Unit 7: Software Development Lifecycles

Authorised Assignment Brief 1

Student Name/ ID Number	
Unit Number and Title	**Unit 7: Software Development Lifecycles**
Academic Year	
Unit Tutor	
Assignment Title	**The Software Development Lifecycle**
Issue Date	
Submission Date	
Submission Format	

The submission is in the form of the following.

A research paper that reviews and assesses the different software development lifecycle methodologies.

The recommended word limit is 1,500–2,000 words, although you will not be penalised for exceeding the total word limit.

You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced using the Harvard referencing system

A written report exploring and assessing the importance of impact feasibility studies in software development projects

The recommended word limit is 1,500–2,000 words, although you will not be penalised for exceeding the total word limit.

You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced using the Harvard referencing system

A written portfolio to undertake a software development lifecycle investigation for a specified problem. The portfolio will include the following.

- Project Report Documents produced to define the Project Initiation phase, including background information, problem statements, data collection processes and recommendation

- Planning Documents produced to define and scope the problem and intended solution, including a requirements analysis and functional and non-functional requirements

- Business Requirements Documents produced to meet the requirements and processes relevant to a given methodology, including context diagrams, ERD designs for data models, overall system designs using DFDs, BSO and TST options and requirements traceability.

The recommended word limit is 2,500 –3,000 words, although you will not be penalised for exceeding the total word limit.

You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced using the Harvard referencing system.

A formal 10-minute presentation (10–20 slides as a guide, with speaker notes) to communicate an evaluation of your investigation to a technical audience, highlighting key information regarding the investigation, planning methodology, tools and techniques used in planning how the solution to the given problem will be developed.

You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced using the Harvard referencing system.

Unit Learning Outcomes

LO1 Describe different software development lifecycles

LO2 Explain the importance of a feasibility study

LO3 Undertake a software development lifecycle

LO4 Discuss the suitability of software behavioural design techniques.

Transferable skills and competencies developed

Computing-related cognitive skills

- Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to computing and computer applications

- Use such knowledge and understanding in the modelling and design of computer-based systems for the purposes of comprehension, communication, prediction and the understanding of trade-offs

- Recognise and analyse criteria and specifications appropriate to specific problems, and plan strategies for their solutions

- Analyse the extent to which a computer-based system meets the criteria defined for its current use and future development
- Deploy appropriate theory, practices and tools for the design, implementation and evaluation of computer-based systems.

Computing-related practical skills

- The ability to evaluate systems in terms of quality attributes and possible trade-offs, presented within the given problem
- The ability to plan and manage projects to deliver computing systems within constraints of requirements, timescale and budget
- The ability to recognise any risks and safety aspects that may be involved in the deployment of computing systems within a given context
- The ability to deploy effectively the tools used for the construction and documentation of computer applications, with particular emphasis on understanding the whole process involved in the effective deployment of computers to solve practical problems
- The ability to critically evaluate and analyse complex problems, including those with incomplete information, and devise appropriate solutions, within the constraints of a budget.

Generic skills for employability

- Intellectual skills: critical thinking; making a case; numeracy and literacy
- Self-management: self-awareness and reflection; goal setting and action planning, independence and adaptability; acting on initiative; innovation and creativity
- Contextual awareness, e.g. the ability to understand and meet the needs of individuals, business and the community, and to understand how workplaces and organisations are governed.

Vocational scenario

You work as a Junior Systems Analyst at Phonyt Digital Solutions (PDS), an independent software development company that specialises in designing and creating bespoke computer systems to meet individual client requirements.

Enomy-Finances is an organisation in the financial sector that provides advice and services related to mortgages, savings and investments.

Enomy-Finances has recently seen an increase in demand for its services and is expanding to meet this demand. They would like a new computer system to support both staff and clients.

The Project Client – the Enomy-Finances Chief Technical Officer – has asked PDS if they would be interested in designing and implementing the new computer system. The client has specified that the new system must be deployed on an upgraded infrastructure.

The CEO has asked you carry out a preliminary software investigation on the new system to be developed prior to taking on the project.

You are to identify the appropriate software methodology to be used should PDS agree to take on the project. You have also been asked to carry out a basic investigation into the project to determine scope, requirements, constraints and to identify core system processes.

You are required to generate some simple software designs to present to the project client to make sure that you have understood their requirements correctly.

PDS has a range of in-house expertise using a range of software development paradigms – Event, Object Oriented, Procedural and Functional Programming. You have been given the freedom to select the most appropriate development approach and the appropriate project lifecycle methodology.

