IM0702 – Software Quality Management
Instructions for the Essay Assignment

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***Abstract*— In Block III of the course 'Software Quality Management', you have to write an essay (in Dutch or in English) about your view on some current trends in the field of software processes. By this assignment, you have to demonstrate that you are able to critically read the literature, find relevant related articles and cite them, formulate your view in a coherent essay and write it in LaTeX in a scientific style.**

The assignment consists of three steps, a Milestone version, a Peer review and a Final version. First, the Milestone should already be in a given format, contain the main references and raise three initial research questions. These research ideas should stem from your views based on articles you have read and, possibly, based on your experiences. Second, you will make reviews of a few other students' Milestone version. Of course, you will also receive feedback on your own work from others. Finally, you can start writing the Final version. The result should be a coherent short paper of at most three pages. Note that the structure of the paper should be very clear and the paragraphs (in Dutch, *alinea's*) should flow well. This assignment will be assessed based on your reviews and the content as well as the format of your essay.

I. INTRODUCTION

Software is everywhere! It is there from the most ambitious projects, such as power plants and giant dams, through our daily computing devices to the tiniest smart dust. Experience shows that there are many things in software development that can go wrong, lead to failure or cause unacceptable delays. There are a lot of exciting challenges today in managing an entire software process, and indeed, to make the entire software life cycle as efficient as possible. Over the years there have been many proposals to improve contemporary techniques. In favourable cases new methods solve some problems; yet, they often introduce other issues. Furthermore, the technical environment is also changing. That is why there is always room for improvement and novel ideas with respect to software processes.

In this assignment you learn about the current state of software processes. You will have to demonstrate a substantial understanding of the field and explain your thoughts clearly in a written form. First, you will read a paper with open and critical eyes. After choosing a particular topic and distilling your views, you have to write a draft (called the *Milestone* version) of a short essay. Second, you have to substantiate your draft by writing the *Final* essay of at least two but at most three pages. It has to follow the provided template (similar to that of this document) and has to clearly explain your view in a scientific style. Both versions have to be in LaTeX and submitted in yOUlearn before the given deadlines.

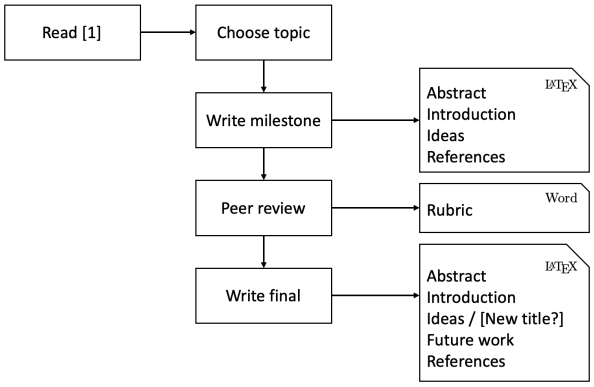

Fig. 1. Steps of writing and submitting the essay; the documents are made in LaTeXor in Word but please submit them in `.pdf`

Additionally, you have to practice giving constructive feedback and improving your own work based on reviews that you receive. The *peer review* part of this assignment is designed for these learning goals. Upon submitting the Milestone version of your essay, you will get two essays of your peers (fellow students) that you have to review according to an evaluation document, the rubric. For the system of peer reviews to work, it is important that you submit the reviews on time. You will also receive two reviews on your work. Furthermore, the teacher will give feedback to the whole class during an online session. Based on this information, you can write the Final version of your essay. Figure 1 gives a brief overview of the project and the output documents. (All three documents must be submitted in pdf format.)

Please read this document carefully before you start working on individual steps of this assignment. First of all, the essay has to be written in LaTeX following this template; see Section A.1 about this typesetting system and how to get started. Second, to succeed with this assignment, you should go through many steps. To make your work easier, we emphasize each important activity by a check mark (✓).

II. TOPICS IN SOFTWARE PROCESSES

Fuggetta and Di Nitto [1] give an overview of the state of the art in the research of software processes. This recent work puts the articles from the *Reader* into perspective and draws the current trends and issues to the forefront. Read this paper

carefully and extract all ideas that you find interesting. Be as critical as possible! *If something captures your imagination or if you do not agree with a statement, stop for a moment and write down your own ideas.* This is a crucial step to understand and appreciate this field – you will see software development differently if you make your thoughts explicit for yourself. In short:

- ✓ Read the paper [1] and take critical notes.
- ✓ Afterwards, choose one of the following topics.

A. Topic 1

Requirements in an agile context can change flexibly. As Royce suggests, "Nearly everything is negotiable." [2]. In Section 4, Fuggetta and Di Nitto [1] report major trends in the software process research. These trends are all related to the internet being the environment for each aspect of software development. There are many challenges ahead of us by which not only requirements are negotiable but also the underlying infrastructure is in constant change.

