SOFTWARE ENGINEERING ESSAY

Version 1.0
BSc Computing for Games
COMP130

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Introduction

In this assignment, you will research software engineering principles to bring an academic perspective to your working practice. Specifically, exploring:

(i) One prolific engineering challenge related to game development;
(ii) and how relevant engineering principles apply to your COMP130 project.

Working practices are important to employers in the games industry. Problems arising from poor software design and ineffective quality assurance practices are very expensive and largely avoidable. As such, key software engineering principles are widely used in the games industry. They are essential to learn. Additionally, research skills will help you with your professional development. Most critically, moving beyond textbooks and websites to the academic literature, which will help you to keep your skills up to date in the future.

This assignment is formed of several parts:

(A) **Write** a 400-word proposal **with** references which must:
  i. **state** a problem associated with the given challenge area;
  ii. **describe** the way in which you intend to address the question;
  iii. and then **list** at least **8** academic references to use to support your research.

(B) **Present**, as an **individual**, a 5-minute summary of your research that will:
  i. **outline** your field of interest **and** research question;
  ii. **analyse** the most applicable principles based on your findings;
  iii. and **discuss how** such principles integrate into your working practice.

(C) **Write** a draft 2000-word essay which will:
  i. **address** the engineering challenge raised by your research queston;
  ii. and **justify** those software engineering principles which should be leveraged in your working practice to overcome the challenge.

(D) **Write** a final 2000-word essay which will:
  i. **revise** any issues raised by your tutor and/or your peers.

Note: All research questions must be distinctive. Members of the same development group must **not** target the same field or question.

"Program testing can be used to show the presence of bugs, but never to show their absence!"

— Edsger Dijkstra

"Let us change our traditional attitude to the construction of programs. Instead of imagining that our main task is to instruct a computer what to do, let us concentrate rather on explaining to human beings what we want a computer to do."

— Donald Knuth

"A good way to stay flexible is to write less code."

— Andy Hunt & Dave Thomas

When you have only a hammer, many problems will look like a nail. Ensure that you broaden your knowledge of engineering so you have a wide repetoir of software development skills that you can apply to a variety of different problems.

Assignment Setup

This assignment is an **academic writing task**. Fork the GitHub repository at the following URL:

`https://github.com/Falmouth-Games-Academy/comp130-software-engineering`

Use the existing directory structure and, as required, extend this structure with sub-directories. Ensure that you maintain the `readme.md` file.

Modify the `.gitignore` to the defaults for **TeX**. Please, also ensure that you add editor-specific files and folders to `.gitignore`.

Part A

Part A consists of a **single formative submission**. This work is **individual** and will be assessed on a **threshold** basis. The following criteria are used to determine a pass or fail:

(a) Submission is timely;
(b) Field and research question are both appropriate and distinctive;
(c) At least eight academic peer-reviewed sources are cited.

To complete Part A, review the challenge area announced in class. Write your proposal in the `readme.md` document and then prepare the reference list using a `*.bib` file. Show these to your tutor. If acceptable, this will be signed-off.

You will receive immediate **informal feedback**.

Part B

Part B is a **single formative submission**. This work is **individual** and will be assessed on a **threshold** basis. The following criteria are used to determine a pass or fail:

(a) Research questions are adequetely addressed;
(b) Some evidence of academic rigor;
(c) Some insight into the relationship between theory and practice.

To complete Part B, prepare a presentation, and refine your argument. Prepare a slide-deck to support your delivery. Be sure to leverage the combined reference list of the group to to breadth of discussion on engineering practices before narrowing down. Help each other. Illustrate key concepts and working practices—leverage screenshots and video where appropriate. Then, attend the scheduled session.

You will receive **informal feedback** within 3 working days after the session.

Part C

Part C is a **single formative submission**. This work is **individual** and will be assessed on a **threshold** basis. The following criteria are used to determine a pass or fail:

(a) Submission is timely;
(b) Enough work is available to conduct a meaningful review;
(c) A broadly appropriate review of a peer's work is submitted.

To complete Part C, prepare a draft version of the essay. Ensure that the source code and related assets are pushed to GitHub and a pull request is made prior to the scheduled session. Then, attend the scheduled session.

You will receive **peer feedback** within 3 working days after the session.

