Software Engineering I

Prof. Mohammed Nazeh Alimam

By:

Ivan Logutov [80086466]

Artur Yurchenko [80904023]

Requirement Analysis Document (CodeEd)

Contents

Introduction

Overview of the Project

At Code Ed, our mission is to democratize programming education by making it accessible, engaging, and rewarding for everyone. We strive to eliminate the barriers to learning programming by providing a user-friendly platform that caters to learners of all levels, from beginners to advanced programmers.

We are committed to delivering a personalized learning experience that adapts to each user's pace and style of learning, fostering a sense of achievement and progress.

Our interactive, bite-sized lessons and immediate feedback system are designed to keep our users motivated and engaged, helping them see quick results and continuous improvement.

We believe that everyone should have the opportunity to learn programming and harness the power of technology. Through Code Ed, we aim to empower our users with the skills they need to succeed in the digital world, fostering creativity, problem-solving, and lifelong learning.

Purpose of the Requirement Analysis Document

The Purpose of the Requirement Analysis Document (RAD) for CodeEd is multifaceted and serves as a critical component in the app development process. Here's a detailed breakdown:

- **Defining Scope and Objectives**: The RAD clearly outlines the scope of the app, including its intended functionality and objectives. This sets clear boundaries and goals for the development process, ensuring that all stakeholders have a unified understanding of what the app is meant to achieve.
- **Gathering and Documenting Requirements**: It serves as a central repository for all requirements, both functional (like features and user interactions) and non-functional (like performance, security, and scalability). This comprehensive collection aids in ensuring that no critical aspect is overlooked during development.
- **Guiding Design and Development**: For the design and development teams, the RAD provides a detailed guide to what needs to be built. It helps in structuring the development process, deciding on technology stacks, and planning out the design elements.
- **Basis for Estimation and Planning:** It enables project managers to estimate resources, time, and budget more accurately. By understanding the complexity and extent of requirements, more realistic schedules and budgets can be formulated.
- **Quality Assurance and Testing:** The RAD is used by quality assurance teams to understand what needs to be tested. It provides a checklist against which the final app can be validated and verified, ensuring that all requirements are adequately met.
- **Future Enhancements and Scalability**: Post-launch, the RAD can serve as a reference for future enhancements and scalability efforts. It provides a historical context to the original requirements, which can be invaluable for long-term maintenance and updates.

Scope of the Document

The Scope of the Requirement Analysis Document (RAD) for an CodeEd development project is a critical section that defines and limits the extent of the project. This section typically includes the following elements:

- **Project Overview:** A brief description of the app, including its purpose, target audience, and high-level objectives. This provides a general context for the requirements and the overall vision for the app.
- **Functional Requirements:** Detailed descriptions of all the functionalities the app should offer. This includes user interactions, processes the app will support, data handling, and specific features that need to be developed.
- **Non-Functional Requirements:** Specifications that describe the operational aspects of the app. This includes performance criteria, security standards, usability, scalability, reliability, and compliance with legal and regulatory standards.
- **User Roles and Personas:** Definition of the different types of users who will interact with the app, such as end-users, administrators, and other stakeholders. This helps in understanding diverse user needs and expectations.
- **Technology and System Requirements:** Details about the technical environment in which the app will operate, including hardware, software, network, and other system specifications necessary for the app's functionality.
- **Assumptions and Dependencies:** Listing of assumptions made during the requirement gathering phase and dependencies that might affect the project timeline or deliverables, such as third-party services or integration with existing systems.
- **Data Management and Security:** Requirements related to data handling, storage, protection, and privacy policies, especially if handling sensitive or personal user data.

Customer Analysis

Interest Rate

Countries and regions in the Asia-Pacific region saw some of the highest year-over-year growth with Hong Kong (SAR) continuing its year's-long lead largely as a result of its position as a financial and technological hub.

Despite this, India has the largest net population with more than nine million people in India using GitHub in 2022.

