspects of the project, it simultaneously represents a recognizable scene from a complex work setting. The associations following the encounter with a familiar surrounding may help the team recall events and emotions and the meaning they were given at the time, as shown in our case study. Also, links in the tool may be followed – between different pages and back and forth in time, thus allowing for the exploration of how events are connected, e.g. causalities. In this way, it may be possible to reconstruct a more complex picture than what is possible based on memory-based recall.

The proposed tagging of contents by team participants and chronological traversal of the marked contents may be used to ensure that issues important to the team are actually addressed in the wiki-aided postmortem review. The opportunity to individually tag information during day-to-day work may help in ensuring that everyone’s voice is heard in the common postmortem review. All team members’ active participation in the tagging is necessary for the approach to succeed in capturing the full complexity of the project.

5.3. Using project wikis to help avoid information overload

The organization of wiki contents across pages and revisions can help team members access and sort out important information and structure their review of that information. The focus on the wiki main page in the postmortem interview of our case is an example, showing a simple way to gain some focus in the review process. Also, the example shows that allowing the team member to explore promising tracks as they turn up during the review, is a good way of spurring further investigation of the process.

On the other hand, given the context of a postmortem review, some structure might be needed for purposes of efficiency in terms of covering key issues in a limited amount of time [23]. There are many ways of approaching historical data on a project, and it may be desirable to focus on different aspects of the project in turn (e.g. individual team members’
perspectives, team-customer relationship, development of requirements.) Again, team participation in the tagging of contents, whether in the there-and-then work situation or in reflective hindsight, would help ensuring that information considered important by those involved is given priority.

6. The wiki walkthrough tool: reviewing selected aspects of project history

In Section 5 we have argued that user-defined tagging of wiki page revisions combined with the possibility to review the set of tagged revisions, could make a project wiki even more useful for postmortem reviews. In this section, we demonstrate how a wiki can be extended in this way. Our ‘wiki walkthrough tool’ (WWT) has been implemented as a prototype extension of DokuWiki. An elaborate presentation of the tool is beyond the scope of the paper, but we provide a brief use scenario and a description of the tool functionality.

6.1. A scenario for the use of a wiki walkthrough tool

The following scenario is intended to show in a compact way how a project wiki can be used for postmortem reflection, aided by some extended wiki functionality.

The context for the scenario is as follows:

There is a SE student project team with five members doing development work for a customer. The team has a project wiki in which they include or link in artifacts related to the project process and product. The wiki is actively used in project management: Various to-do-lists are updated by all team members, and there is a news bulletin mainly updated by the project manager. The chapters in the project report are included in the wiki and converted to a coherent, printable report at need. In addition to the wiki, the team makes use of development tools, including a versioning system, and collaboration technology such as a shared calendar and instant messaging.

The postmortem review scenario:

Throughout the project every team member tags elements in the project wiki reflecting what she considers to be important events. The team member decides if the tag is to be visible to other team members. The following postmortem review takes place twice: just before the delivery of a preliminary project report, and before delivery of the final report:

Each team member spends an hour going through her tagged wiki contents, modifying the trajectory made up of those elements by visiting wiki pages and adding or removing tags. In a common workshop supervised by a project-external facilitator, each team member gets 15 minutes to present her trajectory, using a projector in the meeting room. The team next discusses the project and how their respective understandings differ.

After the mid-term postmortem review, results of the discussion (e.g. conflicting viewpoints, new insights) are documented and actively used in project planning (e.g. changed priorities, changed roles). After the final postmortem review, the team decides on some elements in the wiki that should be included in their common documentation of the project process.

The postmortem review in the scenario is designed to reflect acknowledged practice [23], e.g. encouraging individual recall and reflection followed by plenary presentation and discussion, and the creation of a project management report which is later actively used to achieve improvement in the project.

The scenario has been evaluated by two expert groups experienced in the supervisor and customer roles in the projects of the course described in Section 3. Here, we only report the main conclusions from the evaluation: The expert groups were positive about the potential of wiki history to be utilized in postmortem reflection on the project process. They were also positive about the potential of the WWT to help a team achieve a more focused review.

6.2. The wiki walkthrough tool functionality

A prototype of the WWT was developed during spring 2008. In providing a brief description of the tool functionality in what follows, we take two screenshots as our starting point.

![Figure 3. Tagging a content page with an existing tag ('todo_historikk')](image)

Figure 3 shows a page from a project wiki. This is a DokuWiki into which the WWT functionality has been integrated. The user is browsing the wiki and decides that she wants to tag the particular page revision. She has clicked the ‘Add tags’ button at the top of the page.

