Draft of Paper for SER - 574

Ruben Acuna
Arizona State University
Phoenix, USA
ruben.acuna@asu.edu

Sarthak Tiwari
Arizona State University
Phoenix, USA
sarthak.tiwari@asu.edu

Figure 1. Seattle Mariners at Spring Training, 2010.

Abstract

With the boom in the use of agile process model, imperfect implementations of agile are frequently being seen, out of which the problem of inter-team communication in agile teams is one of the most common issue. An agile team by its definition is a group of people who are self-sufficient to bring their responsibilities to closure, the interaction between different teams is thus considered minimal in most projects implementing agile. This causes problems when the integration of end-products of different teams is carried out. In this paper we have taken a detailed look at this problem and how we can mitigate this.

CCS Concepts • **Computer systems organization** → **Embedded systems**; *Redundancy*; Robotics; • **Networks** → Network reliability.

Keywords Agile, Software Engineering, Process Models, Inter-team, Management

1 Introduction

As mentioned in the Agile Manifesto [5], Individuals and Interactions are given more value than the processes and tools. At the same time, an agile team is supposed to contain all that is required for them to do their work, thus interactions no matter how valuable usually are done intra-team only. Thus, when a situation arrives where two or more agile teams need to work together to achieve a common goal the usual approach taken by companies fail. The agile approach of interacting in-person fails due to a few reasons such as the vertical structure of the company organization and the existence of middle managers [12]. This large number of intermediaries in inter team communication causes the process to crumble and fall apart as it takes longer than usual time for messages to reach their destination then what agile can afford. This problem is harder to fix as this is so embedded in the working culture of the current organizations that changing them will take a long time, thus an immediate patch that works is required. And that's where the approaches listed in the article comes in. We have collected a couple of approaches which if implemented efficiently results in a more stable and functioning agile process model. Thus, in the following sections we will be explaining couple of approaches we came across.

In Section 2, we will be explaining the improvements that can be made to the process and team structures to get better collaboration out of the team involved.

In Section 3, we will be explaining the enhancements that can be done in the technology stack being used and in the different ways in which technology can help in improving the process.

2 Process Improvements

There are many small changes that we can incorporate in our process model to make sure that parallel developing agile teams do not run into problems when they reach the integration phase. These changes are to be made part of the entire process and are not to be implemented only in the end.

2.1 Changes in standups

One of the most critical aspect of agile process model is to have daily standups which are the platform serving the purpose of letting each team member know the work being done in the other parts of the team and corelate it with the work being done by them. This results in escalation of differences between the development early in the process and prevents end moment discovery of mismatches in interfaces and such. In the case of multiple agile teams this problem is compounded as usually a daily stand up is a closed activity of the team itself, thus preventing other teams from knowing the results or discussions of each other. This can be resolved by having a representative of each concerned team being present in the daily standup thus letting each team know the status of other teams.

2.2 Changes to Product Owner

Though in usual implementations the product owner is responsible for agile teams under his supervision, in large projects with multiple agile teams where a number of product owners are present sometimes over time the vision of the owners may get too distinct from each other thus pushing the development track in different directions. This can be limited by having regular meetings of product owners where the scope and vision of the project could be synced again. This can be a bi-weekly or monthly meeting depending on the size of the project.

2.3 Changes in Planning Sessions

All the initial, intermediate and final planning sessions should be made such that all the teams which are or could be impacted by that part of the project are part of the meeting This can assist in early agreement on high-level requirements and standardization of inter-team interfaces.

3 Technology Improvements

A good technology stack can be a powerful tool in maintaining a widely distributed team. Good communication and management tools can help the teams in keeping track of things that they need to do so that other teams can work as intended. The following are some of the areas where the technology can assist the teams in making a more efficient agile process environment.

3.1 Communication Tools

As agile focuses on personal interaction with highest importance given to face-to-face conversation, conferencing tools such as video conferencing and WebEx etc. can help the team interactions become more fluid and clearer. They also make the communication real-time thus removing the lag in process due to time spent in communicating ideas across teams.