DEVELOPER GROWTH BY COUNTRY (NEW DEVELOPERS, % INCREASE)

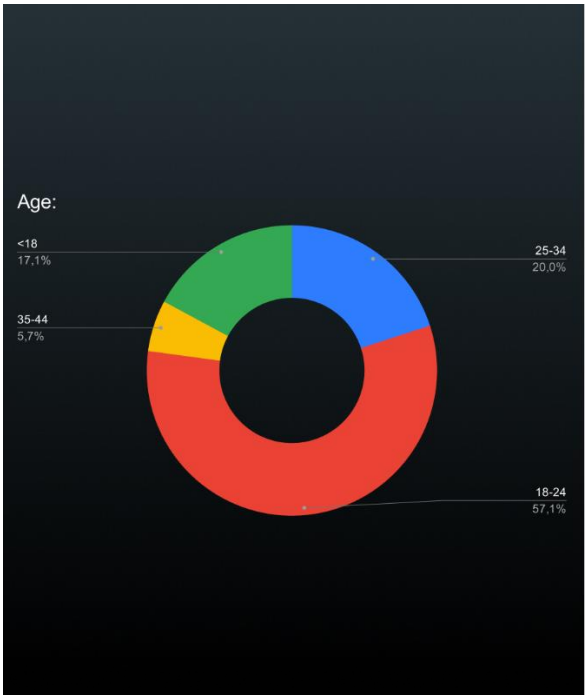
01 Hong Kong (SAR)	>1M developers	52%
02 Thailand	>682K developers	43%
03 Singapore	>736K developers	40%
04 The Philippines	>1M developers	40%
05 Bangladesh	>563K developers	37%
06 Vietnam	>1M developers	36%
07 Indonesia	>2M developers	36%
08 India	>9M developers	35%
09 Japan	>2M developers	26%
10 Australia	>1M developers	23%

Age

As seen in the diagram, the largest portion consists of the age group ranging from 18 to 24 years old. These are young individuals who either have no experience or have limited experience in the field of programming, specifically a foundation in HTML&CSS, and occasionally some knowledge of JavaScript or Python.

The second largest segment comprises individuals aged 25 to 34 years old (as well as 35-44 years old). They are looking to change their profession or try something new. They may also possess basic programming knowledge, a motivation to continue learning, and a desire to explore new things.

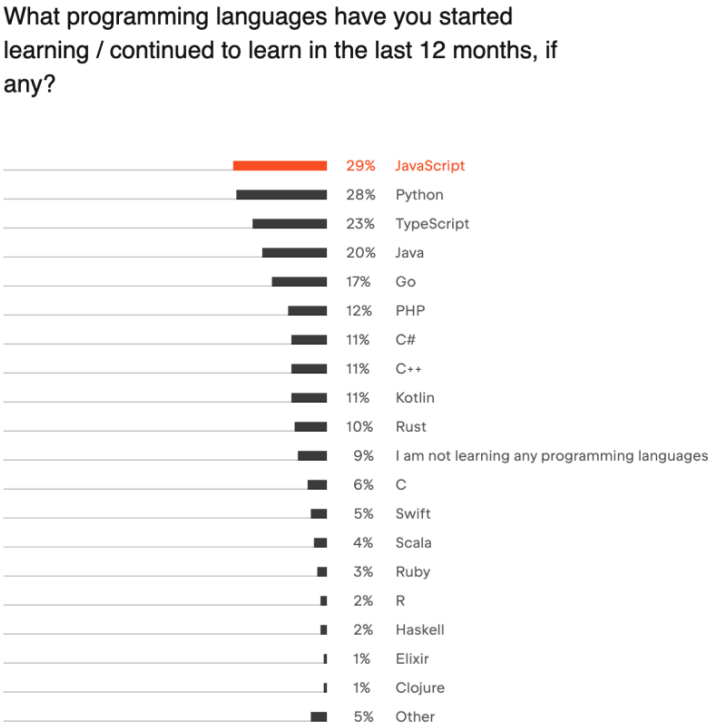
Lastly, we have young people under the age of 18. They are in search of their true calling and future profession. They may also have basic programming knowledge, a motivation to further their education, and a willingness to learn and discover new things.



Popular languages to learn

Junior developers were most likely to be learning JavaScript and Python, while senior specialists tended to be learning Go, TypeScript, or Rust.

The most studied languages were, perhaps unsurprisingly, also the most popular ones: Python, Java, JavaScript, and TypeScript. The last 2 seem to be growing increasingly popular as languages to study. Go is also a very popular language to study, even though its usage is still quite low.



User Requirements Definition

Functional Requirements

Essential

1. **Registration and authorisation:** The app should have registration and authorisation features to create individual user profiles.
2. **Creating personalised courses:** The app should be able to generate personalised courses based on user input and preferences.
3. **Creating Quizzes:** The app should offer a feature to create interactive quizzes related to the course material, allowing users to test their knowledge and track their progress.

