Feasibility Report

for

Interactive Book Reader with Augmented Reality Content

PID 20

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Project Proposal

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1. Introduction

1.1 Overview of the Project

Our proposed project is an interactive Book Reader with Augmented Reality Content that mainly focuses on children's books with ages between 3-10 years. This mobile app will incorporate AR visualisations into children's books, making reading a more engaging and enjoyable experience for children.

Once the app is installed, users can select the relevant book from the dashboard, hold the phone over the book, and visualise the content. The app will support a wide range of book formats, including storybooks, alphabet books. Users can choose from a variety of AR visualisations, including characters and scenarios, making reading more interactive and fun for children. Our app will also support text-to-speech and dictionary features to enhance the reading experience. Users can highlight and comment on text, bookmark pages, and navigate easily. Anyone can upload an AR book to our platform, and people can use our app to view those stories. The website only acts as a platform for authors to publish books and manage them, and for users to read books to some extent. Overall, our proposed system aims to revolutionise children's reading experience by providing an interactive and enjoyable reading experience with the help of augmented reality.

1.2 Objectives of the Project

Design and implement a user-friendly mobile app for reading physical books with AR content and other digital formats and also design and implement a web application that can be used to publish AR content for books and provide a marketplace for users. Implement additional features such as a text-to-speech converter, a dictionary link for complex words, comment and highlight capabilities, and bookmarking functionalities.

1.3 The Need for the Project

Reading is often not enjoyable for small children. Nowadays, children are more interested in audio-visual content like youtube videos. The project addresses the need for making reading fun for kids with AR content and text-to-speech features. This will make them more interested in reading. It also addresses the need for a platform to add AR content for publishers and users to purchase books. The aim is to build a user-friendly interactive platform that integrates the above features.

1.4 Scope of the Project

The project is mainly aimed at children. The mobile app consists of E-book reading capabilities with AR content visualisation and text-to-speech feature to enhance the AR experience. The app can additionally read other digital formats. It also consists of a dictionary for complex words to improve vocabulary, comment and highlight functions for user annotations and bookmarking pages for easy navigation and revisiting.

The web app consists of features to add AR content for publishers and allows users to purchase them in a marketplace.

Guest User: Read books with AR content, digital books. Purchase books from the marketplace in the web app.
Administrator: Add new books. Give publisher rights to the publishers.
Publisher: Publish books to the marketplace.

1.5 Deliverables

An innovative mobile application for young readers to read digital books with the integration of AR visualisation of characters and scenarios along with a sophisticated web platform that facilitates authors to publish and manage their literary works while gaining insights into reader preferences.

1.6 Overview of Existing Systems and Technology

Bookful is a similar type of mobile application that provides an interactive reading experience for kids between the ages of 3 to 8. It offers a diverse selection of 3D/AR books where characters and scenes can be viewed with AR animations, a variety of reading levels, educational games and activities, etc. to entertain the young readers while making them engaged in an active learning experience.

The proposed system uses Unity Vuforia Engine as SDK for developing Augmented Reality related features. The main reason for this is that Vuforia's marker-based AR technology has the capability of triggering virtual content for predefined images or objects when recognized by the app. The business logic of the system would be implemented using NodeJS while the backend would be connected to a MongoDB database. Further, React and ReactNative will be mainly used for the front-end development of the system, in order to provide users with an interactive web application and mobile application.

2. **Feasibility Study**

2.1   Financial Feasibility

Assessment of financial feasibility of the proposed Interactive Book Reader app aims in determining the viability, cost and economic benefits associated with the project and will be then used for decision making purposes to enhance the overall benefits to the organization. The main economical objective of this system is to provide users with a modern way of engaging with reading by making the app freely available for the initial usage with limited features while providing additional premium features and content for the users who purchase the premium version.

In addition to the mobile application, the proposed system also includes web based application that requires hosting through a cost-effective service. Considering the financial aspects of various potential choices and their distinct attributes, Amazon Web Services (AWS)[1] is identified as the most suitable platform for deploying the system. Since AWS free tier offers a 12 months free usage of the hosting service, it is assessed to be suffice for the initial stages of hosting, regardless of the limitations in terms of functionality when compared with the paid versions. However, as the system evolves, the feasibility of using premium versions which offers advanced functionalities will be examined.