The requirements of the Enomy-Finances project are listed in Appendix 1 – U7 Enomy-Finances Client Project Information and it contains further information about the application you are required to investigate. Ensure that you read the information carefully before you attempt this assignment.

The current system is a networked application, but the project client has expressed an interest in possibly moving to a web-based system.

The project client has agreed that, if required, they can be available throughout the project to answer any questions.

Assignment activity and guidance

Activity 1

Write a research paper that reviews the different software development lifecycle models available to PDS.

Your research paper should include the following.

- An overview of different lifecycle models that could be applied to solving the problem. Your overview should contain, as a minimum, coverage of two iterative and two sequential software lifecycle models

- A consideration of different risks to this software project and to software lifecycle models in general, and how these risks can be managed

- A recommendation of an appropriate SDLC model that could be implemented, supported by:

    o a discussion of the benefits and drawbacks of your chosen SDLC mode

    o judgements as to the appropriateness of your chosen SDLC model for the Enomy-Finances project.

- A supported assessment of the merits of using the Waterfall lifecycle model on large-scale projects, such as the Enomy-Finances project

- You should support the points you make in the paper with well-chosen examples from the appendix, and other relevant examples from any research you have carried out on related sectors or projects.

Activity 2

Write an evaluative report that explores the importance of feasibility studies in large-scale computer projects. Your report should include the following.

- Consideration of the contents and purpose of a feasibility report, which includes:
    - an explanation of the purpose of a feasibility study
    - an overview of how different technical solutions, for an identified set of problems, can be compared
    - a discussion of the different components of a feasibility report.
- An assessment of the impact that a feasibility study would have on the Enomy-Finances project, with reference to specific identified feasibility criteria.

You should support the points you make in the report with well-chosen examples from the appendix, and other relevant examples from any research you have carried out on related sectors or projects.

Activity 3

Carry out a software development lifecycle

- Apply an appropriate software development approach to investigate the implementation of the application for the Enomy-Finances project
- As part of your planning you should produce a written report that:
- identifies stakeholder requirements
- plans the scope of the module, including inputs, outputs, processes and process descriptors, consideration of alternate solutions and security considerations
- explores relevant constraints
- presents a set of functional and non-functional requirements
- includes the design of a solution that could be implemented and communicates understanding of the program effectively, including:
    - algorithmic software designs to, for example, flowcharts, pseudocode
    - logical software design, including a finite staan te machine (FSM) and an extended FSM, making sure that there is example of both being used, as well as an explanation of the differences between them
    - data designs, e.g. DFDs, ERDs, Context Diagrams, Data Dictionaries
    - Business Systems Options and Technical Systems Options.

Activity 4

Evaluate the process

Produce a formal presentation (with supporting notes) that communicates an evaluation of your investigation process to your manager. The report should include the following.

- An analysis of how software requirements for the management data analytics module were traced throughout the entire software lifecyle

- A discussion of at least two approaches to improving software quality within a software lifecycle

- An evaluation of the suitability of your investigation in relation to the needs of Enomy-Finances, to include:

  o a discussion, using examples, of the suitability of the software behavioural design techniques you choose

  o an analysis of your chosen software behavioural tools and techniques for investigating the given problem

  o more than one justification of how data driven software can improve the reliability and effectiveness of the software solution

  o how the investigative process you have undertaken on the Enomy-Finances project will affect improving the eventual quality of the implemented software application.

You should support the points you make in the report with well-chosen examples from the information booklet, and other relevant examples from any research you have carried out on related sectors or projects.

Recommended resources

Please note that the resources listed are examples for you to use as a starting point in your research – the list is not definitive.

Weblinks - general:

https://brilliant.org/ (n.d.) *Finite State Machines* [online] Available at: https://brilliant.org/wiki/finite-state-machines/ [Accessed 1 August 2022]

https://edu.google.com/ (n.d.) *Exploring Computational Thinking* [online] Available at: https://edu.google.com/resources/programs/exploring-computational-thinking/ [Accessed 1 August 2022]

https://www.javatpoint.com/ (2021*) Software Design* [online] Available at: https://www.javatpoint.com/software-engineering-software-design [Accessed 1 August 2022]

https://www.roberthalf.co.uk/ (2018) *6 basic SDLC methodologies: which one is best?* [online] Available at: https://www.roberthalf.co.uk/advice/industry-insights/6-basic-sdlc-methodologies-which-one-best [Accessed 1 August 2022]

https://www.tutorialspoint.com/index.htm (2022) *SDLC - Quick Guide* [online] Available at: https://www.tutorialspoint.com/sdlc/sdlc_quick_guide.htm [Accessed 1 August 2022]

Journal articles:

Alagar, V. & Periyasamy, K. (2011). *'Extended Finite State Machine'. Texts in Computer Science*, pp.105-128. doi: 10.1007/978-0-85729-277-3_7.

