PIXIE

Interactive Book Reader with Augmented reality content
Software Requirements Specification
For PID 20 : Interactive Book Reader with Augmented reality content

Version 1.0

Prepared by - Group 14

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04/08/2023

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Revision History

Date	Version	Description	Author
04/08/2023	1.0	Initial version of SRS	MADUSHA E.P.C. 200368L MENDIS D.V.N 200392E MENUKA L.D.S. 200394L

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Software Requirements Specification

1. Introduction

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.What we are aiming to do is give a new experience to kids learning interactively through a mobile app. This app will incorporate AR visualizations into children's books, making reading a more engaging and enjoyable experience for children. With this project, we hope to inspire young readers to fall in love with reading and learning while having fun. We believe that this technology will revolutionize the way children read and learn, and we are excited to be a part of this movement. Our goal is to create an immersive experience that encourages curiosity and creativity, and we can't wait to see the impact this app will have on young minds.

1.1 Purpose

The purpose of the Software Requirements Specification (SRS) is to provide a comprehensive description of the software requirements for our proposed project - an interactive Book Reader with Augmented Reality Content for children aged 3-10 years. The SRS will be used to communicate the requirements to the development team, stakeholders, and users. Our goal is to make learning interesting and engaging for children by incorporating AR visualizations into children's books. This will help parents to engage with their children more, providing them with an opportunity to spend quality time together and guide their learning. The SRS will be a living document that will be updated as the project progresses. It will be reviewed and approved by the stakeholders before the development phase begins, ensuring that the final product meets the requirements. By creating an app that provides an immersive experience, we hope to inspire young readers to fall in love with reading and learning while having fun.

1.2 Scope

The proposed project is mainly aimed at children and involves the development of an interactive Book Reader with Augmented Reality Content. The mobile app will have E-book reading capabilities, with AR content visualization and text-to-speech feature to enhance the AR experience. In addition to this, the app will be able to read other digital formats. It will also have 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 will have features to add AR content for publishers and allow users to purchase them in a marketplace. Guest users will be able to use the app to read books with AR content and digital books. They will also be able to purchase books from the marketplace in the web app. Administrators will have the ability to add new books and give publisher rights to the publishers. Publishers will have the ability to publish books to the marketplace.

1.3 Definitions, Acronyms, and Abbreviations

SRS - Software Requirement Specification

DB - Database

REST - Representational State Transfer

API - Application Programming Interface

1.4 References

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1.5 Overview

This subsection provides an overview of the proposed project, which involves the development of an interactive Book Reader with Augmented Reality Content aimed at children. The mobile app will have E-book reading capabilities, with AR content visualization and text-to-speech feature to enhance the AR experience. In addition to this, the app will be able to read other digital formats. The web app will have features to add AR content for publishers and allow users to purchase them in a marketplace. The rest of the SRS contains detailed requirements and specifications for the app, including user requirements, functional requirements, and non-functional requirements. The document is organized in a logical and structured manner to facilitate understanding and implementation of the proposed project.

2. Overall Description

This section of the SRS provides a general background for the product and its requirements. It covers the following items:

2.1 Product perspective

The interactive Book Reader with Augmented Reality Content for children is designed to provide an innovative and engaging reading experience for young readers. From a product perspective, this app is unique in the market, offering a combination of traditional reading materials with cutting-edge AR technology. Additionally, the web app will include features for publishers to add AR content for sale in a marketplace, providing a platform for creators to showcase their work and increase exposure. Overall, this app has the potential to revolutionize the way children read and learn, and it is an exciting addition to the digital entertainment landscape.

2.2 Product functions

When it comes to product functions, the app that we're talking about has quite a few notable features that are worth mentioning. For starters, it has the ability to read E-books in a variety of different formats. This is particularly useful for individuals who prefer to read books on their electronic devices rather than carrying around physical copies.

In addition to this, the app also has AR content visualization capabilities. This allows users to experience a more immersive and interactive reading experience, as they can see 3D models and other visual elements come to life within the pages of the book.

Another key feature of this app is its text-to-speech functionality. This allows users to listen to the book being read aloud, which can be helpful for individuals who have difficulty reading or who simply prefer to listen to books rather than read them.

The app also includes a number of other useful features, such as the ability to highlight text, bookmark pages, and access digital dictionaries. These features are all designed to make the reading experience as enjoyable and convenient as possible for users.

Finally, the app makes it easy for publishers to create new books with AR models. This means that users can look forward to a wider selection of books with AR content in the future, further enhancing their reading experience. All in all, this app has a lot to offer to anyone who enjoys reading and wants to take their reading experience to the next level.

2.3 User characteristics

Firstly, the primary users of the mobile app are children between the ages of 7-12 who have basic reading skills and an interest in technology. The app is designed to engage them with interactive and immersive augmented reality content, making reading more fun and engaging.

Publishers and authors can also use the web app to create and publish books with AR content. This offers a new and innovative way to present their content to readers and potentially reach a wider audience.

There are admin users who are responsible for maintaining the app and approving books that need to be published on the platform. They ensure that all the content on the app is appropriate for the target audience and meets the necessary quality standards.

Parents can also use the app as a tool to guide their children in using technology in a safe and educational way. They can monitor their children's progress and ensure that they are engaging with appropriate content.

Lastly, teachers may find the app useful as a learning tool in classrooms. It can offer a new and exciting way to engage students in reading and learning, especially for those who struggle with traditional forms of learning.

2.4 Constraints

It is important to note that the app should be compatible with people who may not be tech-savvy. The interface and user experience should be intuitive and easy to navigate. Furthermore, the contents of the app should be available at all times without any failure, ensuring a seamless reading experience. It is also crucial for the app to comply with safety and privacy regulations for children's apps, ensuring that it is a safe and secure platform for young readers. Finally, the app should be compatible with both iOS and Android devices, with minimum hardware and software requirements, making it accessible to a wider audience.

2.5 Assumptions and dependencies

The app assumes that users have access to high-speed internet for downloading and accessing AR content. It depends on publishers to create and upload AR content for sale. Every content that is published through our platform should be strictly monitored.

2.6 Requirements subsets

Specific requirements for the app are defined in detail in Section 3 of the SRS.

3. Specific Requirements

3.1 Functionality

3.1.1 Web app

3.1.1.1 User Registration

3.1.2.1.1 Description and priority

This is a high priority feature of the web application. In order to get access to the system, both the book publishers and the readers need to get registered by creating their user accounts.