Part D

Part D is a **single summative submission**. This work is **individual** and will be assessed on a **criterion-referenced** basis. Please refer to the marking rubric at the end of this document for further detail.

To complete Part D, revise the essay based on the feedback you have received. Then, upload the essay to the LearningSpace. Please note, the LearningSpace will only accept a single `.pdf` file.

You will receive **formal feedback** three weeks after the final deadline.

Additional Guidance

Developing the research question is, by far, the most challenging aspect of this assignment. It is very unlikely that you will settle on the first research question that you propose. This is because the question will often arise out of your individual research and reading efforts. Furthermore, the question should relate to challenges that game developers encounter and the working practices they could adopt to overcome such challenges.

Carefully consider the structure and forumulation of your research question. The question should be framed in such a way that it makes it easy for you to produce a recommendation based on critical argument. There are three key components that you need to consider to enable the question to facilitate the making of such a recommendation. These are: an area of challenge; a specific game system or area of application within game or game engine architecture; and a single relevant engineering principle and/or technique. An example might be: "which design patterns is the most appropriate for localising dialogue?". Here, the challenge is localisation. The specific game system is dialogue. The software engineering aspect is the application of design patterns. This question will hopefully also motivate an analysis as it asks "which is *most* appropriate". You will need to discuss your question with your tutor and your peers to help focus it.

Challenge areas include: accessibility; portability; internationalisation; and verification. Application areas are numerous, but popular choices have included: player interactions; feedback to players; artifically intelligent agents; procedural content generation of levels; collision detection; and many others. Areas of software engineering might include: empirical approaches; metrics; design patterns; CASE tools; test-driven development; continuous integration; novel data structures; choice of programming paradigm (e.g., object-orientated vs data-driven); structured methods for quality assurance; and so on.

It is critically important that submissions focus on a problem, motivate it with examples of how it affects games/players, and present a suitable solution. **It is not enough to merely discuss the importance of a problem or the general usefulness of a working practice!** Essays must focus on a specific challenge and make a concrete recommendation on how to overcome that challenge. An essay that merely emphasises the importance of an issue or the significance of a challenge, or how difficult it is to apply a particular technique will likely fail. Additionally, the work **must be technical in nature and be relevant to software engineering**. Questions about generic project management issues such as human resource management or game design practices such as play testing will be rejected.

Areas where students tend to lose marks are: depth of insight; analytical skill; and evaluative skill. Depth of insight implies rigorous research, addressing one key challenge in much detail, rather than several challenges with weaker research and/or in less detail. Adequete analysis implies going beyond mere descrption, perhaps through: performing calculatons, comparing sources, or even deploying reasoning to generate new insights. Adequete evaluation implies making appropriate reference to evidence and ensuring that evidence is of appropriate quality. Further to this, sound and valid arguments are constructed, criticising the claims made by other authors.

Focus on answering your research question. You have but 2000-words! Depth over breadth. Quality over quantitiy. Write concisely. Your ability to recall facts is not under assessment, your ability to construct an argument through critical analysis, make it relevant to practice, and justify a recommendation, is!

FAQ

- **Is this a mistake?**
  If you have discovered an issue with the brief itself, the source files are available at:
  `https://github.com/Falmouth-Games-Academy/bsc-assignment-briefs`.
  Please make a pull request and comment accordingly.

Additional Resources

Please review the additional resources at: `http://resourcelists.falmouth.ac.uk/lists/AD0A5B57-CE01-8391-95BA-BF7132C795D8.html`