Alshamrani, A. & Bahattab, A. (2015) A Comparison Between Three SDLC Models Waterfall Model, Spiral Model, and Incremental/Iterative Model. *IJCSI International Journal of Computer Science Issues*, Volume 12, Issue 1, No 1, January 2015

Beynon-Davies, Paul & Carne, C & Mackay, Hugh & Tudhope, D. (1999). Rapid application development (RAD): An empirical review. *European Journal of Information Systems*. 8. 10.1057/palgrave.ejis.3000325.

Dawson, Maurice & Burrell, Darrell & Rahim, Emad & Brewster, Stephen. (2010) Integrating Software Assurance into the Software Development Life Cycle (SDLC). *Journal of Information Systems Technology and Planning*. 3. 49-53.

Dingsøyr, T. et al. (2012) A decade of agile methodologies: Towards explaining agile software development. *Journal of Systems and Software*, Volume 85, Issue 6,2012, pp. 1213-1221, doi: https://doi.org/10.1016/j.jss.2012.02.033.

Gurung, Gagan & Shah, Rahul & Jaiswal, Dhiraj. (2020). Software Development Life Cycle Models-A Comparative Study. International Journal of Scientific Research in Computer Science, *Engineering and Information Technology*. pp. 30-37. doi:10.32628/CSEIT206410.

Horsky, J. et al. (2010) Complementary methods of system usability evaluation: Surveys and observations during software design and development cycles. *Journal of Biomedical Informatics*, Volume 43, Issue 5,2010, pp. 782-790, ISSN 1532-0464, https://doi.org/10.1016/j.jbi.2010.05.010.

Pinciroli, F. (2016) Improving Software Applications Quality by Considering the Contribution Relationship Among Quality Attributes. *Procedia Computer Science*, Volume 83,2016, pp. 970-975, ISSN 1877-0509, https://doi.org/10.1016/j.procs.2016.04.194.

Rasnacis, A. & Berzisa, S. (2017) Method for Adaptation and Implementation of Agile Project Management Methodology. *Procedia Computer Science Volume* 104, 2017, pp. 43-50, doi: https://doi.org/10.1016/j.procs.2017.01.055

Van Casteren, W. (2017). *The Waterfall Model and the Agile Methodologies: A comparison by project characteristics*. doi:10.13140/RG.2.2.36825.72805.

Zuzak, Ivan & Budiselic, Ivan & Delac, Goran. (2011). A Finite-State Machine Approach for Modeling and Analyzing RESTful Systems. J. *Web Eng*. 10. 353-390.

Reading:

Dennis, A. and Haley, W. (2009) *Systems Analysis and Design.* John Wiley & Sons Ltd.

Lejk, M. and Deeks, D. (2002) *An Introduction to System Analysis Techniques*. 2nd edn. Addison-Wesley.

Martin, R. C. (2011) *The Clean Coder: A Code of Conduct for Professional Programmers*. USA: Prentice Hall.

McConnell, S. (2004) *Code Complete: A Practical Handbook of Software Construction*. USA: Microsoft Press.

Murch, R. (2012) *The Software Development Lifecycle: A Complete Guide*. Kindle.

Smart, J. F. (2014) *BDD in Action: Behavior-driven development for the whole software lifecycle*. Manning.

HN Global:

HN Global HN Global (2021) *Reading Lists.* Available at: https://hnglobal.highernationals.com/learning-zone/reading-lists

HN Global (2021) *Student Resource Library.* Available at:
https://hnglobal.highernationals.com/subjects/resource-libraries

HN Global (2021) *Textbooks.* Available at:
https://hnglobal.highernationals.com/textbooks