3.2.2.1.2 Stimulus/ response sequence

When a user accesses the web application's landing page, they are provided with options for user registration and login. If the user decides to register, the system responds by presenting a registration form to which the user have to provide their username, email, password etc. and register as either a publisher or a reader. Once the user completes the registration form, the system undertakes validation checks on the provided details such as valid email formatting and a strong password. If any validation issues arise, the system displays relevant error messages to guide the user. If the validation process is successful the system displays a confirmation message to notify the user about completion of the registration process.

3.1.1.2 User Login

3.1.2.1.1 Description and priority

This is a high priority feature of the web application. After creating a personal account users can easily log into the system by providing their username and password.

3.2.2.1.2 Stimulus/ response sequence

In order to log into the system user need to input their registered username and password to the login form. Then the system then verifies the entered credentials against the stored user data. If the credentials match, the user is seamlessly granted access to their account. Upon successful login, the system redirects the user to their personalized dashboard that aligns with their assigned role, whether they are a book publisher or a reader

3.1.1.3 Publish an EBook

3.1.2.1.1 Description and priority

This is a high priority feature of the web application. This feature allows book publishers to share their digital works seamlessly through the platform. By utilizing this functionality, publishers can upload and publish their eBooks, making them accessible to readers.

3.2.2.1.2 Stimulus/ response sequence

After logging in to the system, publishers can publish their eBook by providing the key details about the book they wish to publish, such as title, author, genre, a brief description, a cover image, and the actual eBook file. Once the details are submitted, the system validates the information provided to ensure the accuracy and completeness. Upon successful submission, the system securely uploads the eBook file and associates it with the provided information. Then the user receives a confirmation message as a notification of the eBook's successful publication. Subsequently the new eBook becomes accessible and available for readers to discover and download on the platform.

3.1.1.4 Manage Publications

3.1.2.1.1 Description and priority

This is a high priority feature of the web application. This feature empowers publishers to have comprehensive control over their published materials on the platform. Publishers can efficiently manage various aspects of their publications including updates, modifications, pricing, availability, and removal.

3.2.2.1.2 Stimulus/ response sequence

When a publisher logs into their account he can view a list of his currently published work with all the associated details such as the title, description, price and the cover image. The publisher can make any changes to those details by using the edit option or else remove the publication if needed. Once the changes are finalized and saved, the system responds by updating the publication's details in accordance with the user's actions. Then for the readers, the system showcases the publisher's managed publications, reflecting all the latest updates.

3.1.1.5 Search the Catalog of Books

3.1.2.1.1 Description and priority

This is a high priority feature of the web application. This enables both publishers and readers to search for specific books within the platform's catalog. By offering effective search capabilities, this feature guarantees that users seamlessly explore and access the books they are interested in.

3.2.2.1.2 Stimulus/ response sequence

Using the search option, users can easily search for specific books by entering title of the book or the name of the author. Then the system processes the request and provides user with a comprehensive list of search results closely related to the provided input. Once a specific book is selected users are seamlessly directed to an in-depth view of the book which includes the book's essential details such as book’s title, author, description and the cover image.

3.1.1.6 Purchase Books

3.1.2.1.1 Description and priority

This is a high priority feature of the web application. This allows users to acquire books from the platform's catalog. Readers can select books they are interested in and proceed to purchase them through a secure and user-friendly transaction process. The central objective of this feature is to enhance user *access* to the desired content, while providing valuable support to publishers by facilitating book sales.

3.2.2.1.2 Stimulus/ response sequence

After finding the desired book, users can initiate the payment process by clicking on the purchase option. Then the system responds by transitioning them to a secure transaction interface to which the user need to input their payment details. Once the payment process is succeeded, the user receives an immediate confirmation notifying the completion of their purchase and the purchased book swiftly becomes accessible within their user account. Thereafter, users can conveniently access the book via the PIXIE mobile application.

3.1.1.7 Edit user account details

3.1.2.1.1 Description and priority

This is a medium priority feature of the web application. This empowers, both the publishers and the readers to have control over their profile information, and security settings. By facilitating the user account management, this feature contributes to a personalized and secure user experience.

3.2.2.1.2 Stimulus/ response sequence

When users navigate to their account settings, they're presented with a range of options for managing their account, including the ability to update profile details. Users can choose to update their profile details such as username, password, contact information, or profile picture. Once users have made the desired adjustments, they can seamlessly confirm their edits by using the save option provided. Then the system validates the changes and updates the account details accordingly.

3.1.1.8 Assign Publisher rights

3.1.2.1.1 Description and priority

This is a medium priority feature of the web application.This functionality allows system’s admins to assign publisher rights to users, giving them the capability to publsih their eBooks to the platform. By designating users as publishers, the system enables them to upload, edit, and

manage their eBooks efficiently**.**

3.2.2.1.2 Stimulus/ response sequence

When a user requests publisher rights, the system presents an administrator with the list of application along with the details of user accounts. The administrator selects the user for whom publisher privileges are requested. After confirmation, the system updates the user's account to grant publisher rights.

3.1.1.9 Logout

3.1.2.1.1 Description and priority

This is a high priority feature of the web application.This feature allows users to securely log out from their accounts.

3.2.2.1.2 Stimulus/ response sequence

When a user initiates the logout process by selecting the "Logout" option from the application interface, the system immediately terminates the user's current session. The system responds by redirecting them to the login page. Then the system displays a confirmation message to notify the user that they have been successfully logged out.

3.1.2 Mobile app

3.1.2.1 User Registration

3.1.2.1.1 Description and priority

This is a high priority feature of the mobile application. In addition to the user registration feature (3.1.1.1) provided by the Pixie web application, the same feature is also provided by the mobile application for the convenience of users.

3.1.2.1.2 Stimulus/ response sequence

Similar to 3.1.1.1.1

3.1.2.2 User Login

3.1.2.1.1 Description and priority

This is a high priority feature of the mobile application. In addition to the user login feature (3.1.1.2) provided by the Pixie web application, the same feature is also provided by the mobile

application for the convenience of users.

3.2.2.1.2 Stimulus/ response sequence

Similar to 3.1.1.2.1

3.1.2.3 Access Purchased Books

3.1.2.1.1 Description and priority

This is a high priority feature of the mobile application. This functionality enables users to conveniently access and read the books which they have purchased through the web platform. By providing seamless access to purchased content, this feature enhances user satisfaction and their engagement with the mobile app.

3.2.2.1.2 Stimulus/ response sequence

In the mobile application, users can view a list of their previously purchased books along with the cover images and titles. The user can select a specific book from this list and them the system promptly opens the chosen eBook, providing a reader-friendly interface. Users can effortlessly navigate through pages using gestures like swiping or tapping, ensuring a seamless reading experience.