3.2 Integration Tools

Continuous integration tools can go a long way in finding out inter-team problems early in the process as every time any team makes a change, its impact on the entire project can be seen.

4 Modifications

Modifying the template — including but not limited to: adjusting margins, typeface sizes, line spacing, paragraph and list definitions, and the use of the \vspace command to manually adjust the vertical spacing between elements of your work — is not allowed.

Your document will be returned to you for revision if modifications are discovered.

5 Typefaces

The "acmart" document class requires the use of the "Libertine" typeface family. Your TeX installation should include this set of packages. Please do not substitute other typefaces. The "lmodern" and "ltimes" packages should not be used, as they will override the built-in typeface families.

6 Title Information

The title of your work should use capital letters appropriately - https://capitalizemytitle.com/ has useful rules for capitalization. Use the title command to define the title of your work. If your work has a subtitle, define it with the subtitle command. Do not insert line breaks in your title.

If your title is lengthy, you must define a short version to be used in the page headers, to prevent overlapping text. The title command has a "short title" parameter:

```
\title[short title]{full title}
```

7 Authors and Affiliations

Each author must be defined separately for accurate metadata identification. Multiple authors may share one affiliation. Authors' names should not be abbreviated; use full first names wherever possible. Include authors' e-mail addresses whenever possible.

Grouping authors' names or e-mail addresses, or providing an "e-mail alias," as shown below, is not acceptable:

```
\author{Brooke Aster, David Mehldau}
\email{dave,judy,steve@university.edu}
\email{firstname.lastname@phillips.org}
```

The `authornote` and `authornotemark` commands allow a note to apply to multiple authors — for example, if the first two authors of an article contributed equally to the work.

If your author list is lengthy, you must define a shortened version of the list of authors to be used in the page headers, to prevent overlapping text. The following command should be placed just after the last `\author{}` definition:

```
\renewcommand{\shortauthors}{McCartney, et al.}
```

Omitting this command will force the use of a concatenated list of all of the authors' names, which may result in overlapping text in the page headers.

The article template's documentation, available at https://www.acm.org/publications/proceedings-template, has a complete explanation of these commands and tips for their effective use.

8   Rights Information

Authors of any work published by ACM will need to complete a rights form. Depending on the kind of work, and the rights management choice made by the author, this may be copyright transfer, permission, license, or an OA (open access) agreement.

Regardless of the rights management choice, the author will receive a copy of the completed rights form once it has been submitted. This form contains LaTeX commands that must be copied into the source document. When the document source is compiled, these commands and their parameters add formatted text to several areas of the final document:

- the "ACM Reference Format" text on the first page.
- the "rights management" text on the first page.
- the conference information in the page header(s).

Rights information is unique to the work; if you are preparing several works for an event, make sure to use the correct set of commands with each of the works.

9   CCS Concepts and User-Defined Keywords

Two elements of the "acmart" document class provide powerful taxonomic tools for you to help readers find your work in an online search.

The ACM Computing Classification System — https://www.acm.org/publications/class-2012 — is a set of classifiers and concepts that describe the computing discipline. Authors can select entries from this classification system, via https://dl.acm.org/ccs/ccs.cfm, and generate the commands to be included in the LaTeX source.

Table 1. Frequency of Special Characters

Non-English or Math	Frequency	Comments
$\emptyset$	1 in 1,000	For Swedish names
π	1 in 5	Common in math
$	4 in 5	Used in business
Ψ_1^2	1 in 40,000	Unexplained usage

User-defined keywords are a comma-separated list of words and phrases of the authors' choosing, providing a more flexible way of describing the research being presented.

CCS concepts and user-defined keywords are required for all short- and full-length articles, and optional for two-page abstracts.

10   Sectioning Commands

Your work should use standard LaTeX sectioning commands: `section`, `subsection`, `subsubsection`, and `paragraph`. They should be numbered; do not remove the numbering from the commands.

