



LUND UNIVERSITY

Reflecting on Evidence-Based Timelines

Bjarnason, Elizabeth; Hess, Anne; Svensson, Richard Berntsson; Regnell, Björn; Doerr, Joerg

Published in:
IEEE Software

DOI:
[10.1109/MS.2014.26](https://doi.org/10.1109/MS.2014.26)

2014

[Link to publication](#)

Citation for published version (APA):

Bjarnason, E., Hess, A., Svensson, R. B., Regnell, B., & Doerr, J. (2014). Reflecting on Evidence-Based Timelines. *IEEE Software*, 31(4), 37-43. <https://doi.org/10.1109/MS.2014.26>

Total number of authors:
5

General rights

Unless other specific re-use rights are stated the following general rights apply:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: <https://creativecommons.org/licenses/>

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

Reflecting on Evidence-Based Timelines

Elizabeth Bjarnason, Lund University

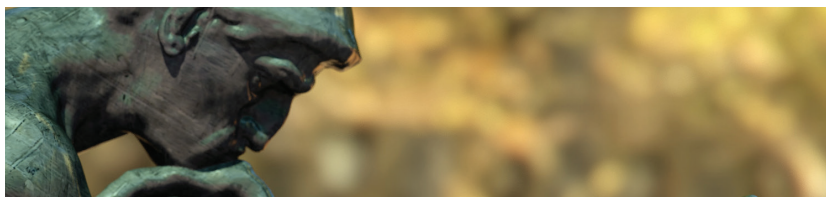
Anne Hess, Fraunhofer Institute for Experimental Software Engineering

Richard Berntsson Svensson, Chalmers | University of Gothenburg

Björn Regnell, Lund University

Joerg Doerr, Fraunhofer Institute for Experimental Software Engineering

// Project retrospectives can be powerful tools for project teams to collectively identify communication gaps and practices to improve for future projects. However, even if project members take the time for a retrospective, it can be hard to correctly remember and jointly discuss past events in a constructive way. Fact-based timelines that visualize a project's events offer a possible solution. //



CONSIDER THE LATEST project you worked on: Did the team take the time to collectively reflect on the experience once the project was completed? If so, was it a constructive

group discussion or merely a feel-good event?

Project retrospectives, also called postmortem reviews or lessons learned, can be a powerful tool for

organizational learning and process improvement.^{1,2} But once a project is completed, it's often swiftly replaced by another. The participants rarely take the time to sit down together to discuss how it went,³ much less what to do better and how in the future. As time passes, the details and sequence of events are soon forgotten, and our memories tend to focus on how we felt and what we experienced.¹

When this happens, a project retrospective can turn into an emotional venting session rather than a constructive discussion on how to improve on practice.^{2,4} Moreover, a retrospective that relies solely on peoples' experiences of events risks drawing incorrect conclusions because they're only considering part of the picture—typically, their own.⁵ To address these issues and better support project members in remembering events and performing fact-based retrospectives, we developed the EBTR (evidence-based timeline retrospective) method.⁶

EBTR Overview

One way to improve project retrospectives is to provide participants with a timeline of project events. This visualization of the project's history serves as a memory prompt and a focal point for participants in collectively discussing those events. In EBTR, timelines containing evidence of project events are planned and prepared in advance. The displayed objective information, or evidence, is gathered from available project sources and includes the documents and repositories used for planning, requirements, issues reports, and so on. Team members then share perspectives around such timelines at a retrospective meeting and gain new insights into the entire