Marking Rubric

Criterion	Weight	Refer for Resubmission	Basic Competency	Basic Proficiency	Novice Competency	Novice Proficiency	Professional Competency
Basic Competency Threshold	40% (Threshold)	Parts A—C have not been submitted, are incomplete, or are unsatisfactory.	Two parts incomplete.		One part incomplete.		Parts A—C are complete.
Appropriateness of Referenced Articles	5%	No relevant article is referenced.	At least four relevant sources are referenced. Where appropriate, a few sources report scholarly research.	At least six relevant sources have been referenced. Where appropriate, some sources report scholarly research.	At least eight relevant sources have been referenced. Where appropriate, most sources report scholarly research.	At least ten relevant sources have been referenced. Where appropriate, most sources report scholarly research.	At least twelve relevant sources have been referenced. Where appropriate, most articles report scholarly research. Some appropriate seminal and highly reputed sources have been referenced.
Relevance to and Focus on the Research Question	2.5%	No focus on the research question.	Little focus on the research question.	Some focus on the research question.	Much focus on the research question. Research questions are explicitly defined.	Considerable focus on the research question. Research question is explicitly defined. Conclusion explicitly refers back to the question.	Significant focus on the research question. Research question is explicitly defined. Conclusion explicitly refers back to the question.
Depth of Insight into Software Engineering Principles	15%	No depth of insight into software engineering principles.	Little depth of insight into software engineering principles.	Some depth of insight into software engineering principles. Insight highlights a specific engineering challenge in digital games development.	Much depth of insight into software engineering principles. Insight highlights a specific and relevant engineering challenge in digital games development.	Considerable depth of insight into software engineering principles. Insight explores, in detail, a specific and relevant engineering challenge in digital games development.	Significant depth of insight into software engineering principles. Critical insight that explores and/or addresses, in detail, a specific and pertinent engineering challenge in digital games development.
Specificity, Verifiability, & Accuracy of Claims	2.5%	No citations to evidence to claims. Substantial errors and/or misinterpretations.	Few claims have a clear source of evidence. Significant errors and/or misinterpretations.	Some claims have a clear source of evidence. Many errors and/or misinterpretations.	Many claims have a clear source of evidence. Some errors and/or misinterpretations.	Most claims have a clear source of evidence. Few errors and/or misinterpretations.	All claims have a clear source of evidence. Almost no errors and/or misinterpretations.
Adequacy of Analysis of Research Articles	15%	No analysis has been presented.	Little analysis has been presented.	Some analysis has been presented.	Much analysis has been presented.	Considerable analysis has been presented.	Significant analysis has been presented.
Adequacy of Justification of Approaches & Techniques	10%	No proposed solution, or limited (if any) transfer to the games industry.	Broad solution proposed. Little justification for applying the solution in the games industry.	Somewhat specific solution proposed. Some justification for applying the solution in the games industry.	Specific solution proposed. Much justification for applying the solution in the games industry, with reference to current games industry and/or game development practice.	Specific and detailed solution proposed, supported with appropriate illustrations (e.g., UML diagrams). Considerable justification for applying the solution in the games industry, with reference to current games industry and/or game development practice.	Specific and detailed solution proposed, supported with appropriate illustrations (e.g., UML diagrams). Significant justification for applying the solution in the games industry, with key insights into pitfalls providing critical justification for its adoption over existing games industry and/or game development practice.
Appropriateness of Academic Writing	5%	Little or no evidence of partial-mastery of academic writing. The reference section is missing.	Evidence of partial-mastery of academic writing. The reference section is incomplete and/or malformed.	Evidence of partial-mastery of academic writing. The reference section is complete and well-formed in either ACM or IEEE format. Most in-text citations and quotations are correct.	Some evidence of mastery of academic writing. The reference section is complete and well-formed in either ACM or IEEE format. All in-text citations and quotations are correct.	Much evidence of mastery of academic writing. The reference section is complete and well-formed in either ACM or IEEE format. All in-text citations and quotations are correct.	Considerable evidence of mastery of academic writing. The reference section is complete and well-formed in either ACM or IEEE format. All in-text citations and quotations are correct.

Criterion	Weight	Refer for Resubmission	Basic Competency	Basic Proficiency	Novice Competency	Novice Proficiency	Professional Competency
Appropriateness of Spelling & Grammar	2.5%	Substantial spelling and/or grammar errors.	Many spelling and/or grammar errors.	Some spelling and/or grammar errors.	Few spelling and/or grammar errors.	Almost no spelling and/or grammar errors.	No spelling or grammar errors.
Appropriateness of Essay Structure	2.5%	There is no structure, or the structure is unclear.	There is little structure.	There is some structure. A few sentences and paragraphs are well constructed.	There is much structure. Some sentences and paragraphs are well constructed. There is a clear introduction and conclusion.	There is much structure, highlighting the argument. Most sentences and paragraphs are well constructed. There is a clear and well-constructed introduction and conclusion.	There is much structure, highlighting the argument. All sentences and paragraphs are well constructed. There is a clear and well-constructed introduction and conclusion.