B. Topic 2

Cloud services play an increasingly important role in providing a platform not only for the operation of software but also for the development, see e.g. the microservices architecture. Software process research and practice attempt to estimate successfully the effects of the cloud on software development.

C. Topic 3

In Agile software processes, "Working software [is more important than] comprehensive documentation"[1], and in general, there is few artefacts beyond the software. We rely on software running on devices following our daily lives; think here about mobile phones or IoT devices. How can security and/or trust be guaranteed where software is ubiquitous yet developed in a change-driven, under-documented way?

III. Milestone version

The Milestone version is an important step of writing your essay. It makes a framework for your work and contains your relevant ideas with respect to the topic you have chosen. An *idea* in this context is an initial research question: it has the potential to discover new findings in it, it piques your curiosity and it can be incorporated in the current theoretical and/or practical domains. Later you will elaborate more on these ideas. As a result of this step, you will have a draft of the Final essay. This version already consists of the most relevant references too.

We estimate that you will need 12 hours to complete the Milestone version.

You have to write in LaTeX. You can make use of on-line LaTeX software tools, such as Overleaf[2]. Alternatively, you can build your own working environment.

- ✓ Study Overleaf or install LaTeX and get familiar with it; see also Section A.1.
- ✓ Starting with the source code of the given template, make your own empty template.
- ✓ Change the subtitle: identify the topic (*i.e. Topic* n) and possibly, give your own title to the essay.
- ✓ Adapt the author and the e-mail address.

A. Related work

Select relevant papers from the Reader to your essay. If you find further articles in journals or conference proceedings, read them too. Make sure that you include at least three papers already in your Milestone version. Note that this means that you will have at least four references, including [1].

When you read (or re-read) papers, it is important to do it at an academic level. That means that you should find the most important ideas and try to question them: 'Is it always true?', 'Do I have other experiences?', 'Is it clear what the authors describe?', 'How can this be generalised?', 'Are there special cases or examples that make an idea clearer?', etc.

B. Own ideas

As a result of reading critically the articles, you probably come up with your own questions and arguments. To inspire you further, we give some ways to generate additional ideas.

- Find future directions, counter-examples and trends or dependencies.
- Think about specific examples related to your own experiences (programming languages, testing methods, re-occurring traps or bugs related to a software process).
- Narrow a topic to a particular context, such as education, military, traffic, government, etc.
- Spot needs for novel methods because of new technological or legal advances (e.g., cloud computing, mobility and new ways of network access, artificial intelligence, cybersecurity or the GDPR), etc.

Make sure that you find at least three separate research questions[3], which you will later be able to further elaborate. Note however, that in this assignment you do not have to actually perform the research.[4]

C. Write

Now you are ready to write the first version of your essay. It will contain a summary (called an abstract), two sections and a list of references. The *Abstract* should briefly describe what your essay is about. It is usually the best if you write the Abstract when you have already written

[1] https://agilemanifesto.org/

[2] Overleaf: `https://www.overleaf.com/`

[3] General information about academic questions can be found on manual collection of the University of Groningen: `https://www.rug.nl/language-centre/communication-training/academic/hacv/handboek/schriftelijk/student/invalshoek-probleemstelling`. Importantly, this website provides a good summary about creating research questions: `https://writingcenter.gmu.edu/guides/how-to-write-a-research-question`

[4] The task is simply to find relevant questions that may be interesting. Also, we call these research questions *initial* because to create a truly 'researchable' question takes much more time. During your master project, you will have the opportunity to create good questions and also to answer them.

the rest of the essay. The *Introduction* section should be a well-written text of three to four paragraphs; see also Section A.2. The *Ideas* section comprises a list of your research questions. This section may contain two optional paragraphs: an introduction and/or a conclusion. Finally, your essay already in this preliminary phase should contain appropriate citations with the *References* at the end of the document. The target audience for the entire essay in its Milestone as well as its Final versions should be your fellow students.

In summary, the actions you have to perform for the Milestone are as follows.

- ✓ Throughout the writing process, make sure that you do not commit plagiarism; see also A.3.
- ✓ Write a brief *Introduction* section that gives context to your discussion, states the topic and explains the problem that you wish to focus on. Start your discussion from a general thought and narrow down to the context of your ideas. In this section it is essential that you construct good paragraphs.
- ✓ Write a draft *Ideas* section that contains a bulleted list of three research questions. (Optional: an introductory and/or a conclusion paragraph.)
- ✓ Write an *Abstract*, which can be very short (three to four sentences) in the Milestone version.
- ✓ Do not forget to cite our fundamental paper [1] and other relevant papers from the Reader and, optionally, from outside the course. Make sure that you have at least four references with proper citations.
- ✓ Submit your Milestone version in yOUlearn on time.