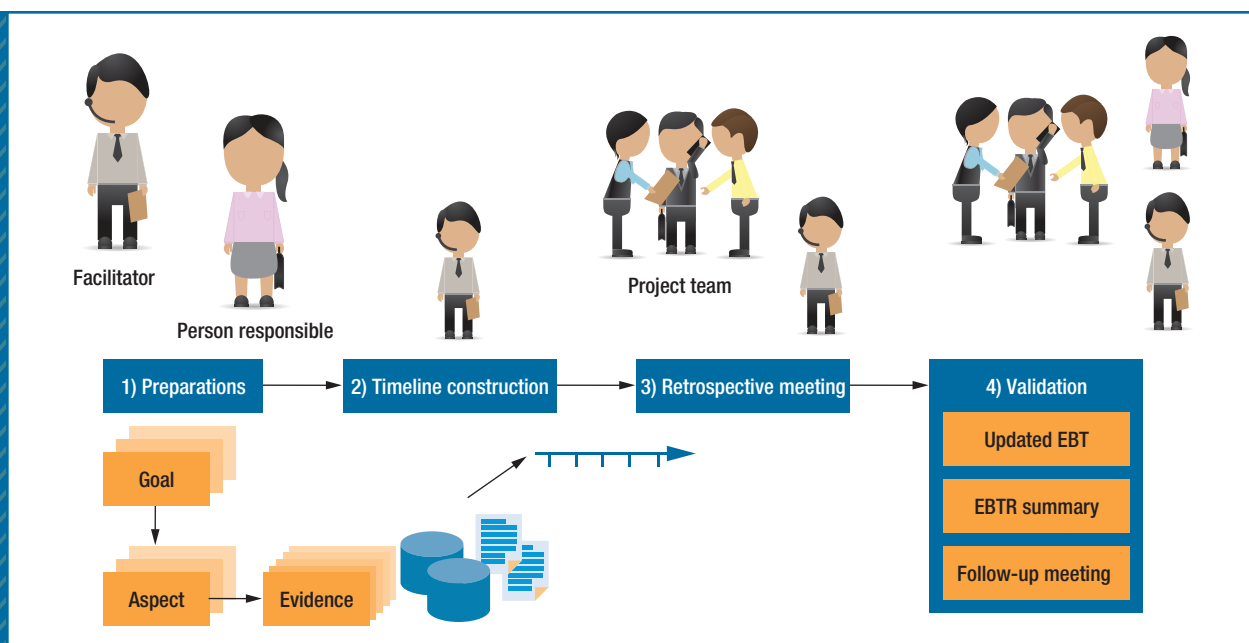


FIGURE 1. The four main steps in the evidence-based timeline retrospective (EBTR) method. The facilitator does all the preparation work, builds the timeline, and sums everything up at the end; participants are tasked solely with attending the meeting.

project life cycle. Project members can also identify good practices and improvements to practice.

An important factor when designing the EBTR method was to minimize the cost for participating teams. Consequently, project members only need to attend and actively participate in the retrospective meeting. A facilitator performs all the necessary preparations, including summing-up the outcome. The method is based on a timeline exercise that Norman Kerth described.⁷ While Kerth's exercise relies on people's memory of events to construct timelines, the EBTR timelines consist of project data as evidence of a project's history. (We use the term *evidence* here differently than you would within, for example, evidence-based medicine and software engineering, where it refers to scientifically validated truth.)

EBTR consists of four main steps: preparations, timeline construction,

retrospective meeting, and validation of the outcome, as illustrated in Figure 1. The method also has six variation points that can be used to tailor EBTR to a specific case. For example, leading structured or semi-structured discussions helps you cover a narrower or a wider range of topics.⁶ Details about how to apply EBTR appear in the "Reflecting on Development Projects" section and online at http://serg.cs.lth.se/research/experiment_packages/ebtr/.

Step 1: Preparations

The "person responsible" for a process or its implementation can initiate an EBTR for a certain purpose and identify a facilitator to manage the work. Through discussions with this person responsible, the facilitator defines goals and aspects on which to focus the EBTR. The goals can target a specific area or a wider set of issues. Based on the defined goals and aspects, and the project

context, the facilitator derives a set of focus questions and determines the type and source of evidence to display in the timeline. The facilitator also uses these focus questions to guide the retrospective meeting in step 3.

Step 2: Timeline Construction

The facilitator extracts time-stamped evidence from its sources to display in the timeline. The timeline content and visualization are variation points tailored for each case, depending on the type and amount of available project information and data sources. The effort and tools required to manage the extracted evidence will vary—for example, small amounts of data from status reports can be collected and managed manually, but larger amounts, say, from issue management systems with hundreds of entries, will require a systematic approach and tool support. Even with

relatively modest datasets, drawing and updating the timeline manually quickly becomes cumbersome and time-consuming. For the timeline to be effective in supporting the retrospective meetings, the project history visualization must be clear, uncluttered, and easily interpreted without special training.

Step 3: Retrospective Meeting

The core EBTR activity is the retrospective meeting, in which the team gathers to reflect on the project. All key roles involved throughout the project's life cycle are invited, with the facilitator leading and moderating discussions to focus on intended goals and aspects. If a vital role-player can't attend, the facilitator might have a separate meeting with this person, but that option isn't ideal.