Simulating a sectioning command by setting the first word or words of a paragraph in boldface or italicized text is **not allowed.**

11   Tables

The "acmart" document class includes the "booktabs" package — https://ctan.org/pkg/booktabs — for preparing high-quality tables.

Table captions are placed *above* the table.

Because tables cannot be split across pages, the best placement for them is typically the top of the page nearest their initial cite. To ensure this proper "floating" placement of tables, use the environment **table** to enclose the table's contents and the table caption. The contents of the table itself must go in the **tabular** environment, to be aligned properly in rows and columns, with the desired horizontal and vertical rules. Again, detailed instructions on **tabular** material are found in the *LaTeX User's Guide*.

Immediately following this sentence is the point at which Table 1 is included in the input file; compare the placement of the table here with the table in the printed output of this document.

To set a wider table, which takes up the whole width of the page's live area, use the environment **table*** to enclose the table's contents and the table caption. As with a single-column table, this wide table will "float" to a location deemed more desirable. Immediately following this sentence is the point at which Table 2 is included in the input file; again, it is instructive to compare the placement of the table here with the table in the printed output of this document.

Table 2. Some Typical Commands

Command	A Number	Comments
\author	100	Author
\table	300	For tables
\table*	400	For wider tables

12 Math Equations

You may want to display math equations in three distinct styles: inline, numbered or non-numbered display. Each of the three are discussed in the next sections.

12.1 Inline (In-text) Equations

A formula that appears in the running text is called an inline or in-text formula. It is produced by the **math** environment, which can be invoked with the usual \begin . . . \end construction or with the short form $ . . . $. You can use any of the symbols and structures, from α to ω, available in LaTeX [22]; this section will simply show a few examples of in-text equations in context. Notice how this equation: $\lim_{n\to\infty} x = 0$, set here in in-line math style, looks slightly different when set in display style. (See next section).

12.2 Display Equations

A numbered display equation—one set off by vertical space from the text and centered horizontally—is produced by the **equation** environment. An unnumbered display equation is produced by the **displaymath** environment.

Again, in either environment, you can use any of the symbols and structures available in LaTeX; this section will just give a couple of examples of display equations in context. First, consider the equation, shown as an inline equation above:

$$\lim_{n\to\infty} x = 0 \tag{1}$$

Notice how it is formatted somewhat differently in the **displaymath** environment. Now, we'll enter an unnumbered equation:

$$\sum_{i=0}^{\infty} x + 1$$

and follow it with another numbered equation:

$$\sum_{i=0}^{\infty} x_i = \int_0^{\pi+2} f \tag{2}$$

just to demonstrate LaTeX's able handling of numbering.

13 Figures

The "figure" environment should be used for figures. One or more images can be placed within a figure. If your figure contains third-party material, you must clearly identify it as such, as shown in the example below.

Figure 2. 1907 Franklin Model D roadster. Photograph by Harris & Ewing, Inc. [Public domain], via Wikimedia Commons. (https://goo.gl/VLCRBB).

Your figures should contain a caption which describes the figure to the reader. Figure captions go below the figure. Your figures should **also** include a description suitable for screen readers, to assist the visually-challenged to better understand your work.

Figure captions are placed *below* the figure.

13.1 The "Teaser Figure"

A "teaser figure" is an image, or set of images in one figure, that are placed after all author and affiliation information, and before the body of the article, spanning the page. If you wish to have such a figure in your article, place the command immediately before the \maketitle command:

```
\begin{teaserfigure}
\includegraphics[width=\textwidth]{sampleteaser}
  \caption{figure caption}
  \Description{figure description}
\end{teaserfigure}
```

14 Citations and Bibliographies

The use of BibTeX for the preparation and formatting of one's references is strongly recommended. Authors' names should be complete — use full first names ("Donald E. Knuth") not initials ("D. E. Knuth") — and the salient identifying features

of a reference should be included: title, year, volume, number, pages, article DOI, etc.

The bibliography is included in your source document with these two commands, placed just before the \end{document} command:

```
\bibliographystyle{ACM-Reference-Format}
\bibliography{bibfile}
```

where "bibfile" is the name, without the ".bib" suffix, of the BibTeX file.