IV. Peer review

Peer reviews are very useful and efficient for improving scientific skills, including critical reading, improving writing, giving constructive feedback and assessing the work of others and reflecting on your own work. In this particular assignment, you will read the Milestone version of two other students. Your goal is to understand the intention of their essays and help them achieve their goals. Please refer to the the rubric document for all the specific instructions.

- ✓ You have received the Milestone version of two students' assignments.
- ✓ Follow the rubric document to assess both works.

V. Final version

Your paper at this point is in a draft phase (Milestone version). In this step your goal is to make a Final version, which is substantially more complete than the previous version. You receive constructive feedback from peers about the Milestone version to help you achieve this goal. It is important that you think about and try to address the comments from the reviews.

To make a coherent and complete essay, you need to perform several tasks. First, you improve the document based on the feedback you received. Second, you elaborate on the research questions. Give a sufficient amount of context to each of them to make it understandable, relevant and interesting. You can discuss possible research methods (without overwhelming detail, of course) that suit the questions. Do not forget to construct good paragraphs (topic sentence, supporting sentences, possibly introductory and concluding sentences); see also Section A.2 for further information. Third, you have to write a new section, *Future work*, in which you provide directions how your project could continue or be extended, should someone find your questions interesting enough to carry out research. You can also describe open research possibilities and further improvements in the software process, based on your main section. Then, you can enhance the *Introduction* (to first narrow down from the reader's general view to your topic, possibly with some good examples) and the Abstract (to describe the problem and your contributions very concisely). Finally, after a final check you can submit the paper. So, your tasks are the following.

- ✓ Elaborate on the ideas that you described in the Milestone version. Possibly, rename the *Ideas* section to a better title with respect to your content.
- ✓ Incorporate improvements from the reviews.
- ✓ Improve the the *Introduction* and make sure that all relevant concepts are introduced here.
- ✓ Write a new section, called *Future work*.
- ✓ Re-write the *Abstract*. Make sure that it is not longer than a few lines.
- ✓ Check that the entire text is coherent and all references (internal ones and citations) are correct.
- ✓ Submit the final version in yOUlearn.

This assignment is an important part of the Software Quality Management course. We estimate that you will need 16 hours to complete the Final version. The mark makes up to 40% of the final grade. Therefore, you will get a maximum of 40 points to your essay depending on the quality of your reviews, and the format, content and writing of your essay. The assessment criteria can be found in the appendix A.4.

– We hope that you will enjoy this assignment. –

References

[1] A. Fuggetta and E. Di Nitto, "Software process," in *Proceedings of the on Future of Software Engineering*. ACM, 2014, pp. 1–12.

[2] W. Royce, "Improving software economics," *IBM Corporation Software Group*, pp. 1–40, 2009.

[3] T. Oetiker, H. Partl, I. Hyna, and E. Schlegl, "The not so short introduction to LaTeX2e," https://tobi.oetiker.ch/lshort/lshort.pdf.

[4] IEEE Authorship Series, "How to write for technical periodicals & conferences," http://ieeeauthorcenter.ieee.org/wp-content/uploads/How-to-Write-for-Technical-Periodicals-and-Conferences.pdf.

[5] Vereniging van Universiteiten (VSNU), "De nederlandse gedragscode wetenschapsbeoefening," http://www.vsnu.nl/files/documenten/Domeinen/Onderzoek/Code_wetenschapsbeoefening_2004_(2014).pdf.

[6] IEEE Referencing, "How to CiteQuote in Your Assignment," http://libguides.bhtafe.edu.au/content.php?pid=88814&sid=660920.

Appendix

A. Technical background and requirements

1) LaTeX: This subsection is mostly taken from the bachelor course 'B2002 – Wetenschappelijke Schrijfvaardigheden' and it describes how to learn LaTeX and then provides the pointers to the LaTeX templates of the IEEE organisation.

LaTeX is a mark-up language. Microsoft Word, e.g., provides a WYSIWYG environment (for: What You See Is What You Get). LaTeX does not provide such an environment. It requires you to write plain-text files and do your mark-up with commands. For example, the command **textbf** makes text bold. The previous sentence is generated by the following LaTeX:

```
For example, the command \textbf{textbf}
makes text bold.
```

Oetiker et al. [3] have written a very good introduction into LaTeX.

✓ Read Chapters 1, 2 (without Section 2.5) and 4.

The LaTeX project page (`https://www.latex-project.org/get/`) provides instructions how to install LaTeX.