3.1.2.4 AR content visualization

3.1.2.1.1 Description and priority

This is a high priority feature of the mobile application. This feature takes advantage of Augmented Reality (AR) technology to elevate the reading experience. It accomplishes this by transforming characters and scenes from kids' books into interactive and captivating visual elements that come to life on the screen. This helps young readers to create a stronger bond with the content while igniting their imagination.

3.1.2.1.1 Stimulus/ response sequence

When reading a kids' book equipped with AR content, users can easily activate the AR experience by tapping the AR option. Then the system then uses the device's camera to scan the designated AR trigger. As a result, characters and scenes from the book pop up on the screen in a 3D view. Users can tap on things to see animations or learn more. They can also move the device around to explore different angles.

3.1.2.5 Text-To-Speech

3.1.2.1.1 Description and priority

This is a high priority feature of the mobile application. This functionality empowers users to have the text content of eBooks read aloud to them, enhancing the accessibility of the content. This introduces an alternative mode of consuming content that extends beyond the conventional reading experience. Moreover, this feature addresses the accessibility gap by catering to users with visual impairments or reading difficulties.

3.2.2.1.2 Stimulus/ response sequence

When the user activates the Text-To-Speech mode within an eBook, the system responds by converting the written content into synthesized speech that accurately reflects the text on the screen. Users can customize their experience by adjusting the pace of the speech, tailoring it to their preferred speed. Moreover, users have the ability to change other voice settings, such as voice type and pitch. When users make adjustments to these settings, system promptly adapts the speech characteristics to match the user's preferences and delivers a personalized user experience.

3.1.2.6 Access Digital Dictionaries

3.1.2.1.1 Description and priority

This is a medium priority feature of the mobile application. This feature allows users to effortlessly search for definitions of unfamiliar words they come across while reading. This quick access to definitions enhances their understanding of the content, enabling a deeper engagement with the material.

3.1.2.1.1 Stimulus/ response sequence

When the user selects an unknown word, the system promptly responds by presenting a contextual menu with a "Lookup" option. Upon choosing this option, the system initiates a quick search for the word's definition within integrated digital dictionaries. Then the definition of the word, along with other related information, is displayed on the screen. Users can use this definition to get better understanding of the word's meaning and save the definition for their future reference.

3.1.2.7 Highlight, Comment and Bookmark pages

3.1.2.1.1 Description and priority

This is a medium priority feature of the mobile application. This functionality empowers users to interact with eBook content on a deeper level by allowing them to highlight important sections, add comments, and bookmark pages for future reference.

3.1.2.1.1 Stimulus/ response sequence

As users read an eBook, they can easily identify sections of interest and initiate the highlight feature by selecting the relevant text. Then the system responds by making the selected text distinct and recognizable. Furthermore, users are provided with the ability to add comments to the highlighted content. If the user wishes to revisit a specific page, they can use the Bookmark option, which records the current page for future reference, making it easy to navigate back to that point.

3.1.2.8 View Saved Definitions

3.1.2.1.1 Description and priority

This is a medium priority feature of the mobile application. This feature allows users conveniently access and go through the meanings of words they have previously saved while reading. This supports them with strengthening their vocabulary and understanding the content.

3.1.2.1.1 Stimulus/ response sequence

The mobile application provides users with a dedicated section where users can re visit the list of words that they've previously saved during their reading journeys. Upon entering this section, users can select a specific word from this list and then the system promptly displays its saved definition along with any additional information.

3.2 Usability

3.2.1 Learnability

Since the PIXIE mobile application is mainly designed for the kids aged 3-12, the application should prioritize a high level of learnability. Kids should be able to figure out how to use the application and become proficient in using its AR and features within a short period of time. Instructions and tips should be clear and straightforward, guiding users through various functionalities without causing any confusion. The Text-To-Speech feature should be easily discoverable, and the process of activating and controlling it should be simple, allowing young readers to grasp its usage effortlessly. By placing an emphasis on learnability and a brief learning period, the application aims to minimize the learning curve for both new and returning users, facilitating a smooth and enjoyable reading experience.

The primary users of the web application are expected to be adults. However, the navigation system within the pages must be straightforward and user-friendly for all types of users, regardless of their age or technical expertise. It's important that the instructions for publishing, purchasing and other actions are presented in a clear and understandable manner, ensuring that users can easily follow the steps without any confusion.

3.2.2 Accessibility

Acknowledging the potential lack of consistent internet access for children, certain features of the

mobile application should be accessible offline. The app's design should cater to the scenario where young users might not have an active internet connection. As part of this design, the app should enable young users to access eBooks that they have previously downloaded, along with any related functionalities such as highlights and bookmarks.

3.1.3 User-friendly GUIs

The GUI of the kids' mobile app should be designed to provide a visually engaging and intuitive interface for our young readers aged 3-12. The app's GUI should be included with bright colors, playful icons, and large interactive elements to create an environment that is easy to navigate and delightful to interact with.
The web application intended for adults should feature a GUI that's user-friendly and matches the preferences and expectations of mature users. The GUI should have a well-structured layout, ensuring that the navigating and using the app feels easy and natural. The design should give importance to being easy to read and use, taking into consideration that users might have different levels of experience with digital tools.

3.2.4 Engagement

To capture and maintain the interest of children, the app should give high importance to create engaging and visually attractive content. Since kids are naturally fascinated by interactive visuals and audio elements, user engagement can be significantly enhanced by integrating animations and sound features into the app's design.

3.2 .5 Flow

The app should ensure a smooth and uninterrupted transition as kids move from one activity to another. This way young users can have a seamless and enjoyable experience without any stops or breaks in between tasks.

3.2.6 Responsiveness

The kids' e-reader mobile app should be highly responsive to prevent user distraction. Specially, the AR visualizations must load promptly to maintain user engagement, particularly for young users. Additionally, the dictionary feature and the text-to-speech feature should be designed for quick and seamless performance, to prevent any disruption to the user experience.

3.3 Reliability

3.3.1 Availability

For the kids' e-reader app, it is crucial to maintain a high level of availability. The app should aim

for an availability rate of 99.99%. This ensures that young readers can enjoy their reading adventures without any disruptions.

Similarly, the publishing web app should also prioritize availability. It is also expected to be available 99.99% of the time. This ensures that publishers can conveniently manage their content at any time, contributing to a seamless and efficient publishing process.

3.3.2 Accuracy

Ensuring accuracy is crucial for both the kids' e-reader mobile app and the web app. The system should aim to deliver accurate results for at least 90% of interactions. This precision guarantees a stable and trustworthy experience for all users, maintaining the integrity of content and interactions within the apps.