Citations and references are numbered by default. A small number of ACM publications have citations and references formatted in the "author year" style; for these exceptions, please include this command in the **preamble** (before "\begin{document}") of your LaTeX source:

```
\citestyle{acmauthoryear}
```

Some examples. A paginated journal article [2], an enumerated journal article [8], a reference to an entire issue [7], a monograph (whole book) [21], a monograph/whole book in a series (see 2a in spec. document) [15], a divisible-book such as an anthology or compilation [10] followed by the same example, however we only output the series if the volume number is given [11] (so Editor00a's series should NOT be present since it has no vol. no.), a chapter in a divisible book [32], a chapter in a divisible book in a series [9], a multi-volume work as book [20], an article in a proceedings (of a conference, symposium, workshop for example) (paginated proceedings article) [3], a proceedings article with all possible elements [31], an example of an enumerated proceedings article [13], an informally published work [14], a doctoral dissertation [6], a master's thesis: [4], an online document / world wide web resource [1, 26, 33], a video game (Case 1) [25] and (Case 2) [24] and [23] and (Case 3) a patent [30], work accepted for publication [27], 'YYYYb'-test for prolific author [28] and [29]. Other cites might contain 'duplicate' DOI and URLs (some SIAM articles) [19]. Boris / Barbara Beeton: multi-volume works as books [17] and [16]. A couple of citations with DOIs: [18, 19]. Online citations: [33–35].

15   Acknowledgments

Identification of funding sources and other support, and thanks to individuals and groups that assisted in the research and the preparation of the work should be included in an acknowledgment section, which is placed just before the reference section in your document.

This section has a special environment:

```
\begin{acks}
...
\end{acks}
```

so that the information contained therein can be more easily collected during the article metadata extraction phase, and to ensure consistency in the spelling of the section heading.

Authors should not prepare this section as a numbered or unnumbered \section; please use the "acks" environment.

16   Appendices

If your work needs an appendix, add it before the "\end{document}" command at the conclusion of your source document.

Start the appendix with the "appendix" command:

```
\appendix
```

and note that in the appendix, sections are lettered, not numbered. This document has two appendices, demonstrating the section and subsection identification method.

17   SIGCHI Extended Abstracts

The "sigchi-a" template style (available only in LaTeX and not in Word) produces a landscape-orientation formatted article, with a wide left margin. Three environments are available for use with the "sigchi-a" template style, and produce formatted output in the margin:

- sidebar: Place formatted text in the margin.
- marginfigure: Place a figure in the margin.
- margintable: Place a table in the margin.

Acknowledgments

To Robert, for the bagels and explaining CMYK and color spaces.

References

[1] Rafal Ablamowicz and Bertfried Fauser. 2007. CLIFFORD: a Maple 11 Package for Clifford Algebra Computations, version 11. Retrieved February 28, 2008 from http://math.tntech.edu/rafal/cliff11/index.html

[2] Patricia S. Abril and Robert Plant. 2007. The patent holder's dilemma: Buy, sell, or troll? *Commun. ACM* 50, 1 (Jan. 2007), 36–44. https://doi.org/10.1145/1188913.1188915

[3] Sten Andler. 1979. Predicate Path expressions. In *Proceedings of the 6th. ACM SIGACT-SIGPLAN symposium on Principles of Programming Languages (POPL '79)*. ACM Press, New York, NY, 226–236. https://doi.org/10.1145/567752.567774

[4] David A. Anisi. 2003. *Optimal Motion Control of a Ground Vehicle*. Master's thesis. Royal Institute of Technology (KTH), Stockholm, Sweden.

