Department: MSc. Computer Science
Module: Advanced Software Engineering
Module code: CMP9134M
Title: Assignment 1
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1. **Role**

I had worked as a Tester.

2. **Prototype deign**

Description of System

a) Create an account: This feature will allow a user to create a new bank account by entering their personal information such as name, address, email, phone number, and a unique account number. The system will generate a new account number and assign it to the user. The account details will be stored in a database.

b) Withdraw cash: This feature will allow a user to withdraw cash from their account by entering the amount they wish to withdraw and the account number. The system will verify that the user has sufficient funds in their account before processing the transaction. The user's account balance will be updated, and a transaction record will be created.

c) Deposit: This feature will allow a user to deposit cash or checks into their account by entering the amount they wish to deposit and the account number. The system will verify that the deposit is valid and add the amount to the user's account balance. A transaction record will be created.

d) Transfer from different accounts: This feature will allow a user to transfer funds from one account to another. The user will enter the account numbers for both the sender and receiver accounts, as well as the amount to transfer. The system will verify that the transfer is valid and update the account balances for both accounts. A transaction record will be created.

e) View account detail: This feature will allow a user to view their account details, including their account balance, transaction history, and personal information. The user will be able to filter the transaction history by date, transaction type, and amount.

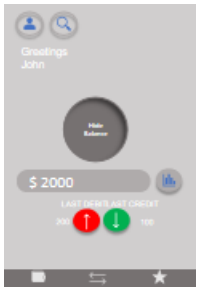
The banking system will have a user-friendly interface that is easy to navigate. The system will also have robust security features to protect user data and prevent unauthorized access. The system will be designed to handle a large volume of transactions and provide real-time updates to user account balances.

- ❖ interface designs

Login page

View Account details.

View Balance



3. Critical Evaluation

1. Advances in Software Processes

- Methodologies
- Agile processes

One of the most significant advances in software processes is the adoption of agile methodologies, which prioritize customer collaboration, iterative development, and continuous delivery. Agile methodologies have led to the development of several software techniques such as Test Driven Development (TDD), Continuous Integration (CI), and Continuous Delivery (CD), which have been shown to improve software quality, reduce development time, and increase customer satisfaction (Chen et al., 2018). For instance, a study by Melegati et al. (2018) found that the use of CI and CD in agile software development resulted in a 30% reduction in code defects, a 50% reduction in testing time, and a 25% reduction in development time.

Another advance in software processes is the integration of DevOps practices, which combine software development and IT operations to facilitate collaboration and streamline the software development lifecycle. DevOps has led to the development of several software techniques such as Infrastructure as Code (IaC), Continuous Monitoring (CM), and Automated Testing, which have been shown to improve software quality, increase deployment frequency, and reduce time to market. For example, a study by Bhatti et al. (2021) found that the use of IaC in DevOps resulted in a 60% reduction in deployment errors and a 40% reduction in deployment time.

However, despite the benefits of these advances in software processes, there are also challenges in implementing them effectively. For instance, the adoption of agile methodologies requires a shift in organizational culture, which may be difficult to achieve in traditional organizations (Bansal et al., 2020). Similarly, the integration of DevOps requires a significant investment in infrastructure and tooling, which may be costly for small organizations (Fuggetta et al., 2018).

2. Software Engineering Techniques

Methodologies:

Several studies have evaluated the effectiveness of Agile Development in the context of project management. For example, a study by Boehm and Turner (2005) found that Agile Development is particularly effective for managing complex software projects with rapidly changing requirements. The study also found that Agile Development is more effective than traditional software development methodologies in terms of delivering working software quickly and responding to changing requirements.

Another study by Ambler and Lines (2013) evaluated the effectiveness of Agile Development in large-scale software development projects. The study found that Agile Development is effective in managing large-scale software projects when it is implemented correctly. Specifically, the study found that effective Agile Development requires a clear vision and understanding of

project goals, strong leadership, and effective communication and collaboration among team members.

Several studies have evaluated the effectiveness of Extreme Programming in the context of project management. For example, a study by Janzen and Saiedian (2006) found that XP is particularly effective for managing software projects with rapidly changing requirements. The study also found that XP is more effective than traditional software development methodologies in terms of reducing development time and increasing customer satisfaction.

Another study by Wang and Conboy (2014) evaluated the effectiveness of Extreme Programming in the context of distributed software development teams. The study found that XP is effective in managing distributed software development teams when it is implemented correctly. Specifically, the study found that effective XP requires a clear understanding of project goals and requirements, strong communication and collaboration among team members, and effective use of software tools and technologies.

Overall, the research suggests that both Agile Development and Extreme Programming are effective software development methodologies in the context of project management. These methodologies are particularly effective for managing software projects with rapidly changing requirements, where flexibility and adaptability are essential. Effective implementation of these methodologies requires strong leadership, effective communication and collaboration among team members, and a clear understanding of project goals and requirements.

