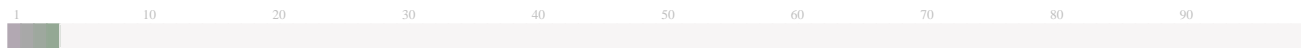


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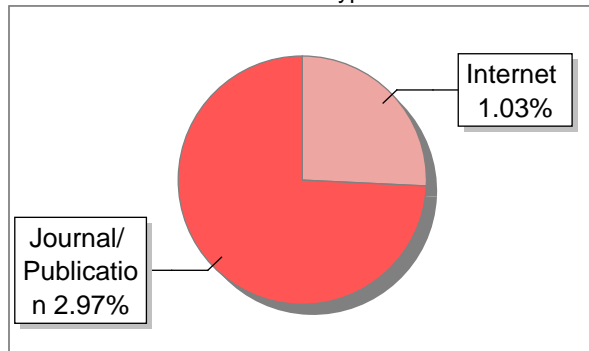
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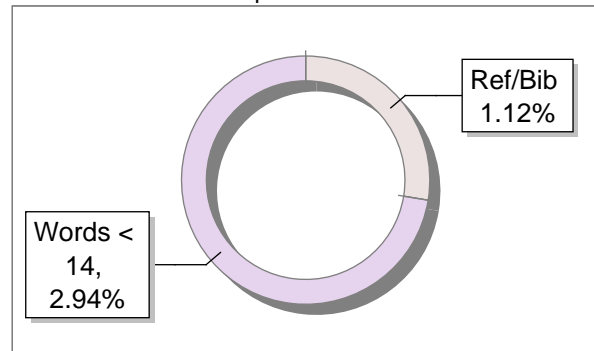
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PROJECT REPORT

ON

Analyze the suitability of Incremental Development, Spiral Model, and Waterfall Model for WhatsApp's SDLC considering its user base, functional requirements, and challenges.

Submitted to

NMAM INSTITUTE OF TECHNOLOGY, NITTE

(Off-Campus Centre, Nitte Deemed to be University, Nitte - 574 110, Karnataka, India)

In partial fulfilment of the requirements for the award of the

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In

INFORMATION SCIENCE AND ENGINEERING

By

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NNM23IS010

Under the guidance of

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Report on the Software Development Lifecycle (SDLC) of WhatsApp

Introduction

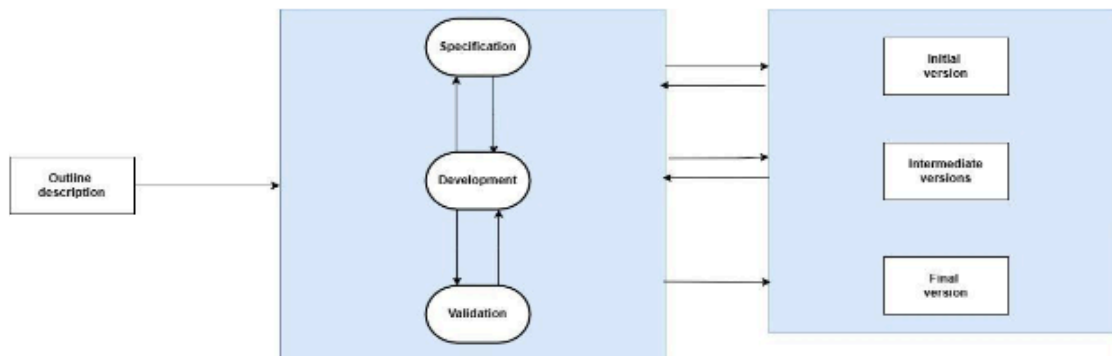
Systematic process of creating Software system is called Software development lifecycle (SDLC). SDLC has its stages in such a sequence that it dictates when programmers develop applications and apply them to produce the software then to also recline software maintenance support. In this report, the process models: Incremental Development, Spiral Model and Waterfall Model are analyzed deeply for the SDLC framework of WhatsApp messaging application. Evaluation is conducted on how each process model is working in functional needs and non functional requirements, and to the ability of the process model to control the risk and changes, and the time and the cost performance. Furthermore, this report makes a simplified requirements document for whatsoap and also has a plan for requirements validation and lists difficulties that can be expected to occur in this stage.