[5] Kent Beck, Mike Beedle, Arie van Bennekum, Alistair Cockburn, Ward Cunningham, Martin Fowler, James Grenning, Jim Highsmith, Andrew Hunt, Ron Jeffries, Jon Kern, Brian Marick, Robert C. Martin, Steve Mellor, Ken Schwaber, Jeff Sutherland, and Dave Thomas. 2001. Manifesto for Agile Software Development. http://www.agilemanifesto.org/

[6] Kenneth L. Clarkson. 1985. *Algorithms for Closest-Point Problems (Computational Geometry)*. Ph.D. Dissertation. Stanford University, Palo Alto, CA. UMI Order Number: AAT 8506171.

[7] Jacques Cohen (Ed.). 1996. Special issue: Digital Libraries. *Commun. ACM* 39, 11 (Nov. 1996).

[8] Sarah Cohen, Werner Nutt, and Yehoshua Sagic. 2007. Deciding equivalences among conjunctive aggregate queries. *J. ACM* 54, 2, Article 5 (April 2007), 50 pages. https://doi.org/10.1145/1219092.1219093

[9] Bruce P. Douglass, David Harel, and Mark B. Trakhtenbrot. 1998. Statecarts in use: structured analysis and object-orientation. In *Lectures on Embedded Systems*, Grzegorz Rozenberg and Frits W. Vaandrager (Eds.). Lecture Notes in Computer Science, Vol. 1494. Springer-Verlag, London, 368–394. https://doi.org/10.1007/3-540-65193-4_29

[10] Ian Editor (Ed.). 2007. *The title of book one* (1st. ed.). The name of the series one, Vol. 9. University of Chicago Press, Chicago. https://doi.org/10.1007/3-540-09237-4

[11] Ian Editor (Ed.). 2008. *The title of book two* (2nd. ed.). University of Chicago Press, Chicago, Chapter 100. https://doi.org/10.1007/3-540-09237-4

[12] Nicolas Frankel. 2016. Making Sure Inter-Team Communication Doesn't Work. https://dzone.com/articles/making-sure-inter-team-communication-doesnt-work/ [Online; posted 13-October-2016].

[13] Matthew Van Gundy, Davide Balzarotti, and Giovanni Vigna. 2007. Catch me, if you can: Evading network signatures with web-based polymorphic worms. In *Proceedings of the first USENIX workshop on Offensive Technologies (WOOT '07)*. USENIX Association, Berkley, CA, Article 7, 9 pages.

[14] David Harel. 1978. *LOGICS of Programs: AXIOMATICS and DESCRIPTIVE POWER*. MIT Research Lab Technical Report TR-200. Massachusetts Institute of Technology, Cambridge, MA.

[15] David Harel. 1979. *First-Order Dynamic Logic*. Lecture Notes in Computer Science, Vol. 68. Springer-Verlag, New York, NY. https://doi.org/10.1007/3-540-09237-4

[16] Lars Hörmander. 1985. *The analysis of linear partial differential operators. III*. Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences], Vol. 275. Springer-Verlag, Berlin, Germany. viii+525 pages. Pseudodifferential operators.

[17] Lars Hörmander. 1985. *The analysis of linear partial differential operators. IV*. Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences], Vol. 275. Springer-Verlag, Berlin, Germany. vii+352 pages. Fourier integral operators.

[18] IEEE 2004. IEEE TCSC Executive Committee. In *Proceedings of the IEEE International Conference on Web Services (ICWS '04)*. IEEE Computer Society, Washington, DC, USA, 21–22. https://doi.org/10.1109/ICWS.2004.64

[19] Markus Kirschmer and John Voight. 2010. Algorithmic Enumeration of Ideal Classes for Quaternion Orders. *SIAM J. Comput.* 39, 5 (Jan. 2010), 1714–1747. https://doi.org/10.1137/080734467

[20] Donald E. Knuth. 1997. *The Art of Computer Programming, Vol. 1: Fundamental Algorithms (3rd. ed.)*. Addison Wesley Longman Publishing Co., Inc.

[21] David Kosiur. 2001. *Understanding Policy-Based Networking* (2nd. ed.). Wiley, New York, NY.

[22] Leslie Lamport. 1986. *LATEX: A Document Preparation System*. Addison-Wesley, Reading, MA.