3.3.3 Mean Time Between Failures (MTBF)

The goal for the Mean Time Between Failures (MTBF), which measures the average time between two system failures, is to have a substantial duration between potential system failures. Therefore, the both the mobile and the web app are expected to have MTBF of at least 7 days. This aims to minimize the frequency of disruptions, ensuring that users experience a dependable and consistent performance.

3.3.4 Mean Time To Repair (MTTR)

To swiftly address any potential issues in the kids' e-reader app, the Mean Time To Repair (MTTR) should be minimal. In case of a failure, the app should aim to have an MTTR of no more than 30 minutes, ensuring that children can resume their reading activities promptly.

Similarly, for the publishing web app, the MTTR is targeted to be within 1 hour, ensuring that any disruptions in the publishing or purchasing processes are quickly resolved, allowing users to continue their activities without prolonged delays.

3.3.4 Maximum Bugs or Defect Rate

For both the kids' e-reader mobile app and the web app, the maximum acceptable bugs or defects rate should not exceed 20 issues per 1000 lines of code. This aims to produce high-quality software with minimal disruptions, providing a reliable and seamless user experience.

3.4 Performance

3.4.1 Response time

The response time of the main screen of the mobile app should be within 1-3s after logging in. This response time is vital as the user can be easily distracted and may close the app. The book library is expected to load within 5s. When opening a digital book, the book should load within 3s. The response time of AR models is expected to be 5s. Since the primary users are children, the response times are expected to be as low as possible to make the experience enjoyable.

(Note that the above response times are expected at good network connectivity)

3.4.2 Throughput

The throughput of the system refers to the number of book requests, AR interactions, and other interactions the system can handle concurrently. Initially, the system is designed to support a moderate level of throughput. As the user base grows and demand increases, the system's throughput capacity will be expanded to accommodate a larger user load. This scalability ensures that the system can maintain optimal performance even during periods of high usage.

3.4.3 Capacity

The capacity of the system relates to its ability to handle a substantial volume of user data, including user profiles, book libraries, and AR content. Initially, the system will have a capacity plan in place to accommodate the expected volume of data. However, as the user base and content library expand, the system's capacity will be incrementally increased to ensure that it can efficiently store and manage a growing volume of data. This scalability guarantees that the system can continue to provide a seamless experience as it scales to serve a larger user community.

3.4.4 Resource Utilization

Resource utilization pertains to the efficient allocation and utilization of computational resources, including server capacity and cloud resources. The system is designed to optimize resource utilization, ensuring that computational resources are allocated judiciously to deliver the best possible performance. Continuous monitoring and optimization of resource utilization will be a part of ongoing system maintenance to ensure efficient operation and cost-effectiveness. As the system evolves and usage patterns change, resource utilization will be adjusted to align with evolving requirements.

3.5 Supportability

3.5.1 Coding Standards

Adhering to consistent and well-defined coding standards is essential for the maintainability of both the kids' E-reader mobile app and the web app. Developers should follow guidelines for naming conventions, indentation, commenting, and code organization to ensure that the code remains well organized and understandable. This aims to facilitate efficient collaboration among development teams and provide a codebase that can be easily maintained and extended over time.

3.5.2 Naming Conventions

In order to enhance code readability and also to facilitate efficient maintenance, developers should use meaningful and consistent names for variables, functions, classes, and other code elements. By adhering to well-defined naming conventions, developers ensure that the code remains understandable as the apps

evolve and undergo updates.

3.5.3 Version Control

The development team should use a proper version control system for both the kids' e-reader mobile app and the web app to track different versions of the system. Developers need to collaborate by cloning the repository, making changes in their branches, and merging through pull requests This ensures systematic version management and maintains the integrity of the codebase for ongoing developments.

3.5.4 Modularity

To enhance the maintainability of both the kids' e-reader mobile app and the web app, it is important to use a modular and scalable design approach. By designing the apps in a modular manner, components can be developed and updated independently, reducing the risk of system-wide failures.

3.6 Design Constraints

3.6.1 Standards Compliance:

To ensure adherence to industry standards, a comprehensive code review process will be implemented. Code reviews will be conducted regularly to identify and rectify any non-compliant code or design elements.

Continuous monitoring of software development best practices and regular team training sessions will keep the development team updated on evolving standards.

3.6.2 Hardware Limitations:

For devices with hardware limitations, the application will employ adaptive rendering techniques. This ensures that the augmented reality features degrade gracefully on less capable devices, maintaining basic functionality while reducing resource-intensive processes.

Compatibility with Google Play Services for AR, a widely adopted platform, will be integrated to facilitate augmented reality experiences on a broader range of devices.

3.6.3 Efficient Database Usage:

To address database constraints, the system will start with a free or low-cost database solution, but scalability will be a key consideration. When user demand and data storage requirements increase, transitioning to a paid database service with higher storage capacity and throughput will be explored.

Caching mechanisms and data compression will be employed to minimize database calls and optimize data retrieval for enhanced system efficiency.

3.6.4 Secure Third-Party API Integration:

Third-party API integration will be conducted through secure channels with proper authentication and encryption protocols in place to safeguard user data.

Regular security audits and vulnerability assessments will be conducted to identify and address any potential weaknesses in the integration, ensuring data privacy and security.

3.6.5 Usability Challenges:

To overcome usability challenges, the application will provide in-app tutorials, tooltips, and step-by-step guides for users, especially newcomers to augmented reality.

User feedback and usability testing will be actively used to refine the user interface and optimize user journeys for a smoother and more intuitive experience.

3.6.6 Accessibility and Inclusivity:

Accessibility features, such as screen readers and voice commands, will be integrated to make the application usable for individuals with disabilities.

Regular accessibility testing will be conducted to ensure compliance with accessibility standards and identify areas for improvement.

3.6.7 Cross-Platform Compatibility:

Cross-platform compatibility will be ensured through the use of cross-platform development frameworks like React Native. This approach allows the application to run on both iOS and Android devices while maintaining a consistent user experience.

Extensive testing on various devices and operating systems will be performed to identify and resolve platform-specific issues.

3.6.8 Documentation and Onboarding:

New user onboarding will be simplified through well-documented tutorials, video guides, and FAQs available on the platform's website and within the application.

Customer support channels, including chat support and email, will be established to assist users with any difficulties they encounter during the onboarding process.

3.7 On-line User Documentation and Help System Requirements

3.7.1 User-Friendly Onboarding:

The system shall provide user-friendly onboarding processes for both new and returning users.

A comprehensive "Getting Started" guide shall be available, outlining the steps for accessing augmented reality content and navigating the platform.

3.7.2 In-App Tutorials:

The application shall include in-app tutorials and tooltips to assist users in utilizing augmented reality features effectively.