The cost associated with database hosting is another major aspect of the financial feasibility of the system. Evaluating the factors such as upfront investments, available pricing models, and availability of free triers, MongoDB Atlas[2] is identified as the most cost effective database hosting solution for this project.

A summary of estimated costs per year is included in the following table.

No	Cost item	Estimated cost/year $
1	Salaries and wages	0
2	Programming Equipment	0
3	Software licenses	0
4	Software utilities and tools	0
5	Web hosting (AWS) (free tier is initially chosen)	0
6	databases (MongoDB Atlas) (free packages was initially chosen)	0
	512MB to 5GB Storage	free
	10GB to 4TB of storage	684

2.2 Technical Feasibility

2.2.1. AR development tools- Unity, Vuforia

The project requires the development of AR models along with the ability to read them within the app. The proposed technology was Unity. The reason was due to its ease of use and large community of users. We are planning to use the Vuforia SDK within Unity[3]. It has a collection of 2D and 3D objects that can be used for our application.

2.2.2. Frontend technologies- React, HTML,CSS, Antdesign

The proposed technology for the front end of the web application was ReactJS[4]. The reason was due to the fact that it makes frontend development intuitive and easier. React also supports a lot of libraries. It also has a lot of learning resources. Ant Design[5] is planned to use for the UI design. It can be used within React as a library. It makes UI design easier.

2.2.3 Design tools- Figma.

Figma[6] is planned to be used for the design of the UI before the development. It helps the developers to get an idea about how the final UI will look like. It also allows collaboration.

2.2.4. Backend technologies- NodeJS, ExpressJS

NodeJS[7] is to be used for the backend due to the speed, scalability and efficiency. It also helps stability and provides long term support. ExpressJs[8] which is a NodeJS framework is to be used for the development. It provides HTTP handlers that can be readily used in our code. It also comes with fair amount of middleware packages that can be used to address many web development problems.

2.2.5. Mobile technologies- React Native

For mobile application development we are planning to use React Native[9]. The main reason for this is its cross platform support. We are planning to first develop an android application. But due to the cross platform support of React Native we can extend and develop and IOS app as well. Another reason is that it uses React which is already to be used within our application. It is also fast and simple.

2.2.5. Database- MongoDB, Mongoose.

We are planning to use the Nosql[10] database MongoDB as the primary database of our application. It is easier for developers to use. Mongoose is used to connect the MongoDB database with the NodeJS backend.

2.2.6. Testing - Postman, React dev tools

Postman[11] is used to test the backend. React dev tools[12] is a Chrome extension that makes react development and testing easier.

2.2.7 Version management- Git, Github

Git[13] is to be used as the version control system. The main reason is its branching capabilities. Github is used to store the repo and to collaborate.

2.2.8 Deploying technologies- AWS

In the realm of deploying technologies, the project's focus shifts to AWS Hosting, a robust and versatile cloud platform that facilitates the seamless deployment and management of applications. AWS Hosting has been chosen as the deployment solution for its exceptional ease of use, scalability, and comprehensive suite of services. This selection aligns seamlessly with the project's goals, allowing for efficient deployment and thorough testing of the application's functionality.

2.2.9 IDE- VSCode, Android Studio

VScode[14] is to be used as the main idea by all developers mainly due to the reason it is lightweight and supports the development technologies we use. It is also integrated with Git and many technologies that make development easier. Android Studio[15] is to be used for the development of the Android mobile app.

