CS777: Software Reliability and Quality Assurance
Term Paper

The term paper is designed to encourage *individual* research into a particular area that will not be directly covered in the course, but will act as a supplement to the class work on reliability and I would prefer you to focus more on quality control / assurance. This is to be independent guided research and reporting. You will be presenting and leading discussions on your work in class.

TOPICS
There are 3 topics to choose from, but if any student has a burning topic that they thing is relevant and that they would like to research, learn and write about, this can be accommodated also. Just let me know and we can determine if it is a reasonable alternative.

1) Quality Attributes of Software
Reliability is but one property of a software system that we may be interested in from a quality perspective. It is one of a number of attributes associated with the dependability of a software system (see the Avizˇienis et al. paper linked on my website). Some people say that reliability is the most critical quality attribute, but others disagree. You will be learning a little about how to specify a reliability target, design a software system in such a way as to bolster its reliability, and gather appropriate data so as to measure the reliability achieved in this course. How do you do this with the other dependability attributes? What approaches, techniques and resources do we have to draw upon? You are to select ONE of the following dependability attributes to research in detail: availability, safety, confidentiality, integrity or maintainability. What is it? Why does it matter? When does it matter? How can you specify and measure it? Your paper should compare and contrast this dependability attribute with reliability. In addition to dependability, what other quality characteristics are there to be concerned about? Oftentimes, people refer to usability, performance, cost and functionality. Where does security fit? It is a composite quality. Feel free to explore and report on any mix of these. Remember, we are interested in how these are specified, how targets are determined, software engineering techniques to help us achieve our targets, and also what we need to do to measure whether or not we have.

2) Quality Hot Topics and Hot People
Quality is a focal topic for many industry initiatives, standards and models, and it is a topic with a number of luminaries. You have probably heard of some of those listed here, but do you actually know what they are and how/whether they apply to the development of software? You have probably heard of some of the influential people also, but what did they do and how does their work apply to software development? You are to select 2 topics from the following, explain what they are and describe the relevance for a software engineer: the ISO/IEEE standards pertaining to quality; Six Sigma and Lean; Software Process Improvement, including CMMI and PSP/TSP (Personal Software Process/Team Software Process); the work of Deming, Juran, Crosby or another important figurehead (pick a couple of key figures to compare and contrast contributions); or any other model/standard/etc. of your choosing (to be agreed). Note, this is not just a brain dump description saying 'what is six sigma' for instance, but needs to be contextualised with respect its use in/for and implications for software development, so written as a software engineer's guide to the topic. The paper needs to present a case as to why a software engineer should bother with quality and explain how the topic you studied for your paper applies and is important for improving the quality of software processes and products.

3) A Culture for Quality
This paper is a little less structured. It is about options for introducing and institutionalizing a software quality culture within your organisation.

Firstly, what is a culture for quality? What would this look like? How would you know you have such a culture? This paper will obviously involve you examining the health of your organisation's approach to software quality, and it may be a little subjective. Conduct a review of the state of the practice within your organisation. What do they purport to do and what do they actually do? If the extent of the QA work is testing, explain this, along with pros and cons. What works well, what works less well? What are the

problems and barriers from your perspective and what opportunities do you see for improvement? If you were tasked with introducing and institutionalizing a software quality culture within your organisation, what would you do? If you were tasked with making recommendations for quality improvement, what would you do? Could you put together a (fuller?) quality assurance program? How would you approach this task? What would you recommend be done? How would you justify this? How would you propose to go about this? More importantly, how would you propose to measure your success (or otherwise)? Can you find any case studies from other organisations to support your work?

NOTE – these are all open-ended topics with general themes. It is to give you the flexibility to propose something that fits you! I would like you to think about this and send me an email to summarise what you would like to work on (perhaps a title and paragraph to explain), and I can guide you from there. Try not to write on anything 'sensitive' in nature.

LOGISTICAL INSTRUCTIONS
The term paper is to be prepared in accordance with the ACM Manuscript Formatting Guidelines (see the template which you can download from my website).
Papers should be 4 to 6 pages in length (including any references and any figures). Submissions less than 4 pages and greater than 6 pages will not be reviewed and marked! This is a rigid constraint.

DEADLINES
Proposal is due on or around Feb 16, 2009 – email me

Final paper is due on March 23, 2009 – in class
You have over one month and time from a class session to spend on your paper.

Drafts/feedback
- **Synopsis.** I have provided quite a structured synopsis of paper topics, so this should be clear to follow. If a student wants to pursue something other than topics 1, 2 or 3, then I need to see a similar synopsis from you by Feb 23, 2009 (email this to me). I am happy for you to do anything on topic.
- **Interim.** If you would like feedback on your work prior to final submission, please send this to me after you have spent time on it, before March 9, 2009. Please email this to me.
- **Other.** I will be happy to give suggestions, pointers and feedback during office hours and after class sessions, but it is your responsibility to seek this – I will not chase you. Every paper and student needs will be different.
- **Presentations.** Each student will get a 5 to 10 minute slot and a 5-minute slot for Q&A in class on March 9, 2009. This is to get comments and feedback before completion and submission.

DELIVERABLES
Students are expected to email me a soft copy and hand me a hardcopy of their paper in class on March 23, 2009. You must also hand in a paper copy of your self-assessment form (see website), signed.

MARKING
The term paper is individual work and is worth 20% of your grade. The grading rubric is available on my website and you are to complete this as self-assessment prior to submission and hand it in with your final paper, signed. Each paper will be read and reviewed by me, and peer reviewed by 2 other students.

PEER REVIEW
You will each have 2 papers to review during the week of March 23, 2009. Plan for this! This is why I expect 6 pages maximum – concise considered work please! Doing the peer review will comprise a small % of your grade. The material will be examinable, so you will be getting topics to balance things out for you and it will be good revision for your exam, so this is why you will need to do this task carefully!

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