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Software engineering case studies

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Abstract

Realistic software engineering challenges are presented with associated background information and discussion questions. The exercises highlight some software engineering issues that might need to be overcome while working as a software developer in different contexts.

1 Introduction

This document contains a series of realistic case studies. Each case study includes some background information, as well as some discussion points. A small group should read the case study background information and discuss possible solutions, providing a summary of actions. The purpose of these exercises is to practice analysing different software engineering challenges.

2 Case study: Data acquisition software

Context

A single developer is responsible for creating some data acquisition software. The developer has access to electronics that should be read out within six seconds. The data should be read out, analysed, displayed on the screen and logged to local storage. The requirements of the software that should be written will not be fully revealed until nearer to the release deadline. The users are not sure what user interface features they need. Once the software has been completed, it will be used to read out electronics for a short period of time. The software must not contain software defects.

Discussion

Discuss what strategies the software developer could use to:

- Work efficiently towards the release deadline, knowing that the bulk of the software requirements will have to be completed in a few days before the release deadline.

- Create the software quickly and avoid potential software architecture problems around reading out a lot of electronics at once.
- Create software that does not contain software defects.

3 Case study: Embedded software

Context

A small team of embedded software developers is requested by a client to build some software that is capable of monitoring an electrical system. The developers will need to make a series of measurements, using a selection of communication buses. The developers should use a microcontroller, which has limited resources. The microcontroller will be connected to measurement electronics, where the scope of the measurement electronics is only partially known when the project starts. They are not sure which microcontroller to buy, since there are several potential options that could be used. Each microcontroller is slightly different, such that the software would have to be re-written to work on another microcontroller.

Discussion

- Discuss the risks that prevent the software from being successfully delivered.
- Think about how misjudging the user requirements might affect the project.
- Propose an approach that could be used to successfully deliver the project, in a sustainable manner.

4 Case study: Long-term development

Context

A company has been developing some software to perform calculations for a long period of time. The original developers worked quickly to build the first version of software, but did not include enough documentation to describe the key elements of the software. The software was built and maintained over several years by the same developers who have now left the company. A new development team has taken over. They cannot find a test framework that is suitable to verify that the software is working as expected. A customer of the company has reported some software defects and requests that the company add some additional software features. The customer expects a fast turn around and an associated low cost for this work.

Discussion

- Discuss the risks to the software development company and the development team.
- Propose steps that the development team could take to successfully debug the software and provide additional software features.

5 Case study: agile development

A company wants to build a new piece of software to assist them. They have in mind a piece of software that will help several of their business needs at once, it will be fully integrated with many other services. The client company is not interested in small releases and wants to have all of the features in the first version of the software. They have summarised some of the basic requirements and want to use an agile software lifecycle to deliver the software. They have a fixed budget and request software development companies to bid against the budget and deliver the software needed. The company has provided their rough summary of user requirements within the description of the work that should be carried out.

Discussion

- Discuss how this project could go wrong.
- Discuss why an agile software lifecycle might create additional risks for the software development company.
- Propose an approach to minimise the risks and successfully deliver the project using:
    1. A V-lifecycle.
    2. An agile lifecycle.