Managing citations: BibTeX is a citation management system. We explain the use of BibTeX by example. This paper cites the paper of Fuggetta and Di Nitto [1]. First, using, e.g., Google Scholar we find the paper. (Similarly, you can find papers and their BibTeX reference sources on the ACM, Springer and IEEE web catalogues.) Google Scholar shows an option "Citeren" or "Cite" for each hit. Choosing that option shows you a screen in which you can choose BibTeX. That option gives you the text that you can copy and paste to the `ref.bib` file:

```
@inproceedings{fuggetta2014software,
  title={Software process},
  author={Fuggetta, Alfonso and Di Nitto,
Elisabetta},
  booktitle={Proceedings of the on Future
of Software Engineering},
  pages={1--12},
  year={2014},
  organization={ACM}
}
```

The BibTeX entry provided by Google Scholar is not necessarily complete. Verify the citation and complete it if necessary. In the .tex document, you can cite it with the command **cite**, which should be preceded by a non-breakable space (~, aka 'tilde'), e.g.

```
Fuggetta and Di Nitto~\cite{fuggetta2014software}
```

Compilation: To compile a tex-file called `zzz.tex` and generate a PDF, execute the following five commands on a command line:

```
pdflatex zzz
pdflatex zzz
bibtex zzz
pdflatex zzz
pdflatex zzz
```

These five commands should result in a file called `zzz.pdf` which you can open with any PDF viewer.

IEEE templates. Templates of of IEEE computer science conferences and journals can be downloaded from IEEE[5]. However, this document itself has been written in the IEEE style as well. It should be much easier to use the template package that we provide as a starting point. In the tex source in that package (called `template.tex`) is already prepared: all relevant packages have been loaded and unnecessary ones have been removed. Furthermore, the source files of the present document are also available for you. The `essay.tex` file contains examples of citations using BibTeX, internal references to other sections, footnotes, and some basic mark-up examples such as including images and typesetting.

2) Paragraph: When you write in scientific style, you should follow some basic rules with respect to the structure of the document and the components of the text. In [4] on page 17 you find a useful collection of aspects to "Making Your Article interesting to Read". Furthermore, practical tutorials can be found about the structure of a good paragraph on the Internet[6].

There are other levels of a paper than a paragraph. At a global sense, an essay should be structured in a way that the reader can easily follow the logic of the writer. In this assignment the structure of the essay is given. At a more local sense, sentences should be grammatically correct and easy to follow. In this assignment we assume that you can construct good sentences. Therefore, although the overall structure and the sentences are essential to create a well-written essay, in this assignment we mostly focus on the clear hierarchy of each paragraph (topic sentence, evidence) and the progression (transitions) of adjacent paragraphs.

3) Plagiarism: As the same principles apply here, a substantial part of this subsection is taken directly from the bachelor course 'IB2002 – Wetenschappelijke Schrijfvaardigheden'.

Some students have difficulty in assessing the difference between paraphrasing, quoting, or plagiarising existing text. It is important that you recognise what is considered to be plagiarism. 'De Nederlandse Gedragscode Wetenschapsbeoefening' [5] provides more information on that and IEEE's 'How to Cite/Quote in Your Assignment' [6] shows guidelines and examples of "unacceptable paraphrasing". A good rule of thumb to avoid plagiarism is to absorb the sources as follows: read, take critical notes, write short summaries for yourself, think, write, think further, rewrite (possibly iterate the latter two steps), polish, and only after all these steps, submit. As you see, the final text is not only far from the sources that you use but also incorporates the results of your own thinking process.

If *unacceptable paraphrasing* is detected or sentences have

[5]IEEE Templates for Transactions: `http://ieeeauthorcenter.ieee.org/create-your-ieee-article/use-authoring-tools-and-ieee-article-templates/ieee-article-templates/templates-for-transactions/`

[6]On Scribbr, you can find good explanations about paragraphs `https://www.scribbr.com/academic-essay/how-to-structure-a-paragraph-in-an-academic-essay/` and topic sentences `https://www.scribbr.com/research-paper/topic-sentences/`

been quoted without presenting them as direct quotes, I will notify you of this and give you *one* opportunity to fix this. Whenever *plagiarism* is detected, from whatever source, you automatically fail the course, no discussion is possible. For more information, see [5].

4) Assessment: The following criteria are taken into account when assessing the Final essay. The numbers in brackets indicate the maximum number of points awarded to the particular criterion.

- Format (**5**)
  - Correct template (1)
  - Correct document structure (1)
  - Page limit: 2-3 pages (2)
  - References and citations are correct (3)
- Content (**20**)
  - Abstract: good summary of the work (3)
  - Introduction: quality of the intro to the topic (narrowing from general to the specific topic) (4)
  - Main part: Relevance of the ideas (6)
  - Main part: Level of knowledge reflected in the text (5)
  - Future work: relation to the main part (1)
  - Future work: quality of content (1)
- Writing (**7**)
  - Abstract: clarity (1)
  - Introduction: clarity (1)
  - Paragraph structure and logical advance (3)
  - Clarity of the text (2)
- Peer review (**8**)
  - Clear and constructive feedback (2)
  - Reviews reflect good knowledge and attitude (3)
  - Received feedback is (critically) applied (3)