The meeting consists of an introduction, a warm-up exercise, a reflective discussion, and a summary of the meeting's outcome. The introductory part includes a walk-through of the timeline and the applied visualization techniques. If it happens prior to the retrospective meeting, it saves time and properly prepares participants for the discussion part to come.

A warm-up exercise helps familiarize everyone with the timeline—one example is to ask each participant to mark his or her active involvement on the timeline and to add other people who worked on the project, revealing hand-over points and previous team members. The exercise also encourages participants to relate to and interact with the timeline, which is an important factor in making the timeline a trigger for the discussions that follow.

The project members reflect on events together by sharing experiences from their different

viewpoints, guided both by the focus questions and the evidence provided in the timeline. The degree of discussion structure can vary, but a more structured format encourages all participants to actively participate. If the discussions dry up, a set of prompting questions can stimulate further reflections.

The next part of the meeting is spent identifying the main findings and suggesting improvements. The facilitator elicits these findings with a set of predefined categories, such as what we learned and what we should do differently. The facilitator documents these findings and the discussions in an EBTR summary.

Step 4: Validation

In this final step, the project members validate the retrospective's outcome. The extent of this validation can vary, but it should at least include distributing updated timelines and the EBTR summary to the full team for confirmations and corrections. Additional follow-up meetings can further communicate the outcome to project members and the process responsible

method in two case studies—telecommunications software and Web-based business applications. We met the specific retrospective goals for each case by tailoring the EBTR—for example, adapting the timelines as in Figure 2.⁶

Telecom Projects

We performed EBTR retrospectives for a large company in the telecommunications domain, specifically on three of its agile development projects that delivered to a larger product. The three projects had four to nine members each and a lead time of 13 to 28 months. The teams frequently held retrospectives for each iteration along the way but rarely conducted them for the whole project, which meant they risked losing sight of the overall picture and making ill-advised short-term decisions.⁴ By performing EBTRs, the goal was to increase the engineers' insight into how requirements were defined and communicated in the overall context (step 1).

The facilitator (who was one of the researchers) had a lot of experience at the company and with its development process, but not with

Project members reflect on events together by sharing experiences from their different viewpoints.

for initiating the EBTR. Decisions about improvements such as new practices or enhancing existing processes are ideal topics at such follow-up meetings.

Reflecting on Development Projects

So far, we've applied the EBTR

the specific projects. She generated timelines (step 2) by extracting large amounts of information from several sources, including the systems for issue management, scope management, and planning. The facilitator then stored the extracted data in MS Excel and constructed the timelines in MS Visio before printing them out

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1

The timelines acted as a natural focal point and attracted people's attention as soon as they entered the room. The facilitator invited the project members to the 90-minute EBTR meetings (step 3), and once they arrived, gave an overview of the timelines and the information visualized in them. The project teams then reflected on the project through an open and semistructured discussion around the timelines.

1 1 0 , 1 ,

At the four-hour retrospective meeting (step 3), the participants sat around the timeline, which was placed on a large table. The facilitator opened the meeting with a short introduction of the goals, the agenda, and the timeline, including its visualization scheme, and then led a structured discussion, topic by topic, using the focus questions. The participants considered the questions individually and noted their reflections on Post-It notes. Each participant then presented his or her notes and added them to the timeline. The group commented on the presented notes and discussed possible reasons and connections to other issues.

Benefits of EBTR

Through these cases studies, we discovered several benefits of applying EBTR.

Fueling Reflective Discussions

The evidence-based timelines helped people remember and triggered discussions about past events. One participant said, “It reminds you of what actually happened.” Another stated, “It would have been difficult to just start talking based on nothing. It was a long time since we did this.” Physical interaction with the timeline stimulated the participants and kept them active throughout the meeting, as they pointed to discussed events or added ones that were missing. The participants also jointly visualized their degree of activity by adding their own activity line to the timeline. By keeping people alert and interested, valuable reflections were made in a short and focused period of time.

Providing a Project Overview

The participants liked that they could “see at a glance what we have

achieved in the project.” This is one of the strengths of the approach compared to retrospectives without evidence-based timelines. A participant said, when comparing it to previous retrospectives, “You get a much better overview with this timeline.” One manager even suggested

even half of this.” Such insight can prevent communication gaps in the future and improve coordination of different activities.

Identifying Improvements

The participants gained new insights into work practices and how things

Evidence-based timelines helped people remember and triggered discussions about past events.

that the timeline approach could be used to visualize and communicate progress throughout the project.