Case Study Selection: WhatsApp

WhatsApp is a global messaging application that serves to exchange plain text messages as well as containing ability to send voice messages, images, videos, and documents. It also has such functions as voice and video calling. A large scale software system like WhatsApp that has an expansive user base of 2 billion monthly active users, a premium such system should have an elaborate and flexible method of development process management and maintenance upkeep. This is because the application's design is easy to use, it is fully encrypted and it regularly adds new features to the software.

Analysis and Comparison

Incremental Development



Incremental development is the creation of the system in pieces that are easy to develop and easier to manage in an iterative process. At each one added step, new capabilities for the existing system can be developed along the feedback process.

Functional and Non-Functional Requirements

Functional Requirements:

- The application ensures that users can both register themselves and access their accounts through phone number authentication. The system requires two-factor authentication to achieve better security standards.

- Users should be given the capability to deliver text messages combined with the functionality to transmit voice messages and documents along with images and videos.
- The application should enable users to form their personal group chats while permitting them to join existing groups. The group administrator position should have controlling authority over the group settings.
- Users should possess the ability to make voice and video calls together with the capability to set up group voice and video communication.
- A total encryption system must protect all messages and calls between users both for speech and video communications.
- Users must obtain notifications about new messages together with missed calls and essential events.

Non-Functional Requirements:

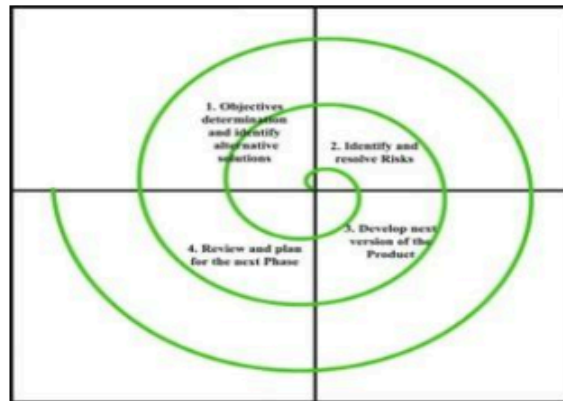
- The application needs to show fast response times along with powerful message and call management to deliver communication quickly.
- The system needs to offer scalability features which enable it to expand as the number of users and messages increases.
- The system needs complete security protocols which should protect user information while stopping unauthorized people from entering and must do routine security checks along with software updates to fight off new security threats.
- Users with disabilities need an interface which delivers a user-friendly experience combined with effortless accessibility throughout the system.

Risk and Change Management :

The style of development through increasing stages shows strong resistance to changing conditions and risk situations. By developing the system in small increments it becomes simpler to detect and solve problems during initial development stages. The platform follows an iterative development process to perform continuous risk assessment and management which fits perfectly with WhatsApp's experience of dynamic security threats and user need evolution.

Time and Cost Constraints :Through this development model organizations achieve both cost-effectiveness and time performance advantages. The project gets easier to manage due to division into smaller portions so resources become more effective and progress monitoring becomes more precise. The method reduces probability of cost increases and schedule delays which makes it an effective solution for big system initiatives similar to WhatsApp.

Spiral Model



As a risk-based iterative approach the Spiral Model unites core features from both the Waterfall and Incremental Models. Each cycle includes four separate areas of planning, risk evaluation, engineering work and evaluation assessment.

Functional Specifications:

- Users need features for registering through mobile phone numbers combined with two-factor authentication for increased security.
- Users need access to text messaging besides voice messaging and functions which allow them to exchange images videos and documents.
- Users need to have the capability to form and participate in group chats which grants group administrators powerful tools for group management options.
- The system must allow users to perform voice and video calls as well as establish group voice and video calls.
- The system must use encryption protocols to protect all communication types including messages together with voice calls and video calls.
- Users need instant notifications for their incoming messages together with their missed calls coupled with essential events.