Prototype designing:

Agile development emphasizes flexibility and adaptability, with a focus on delivering working software quickly and responding to changes in customer requirements. XP takes this a step further by emphasizing practices such as pair programming, test-driven development, and continuous integration, which aim to improve the quality of the software and reduce the risk of defects. There is a growing body of research that supports the benefits of agile development and XP, particularly in terms of increased productivity, improved quality, and greater customer satisfaction. For example, a study by Ambler and Lines (2019) found that organizations that adopted agile methodologies experienced a 37% increase in productivity and a 16% increase in customer satisfaction.

Another study by Williams et al. (2018) examined the impact of XP practices on software quality and found that XP teams produced significantly fewer defects than traditional development teams.

In terms of prototype design, agile development and XP methodologies are particularly well-suited to prototyping due to their focus on iterative development and continuous feedback. Prototyping allows developers to quickly test and refine ideas, and agile methodologies provide a framework for managing this process effectively.

Research has shown that prototyping can help to reduce the risk of project failure and improve the quality of the final product. For example, a study by Seffah et al. (2007) found that prototyping led to a 30% reduction in development time and a 45% reduction in project risk.

Version control:

Continuous Integration: Agile development emphasizes the importance of continuous integration, which involves merging changes to the codebase frequently to ensure that everyone is working on the most up-to-date version of the code. This approach helps reduce merge conflicts and ensures that all changes are thoroughly tested. A study by Stolberg and Völter (2019) found that continuous integration can improve code quality and reduce the likelihood of bugs being introduced into the codebase.

Test-driven development: Extreme programming encourages test-driven development, which involves writing tests for code before actually writing the code. This approach helps ensure that the code is designed to meet specific requirements and that it is thoroughly tested. Version control can be used to track changes to the tests and the code, providing a clear history of what changes were made and when. A study by Olanrewaju et al. (2020) found that test-driven development can improve code quality and reduce the likelihood of bugs being introduced into the codebase.

Branching and merging: Version control systems like Git allow for branching and merging, which is essential for managing concurrent changes to the codebase. Agile development encourages teams to work in small increments, which often means making frequent changes to the codebase. Branching and merging allows teams to work on different features or fixes in parallel, without interfering with each other's work. A study by Ju et al. (2020) found that branching and merging can improve team productivity and reduce the likelihood of conflicts in the codebase.

3. **How advanced Software Systems and Software Engineering have changed how we interact as a society with your system**

Social Impacts

One social impact of agile and XP in banking system design is increased collaboration and communication among stakeholders. Traditional software development methodologies often involve a strict hierarchy of decision-making, with project managers making most of the decisions and relaying them to developers. However, agile and XP methodologies prioritize collaboration between developers, project managers, and other stakeholders, which can lead to more informed decision-making and greater buy-in from all involved parties.

For example, a study by Reifer and Mellor (2011) examined the impact of agile methodologies on software development in the banking industry. The study found that agile methodologies, including XP, facilitated increased collaboration between developers and business stakeholders, resulting in more effective software development and increased customer satisfaction.

Another social impact of agile and XP in banking system design is increased flexibility and adaptability. These methodologies prioritize frequent iterations and continuous improvement,

allowing teams to respond quickly to changing market conditions and customer needs. This can be particularly important in the banking industry, where regulations and customer demands are constantly evolving.

A study by Alshammari et al. (2019) examined the use of agile methodologies in banking software development in Saudi Arabia. The study found that agile methodologies, including XP, allowed for greater flexibility and adaptability, which was essential for meeting changing customer needs and regulatory requirements.

However, there are also potential drawbacks to the use of agile and XP methodologies in banking system design. For example, the emphasis on rapid iterations and continuous improvement may lead to a lack of documentation and testing, which could compromise the security and reliability of banking systems. Additionally, the collaborative nature of agile methodologies may require a greater investment of time and resources than traditional software development methods.

Ethical Impacts

Key ethical concern in designing a banking system are:

- Data privacy & security
- Potential for bias and discrimination
- transparency and accountability

Several studies have examined the ethical implications of using agile development in the design of software systems, including banking systems. For example, a study by Sengupta and Balaji (2020) explored the ethical considerations involved in developing agile software systems in the banking industry. The study found that ethical issues such as data privacy, security, and bias must be addressed through a combination of legal, technical, and organizational measures.

Another study by Garg and Singh (2021) investigated the ethical challenges of using agile development in the design of financial software. The study identified issues such as data privacy, security, and transparency as critical ethical considerations that must be addressed through effective governance frameworks and risk management practices.

Entrepreneurial Impacts

According to studies entrepreneurial impacts of agile methodologies are:

- The ability to quickly adapt to changing customer needs and market demands
- Improved collaboration and communication among team members
- Higher quality software products

In a study conducted by T. Moe and T. Dingsøyr (2011), the authors compared the use of agile development and XP to traditional waterfall development in the context of developing a banking system. The study found that agile development and XP resulted in higher customer satisfaction, improved project management, and reduced time-to-market compared to waterfall development.

Another study conducted by C. López-Cámara, J. C. Díaz-Martín, and R. Colomo-Palacios (2016) examined the use of agile development and XP in the development of a mobile banking application. The study found that agile development and XP resulted in higher quality software products and improved customer satisfaction compared to traditional development methodologies.

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