Tutorials should cover basic interactions, such as capturing AR content from physical books and managing their augmented reality library.

3.7.3 Detailed FAQs and Troubleshooting:

An extensive Frequently Asked Questions (FAQs) section shall be accessible to address common user queries and challenges.

Troubleshooting guides shall be available to help users resolve issues related to device compatibility, camera access, and connectivity.

3.7.4 Contextual Help:

Contextual help features, such as tooltips and info icons, will be embedded throughout the application to provide real-time assistance based on the user's actions.

Users can access relevant information by clicking on these contextual help elements.

3.7.5 Augmented Reality User Guide:

A dedicated guide shall be accessible within the application for users seeking information on how to interact with augmented reality content.

The guide shall include step-by-step instructions on adding AR-enabled books to their library and using the device's camera to engage with AR elements.

3.7.6 Accessible Help Resources:

Help resources, including user documentation and guides, shall be made available on the platform's website for easy access.

User documentation should cover topics ranging from initial setup to advanced augmented reality interactions.

3.7.7 Regular Updates to Documentation:

The user documentation and help resources shall be updated regularly to reflect changes in the application's features, improvements, and new releases.

Updates will ensure that users have access to accurate and up-to-date information.

3.8 Purchased Components

In the initial development phase of the "Interactive Book Reader with Augmented Reality Content" project, we have leveraged a range of components and tools, all of which are available under free usage tiers. This strategic choice not only keeps the development cost-effective but also aligns with our aim to foster an inclusive and accessible community of users and developers. These components include Firebase for real-time database management and authentication, MongoDB as the primary NoSQL database, Figma for collaborative UI/UX design, open-source AR models, Unity integrated with Vuforia Engine for augmented reality features, MaterialUI UI templates to enhance user interface aesthetics and usability, as well as design tools such as Lucidchart and Diagram.io for visual representation creation.

As our product matures and reaches a broader audience, we remain open to considering paid versions of these services to meet the evolving needs of our community while ensuring compatibility and scalability.

3.9 Interfaces

3.9.1 User Interfaces

The images display a prototype version of the mobile application (not implemented yet) that is expected to be designed.

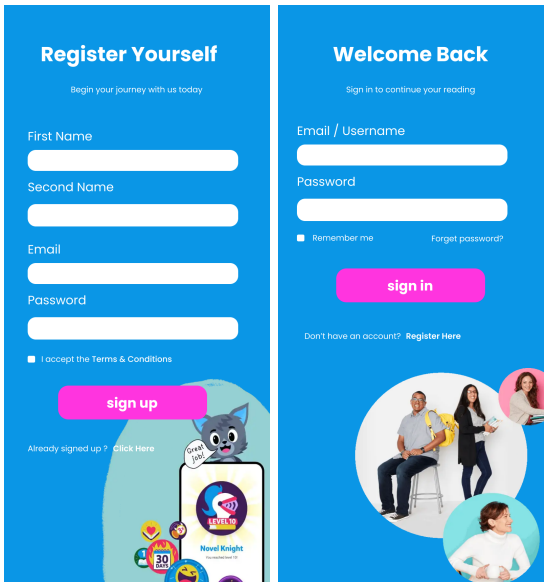
3.9.1.1 *Mobile Interface*

3.9.1.1.1 Landing page for Mobile App

Here, we are showing the designed prototyped template for the landing page once you open the app from your mobile device. It has two options saying if you are already a user start reading now or if you are a new user you can use sign up option to create a new account.

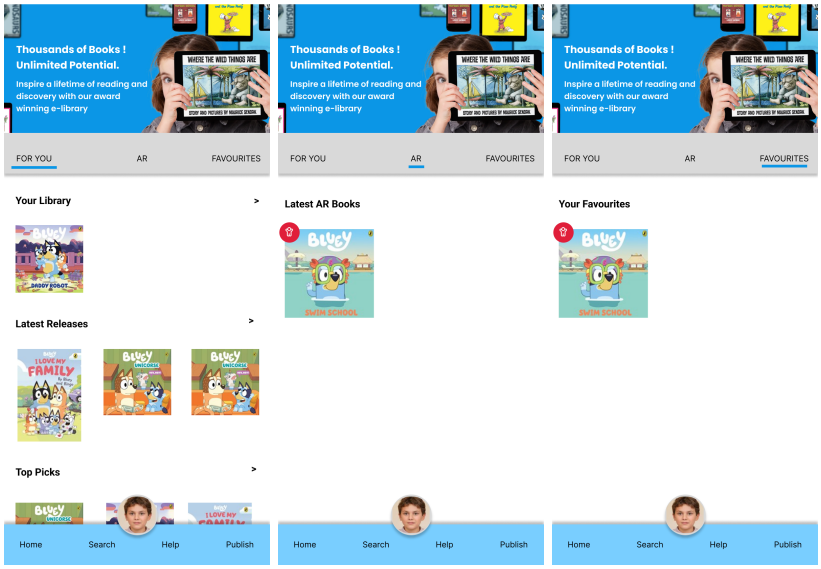
3.9.1.1.2 Login & SignUp Interfaces

This is the expected sample output for the sign in and sign up pages, having the features of creating a new account.



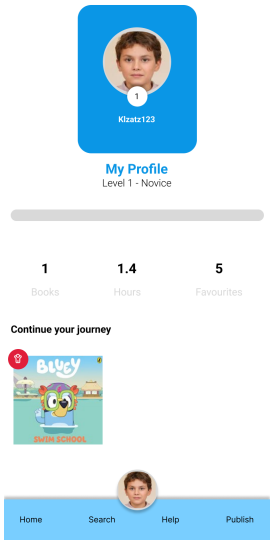
3.9.1.1.3 Home Tab Interfaces

Once you sign in as a user you are directed to the home page, having two navigation bar at the middle and the bottom of the screen. The middle navigation bar has three menu options “FOR YOU”, “AR” & “FAVOURITES” which will directed to the following tabs. The bottom navigation bar has the showing menu options.



3.9.1.1.4 User Profile Interface

This is the user profile interface where you can see your state and the dashboard showing the details of the books you read, number of hours you spent reading and how many favourites you have selected.