Identifying Connections

By pointing to an event in the timeline, participants could consider potential causes or effects by looking at the previous or following events. For example, for the IBIS project, late scope changes were found to be caused by a lack of communication at the project’s start. By uncovering this connection, the IBIS method was improved to avoid such problems.

Seeing the Big Picture

The timelines and group reflections provided an extended perspective of the participants’ work as part of a larger context. For example, one participant became aware of the entire effort spent and the outcomes achieved in the project through the EBTR retrospective. The developers and testers in particular appreciated seeing the big picture, including project activities in which they weren’t actively involved: “It’s interesting to see a compilation of the big picture. As a developer, I don’t see

such as company strategy could impact a project’s scoping and detailed requirements. EBTR helped them summarize their experiences and identify improvements, which in turn served as motivation. As one project manager said, “It’s a good reminder that can help us when we start on the next bigger project.” For IBIS, the EBTR summary even provided valuable feedback to customers and was included in the final project report to funders.

Lessons Learned

Seeing some of EBTR’s benefits first hand, we learned how to best perform future EBTRs through case studies.

Introduce the Timeline Prior to the Retrospective

The participants in the telecom projects initially found it hard to understand and use the timelines. They quickly caught on, but it meant a slow start to the retrospective meetings.

Retrospectives launch more quickly if the participants receive a 10-minute introduction prior to the meeting. For example, the timeline concept can be presented at a project or team



ELIZABETH BJARNASON is an associate senior lecturer at Lund University's Department of Computer Science. Her research interests include communication and coordination of requirements engineering within software development. Bjarnason received a PhD in software engineering from Lund University. Contact her at elizabeth.bjarnason@cs.lth.se.



ANNE HESS is a researcher at the Fraunhofer Institute for Experimental Software Engineering. Her research interests include user-centered requirements engineering for complex and innovative information systems. Hess received a German Diplom in computer science from the Saarland University of Saarbruecken. Contact her at anne.hess@iese.fraunhofer.de.



RICHARD BERTSSON SVENSSON is a senior lecturer in the software engineering division, Department of Computer Science and Engineering at Chalmers and University of Gothenburg. His research interests include quality requirements, software product management, empirical software engineering, and creativity and innovation. Berntsson Svensson received a PhD in software engineering from Lund University. Contact him at richard@cse.gu.se.



BJÖRN REGNELL is a professor in the Department of Computer Science and vice dean of research for the Faculty of Engineering, Lund University. His research interests include requirements engineering, software quality, software innovation, software product management, and empirical research methods. Regnell received a PhD in software engineering from Lund University. Contact him at bjorn.regnell@cs.lth.se.



JOERG DOERR is head of the information systems division at the Fraunhofer Institute for Experimental Software Engineering. His research areas include requirements engineering with a focus on nonfunctional requirements. Doerr received a PhD in computer science from the University of Kaiserslautern. Contact him at joerg.doerr@iese.fraunhofer.de.

meeting, with actual timelines distributed in advance of the retrospective itself. This has the added advantages of motivating project members to participate and introducing them to the facilitator. Both of these factors can support a more open and constructive retrospective discussion.

Organize the Meeting Room around the Timeline

At the first retrospective meeting, timelines were posted in a corner of the room that wasn't immediately visible to participants, who placed themselves around a table at the other end of the room. This physical

distance and placement made it hard to focus discussions on the timeline and prevented participants from directly interacting with the timeline.

At subsequent retrospective meetings, we consciously organized the room to encourage participants to interact with the timeline, choosing a central location for posting the timeline and placing chairs around it. The result was more open and free flowing discussions.

Keep the Retrospective Short and Focused

We've varied the length of our retrospectives between 75 minutes and three hours, and found that a longer meeting doesn't lead to more insights or findings. It's also hard to keep a constructive discussion going for more than 60 minutes—everyone gets tired and finds it hard to concentrate. However, 60 minutes isn't long enough to conclude and summarize the meeting.

The meeting time can be optimized by keeping the discussion focused on the goals and aspects defined for the EBTR. The facilitator plays a key role in this and should have good knowledge of the domain and the applied development processes. The focus questions help keep the discussions within the topic area, but the time spent on each question should be monitored and kept within a rough time budget. This will ensure time at the end for summarizing findings. The facilitator can also decrease the discussion time by selecting a subset of topics or presenting the topic area rather than detailed focus questions.

Tailor EBTR to the Purpose and the Project

One flavor of EBTR doesn't necessarily suit all projects and

organizations, so before performing the retrospectives, we had to tailor the methods for each project context.