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Describe different software development lifecycles		
P1 Describe two iterative and two sequential software lifecycle models. **P2** Explain how risk is managed in software lifecycle models.	**M1** Discuss using an example, why a particular lifecycle model is selected for a development environment.	**D1** Assess the merits of applying the Waterfall lifecycle model to a large software development project.
LO2 Explain the importance of a feasibility study		
P3 Explain the purpose of a feasibility report. **P4** Describe how technical solutions can be compared.	**M2** Discuss the components of a feasibility report.	**D2** Assess the impact of different feasibility criteria on a software investigation.
LO3 Undertake a software development lifecycle		
P5 Undertake a software investigation to meet a business need. **P6** Use appropriate software analysis tools/techniques to carry out a software investigation and create supporting documentation.	**M3** Analyse how software requirements can be traced throughout the software lifecycle. **M4** Discuss two approaches to improving software quality.	**D3** Evaluate the process of undertaking a systems investigation with regard to its effectiveness in improving a software quality.
LO4 Discuss the suitability of software behavioural design techniques.		
P7 Discuss, using examples, the suitability of software behavioural design techniques.	**M5** Analyse a range of software behavioural tools and techniques. **M6** Differentiate between a finite state machine (FSM) and an extended FSM, providing an application of use for both.	**D4** Present justifications of how data-driven software can improve the reliability and effectiveness of software.

Appendix 1 – Enomy-Finances Client Project Information

Organisation overview
Enomy-Finances is an organisation in the financial sector that provides advice and services related to mortgages, savings and investments. Its work includes: ● assessing clients' income and outgoings to provide advice on budgeting and consolidating debt ● providing access to savings and investment opportunities ● managing investment portfolios. Enomy-Finances has recently seen an increase in demand for its services and is expanding to meet this demand. As part of the expansion, Enomy-Finances would like to commission a new computer system to support both staff and clients. The new system will consist of a new software platform that should be deployed on an upgraded infrastructure.

Key application requirements
The owner of the company has provided you with a list of some of the key requirements for the application that you have been tasked with creating. These requirements are as follows. ● Providing tools to calculate the cost to clients of purchasing different currencies ● Providing quotes on potential earnings on savings and investment plans ● Simple to use user interface ● Support users through appropriate use of textual, numeric and graphical data representation ● Store user information such as contact information, records of transactions and saved quotes ● Keep user data secure ● The current system consists of a client application deployed on each staff computer, and a set of servers that currently handles all business logic and processing as well as acting as database servers. These act to load current exchange, market and currency data into a data warehouse as well as storing any local company or client data required for processing ● The client would like to explore moving to a web-based application.

Additional information
Currency conversion module The program will be used to calculate the cost of buying and selling different currencies. The system must be able to convert between different currencies, including: ● pounds sterling (GBP) ● American dollars (USD) ● Euro (EUR)

- Brazilian real (BRL)
- Japanese yen (JPY)
- Turkish lira (TRY).

It should allow the user to enter a value in one currency and calculate the amount in another currency that it is worth.

The application should make use of current, up-to date currency values to calculate the conversions.

There are limitations on the values of a single transitions These are:

- minimum transaction = 300 of the initial currency to be converted
- maximum transaction = 5000 of the initial currency to be converted.

The company charges a fee for each transaction. The fees are:

Initial currency amount	Fee
Up to 500	3.5%
Over 500	2.7%
Over 1500	2.0%
Over 2500	1.5%

Savings and investments module

The program should allow the user to enter this information:

- initial lump sum to be invested
- monthly amount to be invested
- the type of investment they want.

The program should then provide the user with a personalised investment quote that shows:

- the maximum and minimum returns they can expect the investment to be worth after:
    - o 1 year
    - o 5 years
    - o 10 years.
- total profit in each time frame
- total fees paid in each time frame
- total taxes paid in each time frame.

Values should be formatted as currency (GBP) to two decimal places.

The program should be able to handle user errors.

In addition, should any internal system error occur, the system needs to fail gracefully while logging all diagnostic data at the point of error to a database an,d in the case of a network failure, to the local file system. Any user data needs to be cached immediately.

Types of investment

Investment types offered	Information
Option 1 – Basic Savings Plan	**Maximum investment per year:** £20 000 **Minimum monthly investment:** £50 **Minimum initial investment lump sum:** N/A **Predicted returns per year:** ● 1.2% to 2.4%. **Estimated tax:** ● 0%. **RBSX group fees per month:** ● 0.25%.
Option 2 – Savings Plan Plus	**Maximum investment per year:** £30 000 **Minimum monthly investment:** £50 **Minimum initial investment lump sum:** £300 **Predicted returns per year:** ● 3% to 5.5%. **Estimated tax:** ● 10% on profits above £12 000. **RBSX group fees per month:** ● 0.3%.
Option 3 – Managed Stock Investments	**Maximum investment per year:** Unlimited **Minimum monthly investment:** £150 **Minimum initial investment lump sum:** £1000 **Predicted returns per year:** ● 4% to 23%. **Estimated tax:** ● 10% on profits above £12 000 ● 20% on profits above £40 000. **RBSX group fees per month:** ● 1.3%.