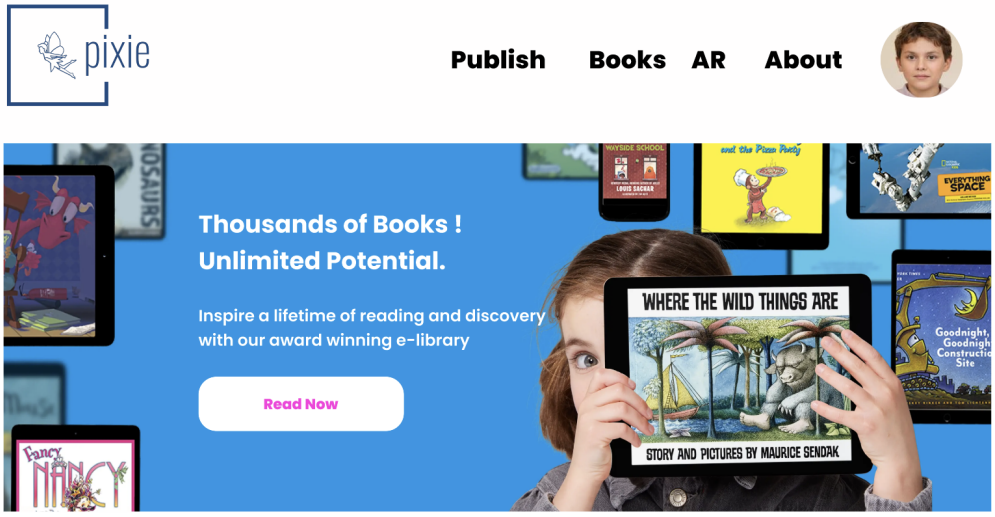
3.9.1.1.5 Other Tabs

These two tabs mainly show the additional features you can have if you visit the website and instructions to use Augmented Reality content.

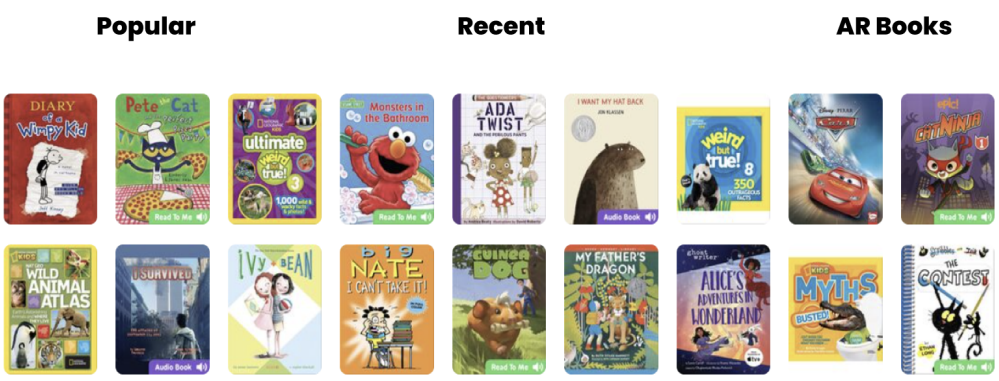
3.9.1.2 Web Interface

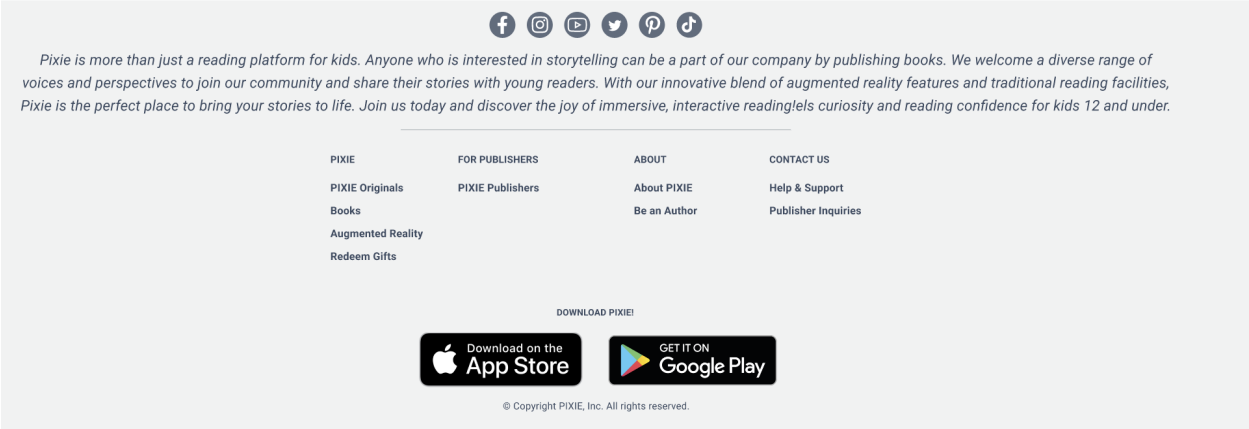
3.9.1.2.1 Home Page

This is the landing page of the website, once you logged in as a user you will be able to see the menu options and the user profile icon. Mainly this page consists of showing what we are offering to you as this platform and some information about our product PIXIE.



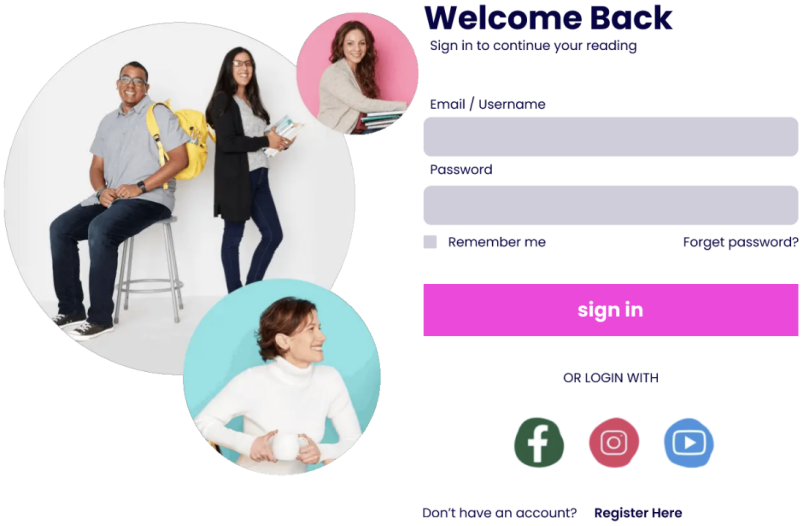
Explore more than 100+ books with Augmented Reality content.