In the preparation step, the purpose of applying the method affects the definition of goals, aspects, and evidence. We can achieve a wide and general assessment goal by reflecting on a broader picture supported by a wide range of evidence. This was the case for the telecom projects, in which increased insight into requirements within the development process was the target. That said, reflecting on less evidence will facilitate a more focused discussion and enable meeting a more specific EBTR goal—the specific EBTR goal of evaluating the IBIS method is an example of this.

The discussion structure at the retrospective meeting can also be tailored to match the EBTR goal's width: a more structured discussion around the focus questions will narrow the reflections to a specific goal, whereas using the questions more as a checklist will lead to discussions of a wider set of topics and more reflections on the big picture.

The facilitator's relationship to the project is another variation point to consider. For IBIS, a project member acted as the EBTR facilitator. As such, she had insight into the project's specific events and history, which turned out to be well matched to the EBTR goal of assessing specific issues. But if the EBTR goal is a wider assessment of an area, we recommend using a facilitator with no previous relationship to the project—doing so will encourage wider discussions and reflections of the bigger picture.

Don't Overload the Timeline


It was a challenge to visualize the

project data in a clear and uncluttered way. For the IBIS project, we used cards and Post-It notes on a flipchart to display the moderate amounts of data. Initially, this approach worked well, but as the meeting progressed, the flipchart timeline became hard to read as the amount of cards and Post-It notes increased. From this, we learned that the initial timeline is best prepared digitally and then printed. Additional events and information can then be added in the form of cards or Post-It notes during the retrospective.

In contrast, the huge amounts of data for the telecom projects posed a challenge in the timeline construction itself. We choose a combination of MS Excel for storing and sorting the data and MS Visio for visualizing it, but we also found it necessary to separate different types of evidence, for example, by displaying information about people involved in the project on one timeline and the project planning information on another.

The response we've received from the retrospective participants encourages us to continue evolving and improving the EBTR method. One extension to investigate is how to apply EBTRs to larger projects that have more members than can attend a common retrospective meeting. This also requires more powerful tools for constructing timelines with huge amounts of data. Another avenue to explore is integrating the EBTR approach for agile and iterative development—for example, constructing the timeline for each sprint or iteration, and using it at iteration retrospectives. The project members would then become more familiar with the timelines as the project

progresses, and the team could contemplate the wider picture for each iteration and ultimately reflect on the full project history.

We encourage practitioners to consider how EBTR can be tailored to their needs and projects. We believe that our reported experiences from applying the method can encourage development teams to learn and improve by reflecting on evidence-based timelines. 

Acknowledgments

We thank all EBTR participants. This work was partly funded by EASE (<http://ease.cs.lth.se>) and by the German Federal Ministry of Education and Research under project number 01IS11017.

References

1. M. von Zedtwitz, "Organizational Learning through Post-Project Reviews in R&D," *R&D Management*, vol. 32, no. 3, 2002, pp. 255–268.
2. B. Collier, T. DeMarco, and P. Fearey, "A Defined Process for Project Postmortem Review," *IEEE Software*, vol. 13, no. 4, 1996, pp. 65–72.
3. R.L. Glass, "Project Retrospectives, and Why They Never Happen," *IEEE Software*, vol. 19, no. 5, 2002, pp. 111–112.
4. M. Drury, K. Conboy, and K. Power, "Decision Making in Agile Development: A Focus Group Study of Decisions and Obstacles," *Proc. Agile Conf.*, 2011, pp. 39–47.
5. M. Jørgensen and D. Sjøberg, "The Importance of NOT Learning from Experience," *Proc. European Software Process Improvement (EuroSPI 00)*, 2000, pp. 2.2–2.8.
6. E. Bjarnason et al., "Variations on the Evidence-Based Timeline Retrospective Method: A Comparison of Two Cases," *Proc. 39th Euromicro Conf. Series Software Eng. and Advanced Applications (SEAA 13)*, 2013, pp. 37–44.
7. N. Kerth, *Project Retrospectives: A Handbook for Team Reviews*, Dorset House, 2001.
8. D. Loeffler et al., "Developing Intuitive User Interfaces by Integrating Users' Mental Models into Requirements Engineering," *Proc. 27th Int'l British CS HCI*, 2013; <http://ewic.bcs.org/content/ConWebDoc/51701>.



Selected CS articles and columns are also available for free at <http://ComputingNow.computer.org>.