2.3 Resource and Time Feasibility

2.3.1 Resource Feasibility:

Resource feasibility is a crucial aspect of any software project. Having a skilled team that is familiar with the chosen technologies and development tools is a significant advantage. The project team's expertise and experience ensure that they can efficiently handle the challenges that may arise during development.The team's proficiency with the selected technologies will lead to a higher quality of work and reduced development time. They won't need to invest extensive resources in learning new tools or techniques, allowing them to focus on implementing innovative features and functionalities.Moreover, having readily available laptops and development software ensures that there are no delays or bottlenecks caused by hardware or software constraints. The team can start working on the project immediately, maximizing productivity from the outset.The availability of skilled members and necessary resources also translates to effective collaboration within the team. Open lines of communication, knowledge sharing, and mutual support foster a positive work environment, promoting efficiency and creativity.Additionally, the project team's familiarity with the chosen technologies allows for more accurate estimations of the required resources. They can better assess the hardware, software, and other tools necessary to complete the project successfully, reducing the risk of underestimating or overestimating resource needs.

The resource feasibility for the software project is well-established due to the team's strong skill set and familiarity with the chosen technologies and development tools. Our expertise ensures we can handle potential challenges efficiently, leading to higher-quality work and reduced development time.

With readily available laptops and development software, our team can start working immediately, maximising productivity. Effective collaboration within the team, supported by open communication and knowledge sharing, creates a positive work environment, promoting efficiency and creativity. The team's ability to accurately estimate resource needs based on their knowledge of the technologies minimises the risk of underestimating or overestimating requirements. Overall, we are well-equipped to fulfil the resource feasibility requirements and execute the project successfully within the allocated timeline.

2.3.2 Time Feasibility:

The 14-week timeline for the project is advantageous as it allows sufficient time for development and testing, ensuring each stage receives adequate attention for effective execution. Distributing project modules based on team members' expertise balances the workload, promoting specialisation and reducing the risk of overburdening individuals. A well-defined timeline ensures everyone knows our responsibilities and deadlines, facilitating better coordination and collaboration.

During the planning phase, breaking down the project into smaller tasks and establishing milestones enables regular progress tracking and early identification of potential issues or delays. The team's experience and familiarity with technologies enhance time feasibility, enabling them to swiftly transition from design to implementation and minimise the development cycle duration.

A well-structured project plan with clear deliverables and deadlines supports efficient project management, allowing for adjustments or changes to be accommodated with minimal disruptions. Overall, the combination of a favourable timeline, effective distribution of tasks, experienced team members, and a structured plan ensures the project is well-positioned to meet its objectives within the allocated time frame.

2.4 Risk Feasibility

E-readers[15] have been around for a long time and gained popularity among the users with the evolution of its features and functionality. However, Augmented Reality technology in the context of e-readers[16] is relatively new and still in its development stages. Therefore, the lack of experience in AR among users can pose some major risks in the development and marketing of this system. Adoption rate of the system can severely be at risk due to the unfamiliarity of the users with the AR technology. This could be even more challenging with the main target group of system being kids in the age of 3 to 8, as they could find it challenging to get accustomed to interact with AR content and navigate the app's AR features. In order to address this issue, the system design will mainly focus on providing users with an intuitive and user friendly interface along with the step by step guiding through the AR features. Further, the system will be optimised to have simple and straightforward AR interactions, minimising the learning time.

Since there are a number of existing E-reader apps which are much popular among young readers, such as Kindle[17], Bookful[18] etc. there is a potential risk of having to face a huge market competition to increase the user base of the proposed system. To effectively address this issue, necessary development and marketing strategies will be taken to highlight the innovative AR features, interactive content and the

unique reading experiences that the users can find through this proposed mobile app. In order to attract a wider audience, the AR features of the app will not just be positioned as an entertainment tool, but also as an educational resource which can align with the interest of parents and educators.

Due to the free and premium versions in the proposed mobile app, there is a risk of raising concerns among users regarding the monetary transactions. Since it can potentially discourage users from upgrading the app to the premium version, the impact of this risk to the project is considerably high. Therefore in order to address this issue, payment processing of the system will be handled by the reputable and well established payment methods such as PayPal[18], Visa and MasterCard.

In addition to that, risks associated with the hardware and software can indeed have a significant impact on the development of the system. While the probability of encountering such issues might be relatively low, their potential consequences are substantial. Therefore in order mitigate these risks, the project will implement a comprehensive backup strategy which includes regular backups will be used to reduce the impact.