In the pop-up window appearing in the middle of the page, the user gets the option of using an existing tag or creating a new one. She picks an existing one, ‘todo_historikk’, from the list. When she clicks ‘Save’,
the page revision will be tagged with ‘todo_historikk’. While in the example it is the current revision of the page being tagged, the procedure would have been the same if the user was viewing an older revision of the page and wanted to tag it.

When the user chooses ‘All tags’ or ‘Tag search’ at the upper right of a contents page like the one in Figure 3, she can proceed to choose a tag and get a report showing the page revisions tagged by it. In Figure 4, the report shows contents tagged with ‘todo_historikk’.

In the report view, for each page, tagged revisions are shown together chronologically. The user may view one or more of the revisions. In Figure 4, three wiki pages have been tagged with ‘todo_historikk’. ‘Start’ has three revisions tagged, but the user has chosen to view only the last one. For the page ‘TODO’, the user has chosen to view two of the tagged revisions. In the small window on top of the upper TODO revision, visibility of the revisions can be changed. The third page displayed in this report is the ‘presentasjon_final’ page revision tagged in Figure 3.

6.3. Related work on wiki tagging

Tagging wiki contents is not a new idea as such. Many existing wiki extensions allow users to impose extra structure on a wiki in order to make it useful in new ways.

The use of semantic web enabled technologies to improve navigation and search in a wiki, so called “social tagging”, has been implemented in SweetWiki [24] and Semantic MediaWiki [25]. Gnowsis [26], a semantic desktop including a wiki, implements the idea of collecting relevant information to reflect a personalized view. The use of structured tagging, including free, personal tagging, to provide personalized access to wiki information for purposes of document management, is discussed in [27].

History or chronology is not in particular focus in the aforementioned systems. However, whereas the opportunities to tag earlier page revisions are only partially addressed in the associated literature, we assume that some existing tagging tools largely cover the functionality proposed for the WWT. Accordingly, from a technical point of view, some existing tool could be used for our purposes, maybe after some minor tailoring. From a usability perspective, we hold that alternative usage of a tool, perhaps involving only a subset of the available functionality and requiring substantial adjustments, might introduce too much ‘noise’ to meet our high-level requirement for minimal intrusiveness into the work process in which tagging should be a background feature.

A tool that deserves particular consideration for its related functionality is WikiTrails [28], designed to help build context and structure around existing wiki contents in an educational setting. The tool makes it possible for a wiki user to leave a trail while browsing the wiki, enabling other users to follow that trail later on. The aim is thus related to ours: building and sharing a ‘story’ through a sequence of wiki pages. A manual mode is provided, in which pages for a trail may be picked and added by the user, e.g. from a list.

Two aspects of WikiTrails make it inadequate for the intended use of the WWT. First, WikiTrails is not designed to support the marking of potentially interesting information element during work activity for possible later incorporation in a trail. Second, WikiTrails provides no support for the generation of a chronological sequence; focus is on generating a trail that will amount to a pedagogically sound presentation of existing wiki contents. A third and minor objection to WikiTrails in our context is that it seems to lack functionality for the tagging of sections within a page, a drawback it shares with the WWT prototype. However, in WikiTrails the opportunity to annotate might compensate for this fairly coarse granularity.

In sum, while acknowledging the potential of existing tools to aid the structuring and traversal of wiki contents, we advocate the use of a designated tool for the reconstruction of a project trajectory.
7. Conclusion and further work

In this paper, we have drawn upon a detailed study of a postmortem interview from a capstone SE student project to demonstrate the potential of project wikis to be used as a means for the recall of, and reflection on, a project process, thus making the project wikis already in use even more useful to the project teams.

Some limitations to our research provide directions for further research. The interview forming the core of our empirical data was partially exploratory, and adequate for pointing out the potential for project wikis to aid in postmortem reflection. Our findings indicate how various types of information may be used to recall and reflect on various types of issues. However, we do not have sufficient data to reasonably generalize about the connections between the two. We suggest that wiki-aided postmortem reviews be conducted in other projects and the interaction and tool use of the participants during the sessions be analyzed. The interviews should follow a well founded design for a postmortem review and be video recorded. In this way it might be possible to identify what type of information in a project wiki promotes reflection in certain ways or on certain topics. Also, collective, tool-mediated postmortem reflection should be investigated.

Our wiki walkthrough tool needs to be evaluated through use in real projects to see if it is deemed useful by the project teams.

The idea of utilizing history stored in a collaboration tool in reflection on the process is relevant to other tools. E.g., source code management and bug tracking tools contain a history of commented project artifact revisions. The student teams at our university increasingly prefer this type of tool (e.g. Trac) to manage their SE projects. A next step in our research is to conduct and evaluate postmortem reviews mediated by these tools to see if they, too, can help students learn from their SE project experience.

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8. References