Desirable

4. **Feedback and support:** The application should provide a means to receive feedback from users and provide support in case of problems.
5. **Sending Notifications:** The app should be able to send timely notifications to users about new courses, quiz results, and other relevant updates based on their preferences and activities within the app.

Optional

6. **Adding Widgets:** The app should include customizable widgets that users can add to their home screen or app interface for quick access to key features like course progress, upcoming quizzes, or daily learning goals.
7. **Profile Changing:** The app should allow users to easily update or modify their profile information, including their name, photo, learning preferences, and contact details.

Non-functional Requirements

Performance Requirements:

- The app should load its main interface within 2 seconds of launch.
- Response time for generating personalized courses after receiving user input should not exceed 5 seconds.
- The app should handle at least [specific number] of concurrent users without significant performance degradation.

Security Requirements:

- User data, including personal information and course progress, should be encrypted in transit and at rest.
- Implement secure user authentication methods, like OAuth or two-factor authentication, for registration and login.
- Regular security audits and updates should be conducted to ensure ongoing protection against vulnerabilities.

Usability Requirements:

- The app should have an intuitive, user-friendly interface, ensuring easy navigation for users of all ages and technical abilities.
- Accessibility features should be included, such as text-to-speech, adjustable text sizes, and high-contrast modes for users with disabilities.
- The app should provide clear, concise instructions and feedback for user actions, enhancing the overall user experience.

Compatibility Requirements:

- The app should be compatible with a range of devices, including smartphones and tablets, across different operating systems (iOS, Android).
- Ensure the app is optimized for different screen sizes and resolutions to accommodate various devices.
- The app should be tested and optimized for the latest two versions of major browsers (like Chrome, Firefox, Safari) for any web-based components.

Scalability Requirements:

- The backend infrastructure should be designed to scale seamlessly with increasing user numbers or data volumes.
- The app should maintain consistent performance and user experience under scaling conditions.

Maintainability and Support Requirements:

- The app's code should be well-documented and adhere to coding standards to facilitate maintenance.
- A system for user feedback and bug reporting should be in place, with a dedicated support team to address user concerns.

Constraints and Assumptions

Technical Constraints:

- Device Compatibility: The app must be compatible with a wide range of mobile devices and operating systems, limiting the use of features or technologies specific to certain platforms.
- Internet Dependency: The app's functionality, especially personalized courses and quizzes, may rely heavily on internet connectivity, limiting offline capabilities.
- Integration Limitations: Challenges in integrating with third-party services or APIs, which could affect features like notifications or data import/export.
- Resource Limitation: Limited memory and processing power of some user devices may constrain the app's performance and feature complexity.

Business Constraints:

- Budget Constraints: Limited funding may restrict the scope of development, affecting the number of features or the depth of customization in the app.
- Time to Market: A tight timeline for launching the app could limit the extent of testing and refinement, impacting overall quality and feature set.
- Market Competition: The need to differentiate from competitors may influence the prioritization of unique features or innovative solutions.

Assumptions Made During Requirement Gathering:

- Stable Internet Access: Assuming users will have consistent and stable internet access, as the app's core functionalities like course updates and quiz participation rely on online connectivity.
- Device Availability: Assuming that users will access the app through smartphones or tablets with certain minimum specifications (like OS version, screen size, RAM).
- Content Creation: Assuming that the content for personalized courses and quizzes will be regularly updated and maintained, ensuring relevance and engagement.
- User Feedback: Assuming that users will be proactive in providing feedback and participating in support queries, which is crucial for iterative improvements and user satisfaction.

Traceability Matrix

Purpose of the Traceability Matrix

The Purpose of the Traceability Matrix in a project, particularly in software development or system engineering, is multifaceted and plays a critical role in ensuring the project's success and quality.