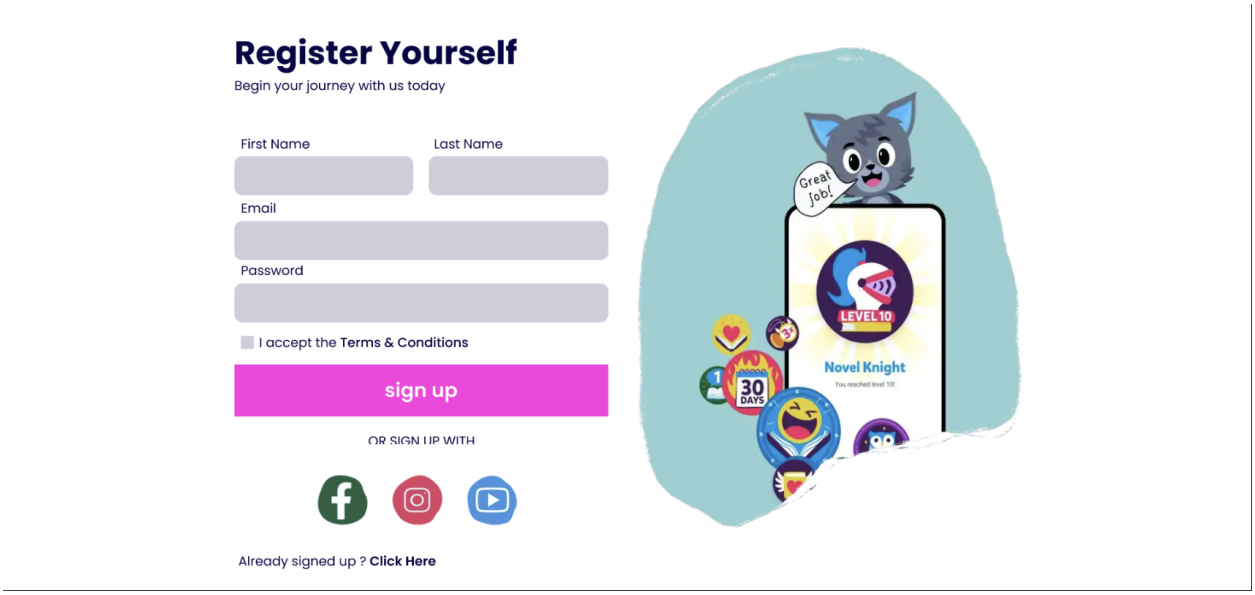




3.9.1.2.2 SignIn & SignUp Pages

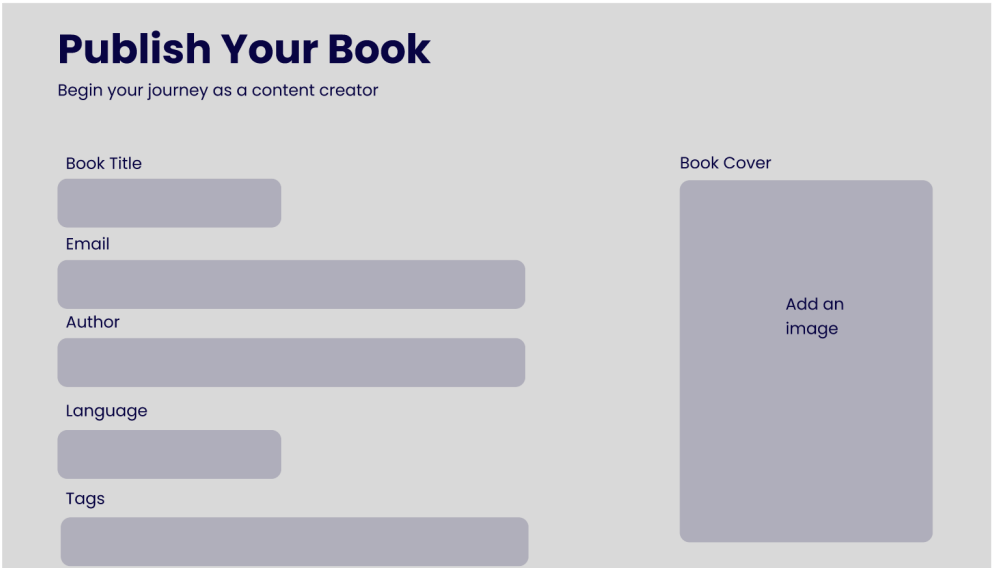
This is the sample design setup for the sign in and sign up functions.





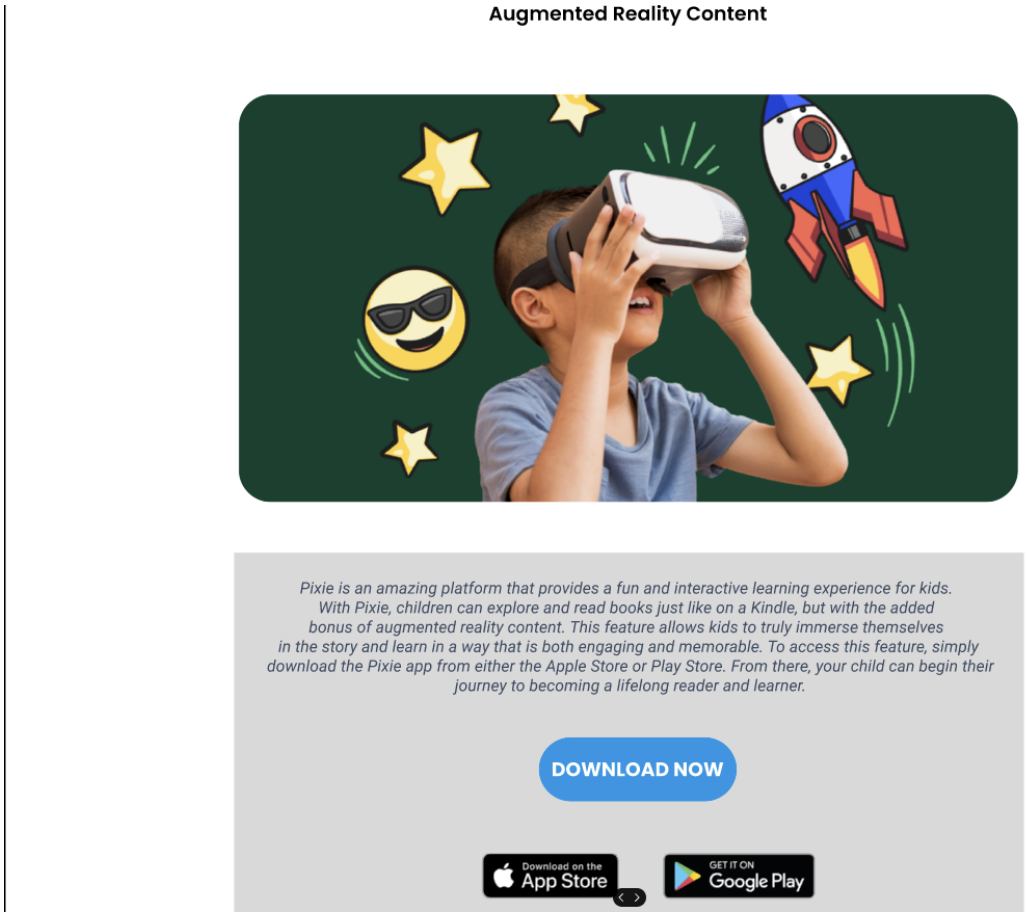
3.9.1.2.3 Publish Page

This is the page that if anyone want to publish a book, he/she can fill this form appropriately and then add the content that he/she wished to add.