Non-Functional Requirements:

- The system must achieve efficiency which generates prompt responses for handling large message and call quantities with quick delivery times.
- The system requires ³ design features that enable users to scale their service offering to accommodate higher numbers of customers and greater message volume.
- User data needs complete protection through security standards which also prevent unauthorized system entrance. Running regular security examinations together with software updates remains essential to handle new security risks.
- An easy-to-use interface together with accessible navigation should be fundamental since it benefits all users but especially those with disabilities.

Risk and Change Management:

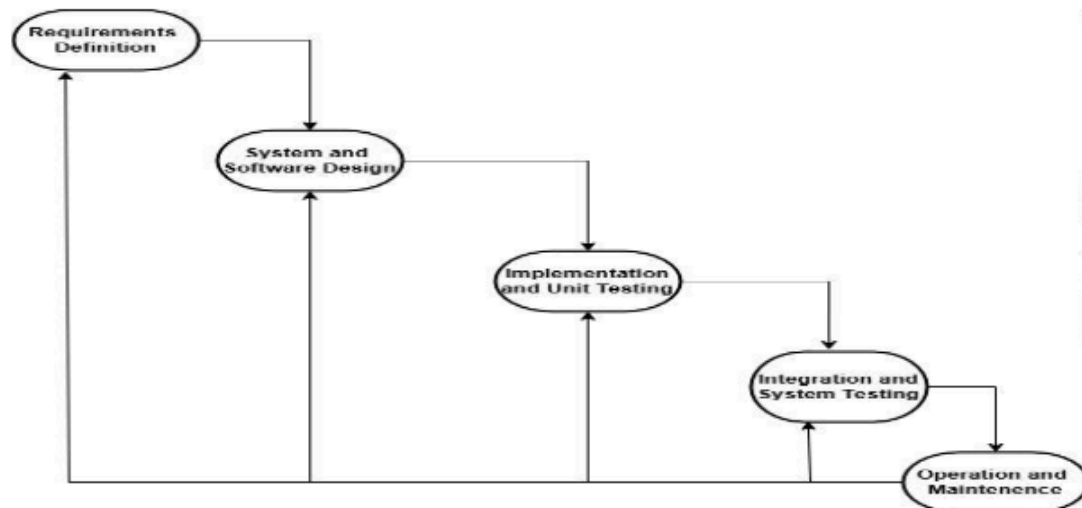
Every stage of the Spiral Model includes risk assessment and management which builds security measures as well as minimizes attack opportunities. Risk mitigation becomes easier through the continuous development method. The model makes a strong match with WhatsApp because it

operates in a fast-evolving environment that experiences security threats alongside changing user requirements.

Time and Cost Constraints :

The Spiral Model is the ideal choice for big, complex projects. Because of the model following iterations, breaking a very large project into small ones is easy for the developers and ensuring that one feature is handled at a time to prevent leaving out anything. Creating a progressive prototype makes it easy to estimate the cost of the project in some instances at certain times.

Waterfall Model



Waterfall Model is one of those methodologies where a phase must be finished before starting the next phase. The model is characterized as linear and demands all the requirements to be explicitly defined at the beginning.

Functional Specifications:

- User Authentication: Users should be able to register and log in via their mobile phone number, with the choice of enhanced security options like two-factor authentication.
- Messaging: Users should be able to send and receive SMS, as well as send voice messages, photos, videos, and documents.
- Group Chats: Users should be able to create and join group chats, where group administrators can effectively manage group settings.
- Voice and Video Calls: Voice and video calls need to be supported with the option of making group voice and video calls.
- End-to-End Encryption: Any means of communication, whether messages, voice calls, or video calls, needs to have encryption systems built into it in order to achieve privacy and security.
- Notifications: The users need to be provided with timely notifications regarding incoming messages, missed calls, and so forth.

Non-Functional Requirements:

- Performance: The app should be responsive and handle high call and message volumes with little delay in delivery.
- Scalability: The system should be scalable to keep up with the growing number of users and higher message volume.
- Security: Implementing strong security is crucial to secure user data and keep out malignancy. Periodic security scanning and updating have to be done to address new threats.
- Ease of use: An intuitive interface and user experience are essential, with seamless navigation and ease of access, particularly for individuals with disabilities.