Furthermore, any resource related risks, such as a team member's inability to contribute to the project due to illness or personal issues, can also be identified as potential challenge as these risks have the potential to cause delays and disrupt the progression of the project. In order to reduce the impact of such risks, the project will be thoroughly planned and executed with the goal of achieving an earlier completion date.

2.5 Social/Legal Feasibility

2.5.1 System usability

The system's usability is of utmost importance, especially since it is primarily targeted towards children aged 3 to 10 years. The user interface and interaction design should be intuitive and user-friendly, allowing young readers to navigate and enjoy the content without any trouble.

To ensure a safer and balanced digital experience for children, parental control features will be incorporated, allowing parents to monitor and manage screen time to prevent overuse and addiction to devices. The app should be easy to use for people from all social backgrounds and technical literacy levels.

Utilising ad revenue within the app may not align with the primary purpose of serving children's educational and entertainment needs. Thus, the project should explore alternative monetization strategies that prioritise user experience and content quality. Additionally, the content published by different authors should be monitored to prevent harmful or inappropriate content from being uploaded that could adversely affect young users.

From the artistic perspective, this app should be a means of expressing feelings to society and children alike.

2.5.2 Rules and Regulations

Ensuring compliance with established rules and regulations is paramount to the successful implementation and operation of the "Interactive Book Reader with Augmented Reality Content" project. The platform will adhere to a set of guidelines to ensure a responsible and secure digital environment for its users.

In line with the project's commitment to providing age-appropriate and wholesome content, the system will enforce content restrictions based on age ratings. This includes categorising content under specific age groups such as "PG3+" (suitable for ages 3 and above) and "PG5+" (suitable for ages 5 and above). This approach will prevent children from accessing materials that are beyond their developmental stage or that may not align with their cognitive maturity.

Furthermore, to ensure the safety and privacy of users, the project will implement stringent data protection measures. When using the mobile phone's camera to visualise AR content, camera access will be requested and managed with the utmost care, prioritising the privacy of the user and others. Additionally, payment details and children's information will be safeguarded using encryption and secure storage mechanisms, preventing unauthorised access and data breaches.

2.5.3 Copyrights and data privacy

Using external tools such as data visualisation tools, apis tools and algorithms must be done with proper permission and without violating the copyrights. The privacy of the data should also be protected when dealing with external tools and third party applications.

3. Considerations

The "Interactive Book Reader with Augmented Reality Content" project necessitates a comprehensive examination of various facets, encompassing technical, financial, and legal dimensions. The overarching goal is to elevate children's reading encounters by introducing captivating and interactive content that fosters education. The adept development team is primed to navigate challenges and ensure a seamless realisation of the project's objectives.

3.1 Enhancing Child Well-being

Central to the project's vision is the well-being of its young users. The team is committed to safeguarding children's health and digital habits. Consideration will be given to screen time management and the prevention of addictive usage patterns. By incorporating robust parental control features, caregivers can monitor and curate screen time, fostering a balanced digital engagement.

3.2 Universal Accessibility and Ease of Use

To maximise the project's impact, a user-centric approach will drive design and development. The "Interactive Book Reader" will be optimised to operate seamlessly on middle-tier smartphones, ensuring accessibility for a broader audience. Furthermore, the user interface will be intentionally intuitive, catering to individuals with varying degrees of technical proficiency. This inclusivity underscores the commitment to ensuring that the app is user-friendly for all, regardless of their technological familiarity.

3.3 Content Safety and Monitoring

In line with responsible content consumption, a stringent content monitoring system will be established. The project places a premium on ensuring that young readers are shielded from exposure to harmful, negative, or inappropriate materials. A comprehensive review process will be implemented to curate content and guarantee a safe and enriching reading environment.

3.4 Data Privacy and Ethical Camera Usage

Respecting user privacy is paramount. The project pledges adherence to industry-standard regulations when accessing camera data. No information will be shared with third parties without explicit user consent, thereby upholding robust data privacy principles. This commitment to ethical data usage ensures a secure and trustworthy experience for all users.

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