[23] Newton Lee. 2005. Interview with Bill Kinder: January 13, 2005. Video. *Comput. Entertain.* 3, 1, Article 4 (Jan.-March 2005). https://doi.org/10.1145/1057270.1057278

[24] Dave Novak. 2003. Solder man. Video. In *ACM SIGGRAPH 2003 Video Review on Animation theater Program: Part I - Vol. 145 (July 27–27, 2003)*. ACM Press, New York, NY, 4. https://doi.org/99.9999/woot07-S422

[25] Barack Obama. 2008. A more perfect union. Video. Retrieved March 21, 2008 from http://video.google.com/videoplay?docid=6528042696351994555

[26] Poker-Edge.Com. 2006. Stats and Analysis. Retrieved June 7, 2006 from http://www.poker-edge.com/stats.php

[27] Bernard Rous. 2008. The Enabling of Digital Libraries. *Digital Libraries* 12, 3, Article 5 (July 2008). To appear.

[28] Mehdi Saeedi, Morteza Saheb Zamani, and Mehdi Sedighi. 2010. A library-based synthesis methodology for reversible logic. *Microelectron. J.* 41, 4 (April 2010), 185–194.

[29] Mehdi Saeedi, Morteza Saheb Zamani, Mehdi Sedighi, and Zahra Sasanian. 2010. Synthesis of Reversible Circuit Using Cycle-Based Approach. *J. Emerg. Technol. Comput. Syst.* 6, 4 (Dec. 2010).

[30] Joseph Scientist. 2009. The fountain of youth. Patent No. 12345, Filed July 1st., 2008, Issued Aug. 9th., 2009.

[31] Stan W. Smith. 2010. An experiment in bibliographic mark-up: Parsing metadata for XML export. In *Proceedings of the 3rd. annual workshop on Librarians and Computers (LAC '10)*, Reginald N. Smythe and Alexander Noble (Eds.), Vol. 3. Paparazzi Press, Milan Italy, 422–431. https://doi.org/99.9999/woot07-S422

[32] Asad Z. Spector. 1990. Achieving application requirements. In *Distributed Systems* (2nd. ed.), Sape Mullender (Ed.). ACM Press, New York, NY, 19–33. https://doi.org/10.1145/90417.90738

[33] Harry Thornburg. 2001. Introduction to Bayesian Statistics. Retrieved March 2, 2005 from http://ccrma.stanford.edu/~jos/bayes/bayes.html

[34] TUG 2017. Institutional members of the TEX Users Group. Retrieved May 27, 2017 from http://wwtug.org/instmem.html

[35] Boris Veytsman. [n. d.]. acmart—Class for typesetting publications of ACM. Retrieved May 27, 2017 from http://www.ctan.org/pkg/acmart

A Research Methods

A.1 Part One

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Morbi malesuada, quam in pulvinar varius, metus nunc fermentum urna, id sollicitudin purus odio sit amet enim. Aliquam ullamcorper eu ipsum vel mollis. Curabitur quis dictum nisl. Phasellus vel semper risus, et lacinia dolor. Integer ultricies commodo sem nec semper.

A.2 Part Two

Etiam commodo feugiat nisl pulvinar pellentesque. Etiam auctor sodales ligula, non varius nibh pulvinar semper. Suspendisse nec lectus non ipsum convallis congue hendrerit vitae sapien. Donec at laoreet eros. Vivamus non purus placerat, scelerisque diam eu, cursus ante. Etiam aliquam tortor auctor efficitur mattis.

B Online Resources

Nam id fermentum dui. Suspendisse sagittis tortor a nulla mollis, in pulvinar ex pretium. Sed interdum orci quis metus euismod, et sagittis enim maximus. Vestibulum gravida massa ut felis suscipit congue. Quisque mattis elit a risus ultrices commodo venenatis eget dui. Etiam sagittis eleifend elementum.

Nam interdum magna at lectus dignissim, ac dignissim lorem rhoncus. Maecenas eu arcu ac neque placerat aliquam. Nunc pulvinar massa et mattis lacinia.