Risk and Change Management :

The Waterfall Model exhibits limitations in its adaptability to changes and risks. Given its linear nature, any modifications or risks identified at later stages can result in substantial delays and budget overruns. Consequently, this model may not be ideally suited for a system like WhatsApp, which functions within a rapidly changing environment characterized by evolving security threats and shifting user expectations.

Time and Cost Constraints :

The Waterfall Model is likely to cause more time and expense as it is a linear model. It requires complete specification of all the requirements at once, which is difficult and time-consuming. The process might not be the optimal option for such a huge system as WhatsApp, where flexibility and speed are needed.

Requirements Engineering Process

Simplified Requirements Document for WhatsApp

Functional Requirements

1. User Authentication:

The users should be able to register and log in through their phone numbers.
Two-factor authentication should be done in order to give the highest security.

2. Messaging:

Users should be able to send and receive text messages.

Send and receive voice messages feature should be enabled.

Sending and receiving images, videos, and documents should be enabled as an option.

3. Group Chats:

Users should be able to join and create group chats.

o Group administrators should be able to manage group settings.

4. Voice and Video Calls:

o Users should be able to make voice and video calls.

o Group voice and video calls should be enabled.

5. End-to-End Encryption:

o All messages, voice calls, and video calls should be encrypted for security and privacy.

6. Notifications:

o Users should be notified in a timely manner for incoming messages, missed calls, and other important events.

Non-Functional Requirements

1. Performance:

- The application should be responsive and efficient in handling lots of messages and calls.
- Message and call delivery should also be low-latency.

2. Scalability:

- The system should be scalable to handle a larger user base and increased message traffic.

3. Security:

- Implement strong security features to protect user data and unauthorized access.
- Regular security audits and updates should be done to counter new threats.

4. Usability:

- Provide an easy-to-use user interface and experience.
- Make it easy for users with disabilities to navigate and access.

Requirements Validation Strategy

Requirements Reviews:

- Periodic review of stakeholders to make sure the requirements are consistently, completely, and clearly stated.
- Workshops and focus groups to gather feedback from potential users.

Prototyping:

- Prototypes to display major features and gather user comments.
- Refine the prototypes based on the information gathered and improve the requirements.

Test-Driven Development (TDD):

- Create test cases for all the requirements to make sure the implementation matches the criteria created.
- Use automated test software to run the tests and determine any deviations.

User Acceptance Testing (UAT):

- Conduct UAT with a representative group of users to test the requirements within a live setup.
- Capture detailed feedback and implement suitable alterations.

Potential Challenges in Requirements Validation

Changing Requirements:

- User expectations and requirements could change during validation, and corresponding changes in the requirements documentation are required.
- Effective handling of changes requires constant communication with stakeholders.

Complexity of Requirements:

- Non-functional requirements like performance and scalability are hard to define and test. • Using metrics and benchmarks will ease the task of measuring and verifying such requirements.

User Feedback:

- Obtaining and interpreting user feedback can be challenging, particularly where feedback is conflicting or ambiguous.
- Intensive analysis and prioritization of feedback on the basis of impact and feasibility is necessary.

Resource Constraints:

- Requirements validation can take a lot of time and effort.

- Advance planning and strategizing of validation tasks are necessary in order to manage resources efficiently.

Conclusion

This essay gives a thorough comparison of the software development lifecycle (SDLC) used by WhatsApp, bearing in mind the efficacy of Incremental Development, the Spiral Model, and the Waterfall Model. Based on the result, Incremental Development and the Spiral Model are better for WhatsApp, given their inbuilt flexibility, reactivity, and efficient risk and change management. Besides, this report built a solid requirements document for WhatsApp, outlining both functional and non-functional requirements, and suggested a validation plan for these requirements and the identification of potential challenges in this crucial stage. Through the application of strengths over weaknesses of different process models, and solving issues in terms of requirements validation, WhatsApp is in a good position to enhance and fit the changing needs of its huge user base.

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