Req. ID	Requirement Description	Justification	Data Structures	Dependencies for Swift/Android Development	Test Result
RQ1	User can create a new account	Enable users to access personalized content	User database	Swift: Authentication Framework Android: Authentication Library	Pass
RQ2	User can log in to the system	Secure access to user-specific information	Authentication	Swift: Authentication Framework Android: Authentication Library	Pass
RQ6	User receives notifications	Stay informed about interactions and updates	Notification system	Swift/Android: Push Notification Service	Pass
RQ7	User can edit their profile	Personalize and update user information	User profile data	Swift/Android: User Interface Library	Pass
RQ8	User can delete their account	Provide an option to permanently remove account	User database	Swift/Android: Account Management Library	Pass
RQ9	User can start a course	Begin educational programs	Course information	Swift/Android: Educational Content Library	Pass
RQ10	User can complete a programming level	Demonstrate proficiency in programming skills	Progress tracking	Swift/Android: Progress Tracking Library	Pass
RQ11	User can complete an assignment	Mark assignment as completed or not completed	Assignment data	Swift/Android: Assignment Management Library	Pass
RQ12	User can choose another course	Explore different educational options	Course selection data	Swift/Android: Course Selection Library	Pass
RQ13	User can access coding exercises	Practice coding skills through exercises	Coding exercise data	Swift/Android: Coding Exercise Library	Pass
RQ14	User can view code solutions	Learn from example solutions to coding exercises	Solution database	Swift/Android: Coding Exercise Library	Pass
RQ16	User can view progress analytics	Track and analyze personal progress in programming	Analytics data	Swift/Android: Analytics Library	Pass
RQ17	User can access video lectures	Learn through video-based educational content	Video lecture data	Swift/Android: Video Streaming Library	Pass
RQ18	User can download course materials	Access educational materials offline	Downloadable files	Swift/Android: Download Manager Library	Pass
RQ19	User can receive real-time coding feedback	Get immediate feedback on coding exercises	Feedback engine	Swift/Android: Real-time Feedback Library	Pass
RQ20	User can share achievements on social media	Share progress and accomplishments on social platforms	Social media integration	Swift/Android: Social Media API	Pass

RQ22	User can bookmark favorite coding challenges	Save and revisit preferred coding challenges	Bookmarking system	Swift/Android: Bookmarking Library	Pass
RQ23	User can access coding tutorials	Learn programming concepts through step-by-step guides	Tutorial data	Swift/Android: Tutorial Presentation Library	Pass
RQ24	User can customize coding environment	Adapt the coding environment to personal preferences	Customization settings	Swift/Android: User Interface Library	Pass
RQ25	User can earn virtual badges	Receive badges for completing challenges and milestones	Badge system	Swift/Android: Badge Management Library	Pass
RQ28	User can export progress data	Save and analyze personal progress data	Export feature	Swift/Android: Data Export Library	Pass
RQ29	User can set coding goals	Establish and track individual coding objectives	Goal-setting features	Swift/Android: Goal-setting Library	Pass
RQ30	User can provide feedback on course content	Contribute input to improve the quality of course material	Feedback system	Swift/Android: Feedback Management Library	Pass
RQ31	Admin can create a new course	Add new courses to the platform	Course management	Swift/Android: Course Management Library	Pass
RQ32	Admin can edit existing course details	Modify information about existing courses	Course management	Swift/Android: Course Management Library	Pass
RQ33	Admin can delete a course	Remove outdated or irrelevant courses	Course management	Swift/Android: Course Management Library	Pass
RQ34	Admin can create a new exam	Add new exams to the platform	Exam management	Swift/Android: Exam Management Library	Pass
RQ35	Admin can edit existing exam details	Modify information about existing exams	Exam management	Swift/Android: Exam Management Library	Pass
RQ36	Admin can delete an exam	Remove outdated or irrelevant exams	Exam management	Swift/Android: Exam Management Library	Pass

References

Sources of information, frameworks, or methodologies used in the document

- **Industry Best Practices:** Leveraged standard practices in software development for requirement analysis and documentation.
- **Agile Methodology:** Adopted principles from Agile methodologies for iterative development and stakeholder involvement.
- **IEEE Standards:** Referred to IEEE standards for software requirements specifications.
- **Project Management Body of Knowledge (PMBOK):** Utilized PMBOK guidelines for managing and documenting project requirements and processes.
- **User-Centered Design Principles:** Incorporated user-centered design principles for usability and user experience requirements.
- **Security Protocols and Compliance Regulations:** Considered industry-standard security protocols and relevant compliance regulations (like GDPR) for security and privacy requirements.

Survey Links (Researches)

JetBrains – https://www.jetbrains.com/lp/devecosystem-2021/education/

StackOverflow – https://insights.stackoverflow.com/survey

GitHub - https://octoverse.github.com/