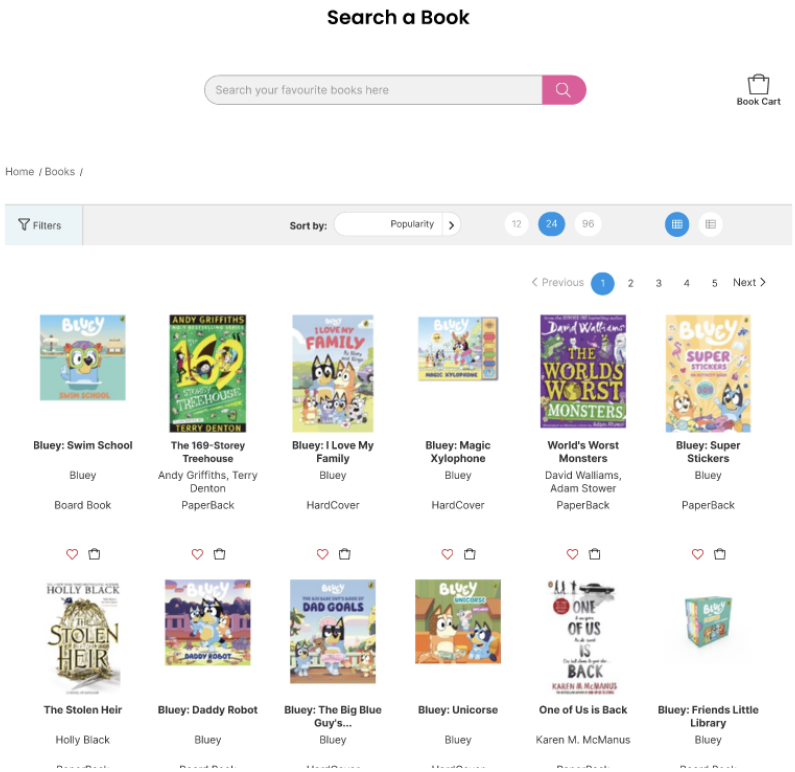
3.9.1.2.4 AR Page

This page explains the unique feature that we got as a product and guides you to download it from Play Store or app store in order to use AR contents.



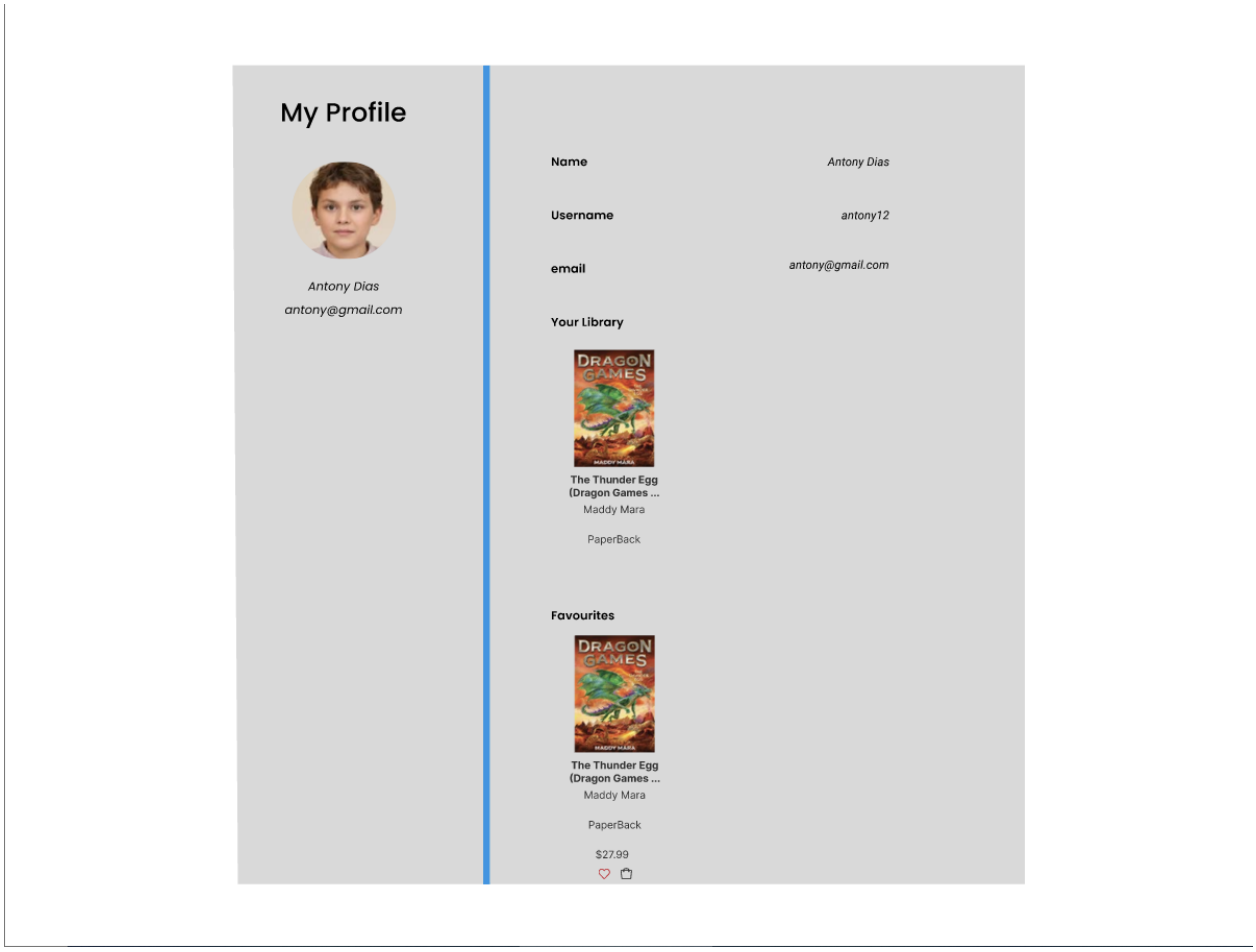
3.9.1.2.5 Books Page

This page gives the option to view the all books that our platform has, and you can search the book you want and add them to your personal library or you can add them into your favourites.



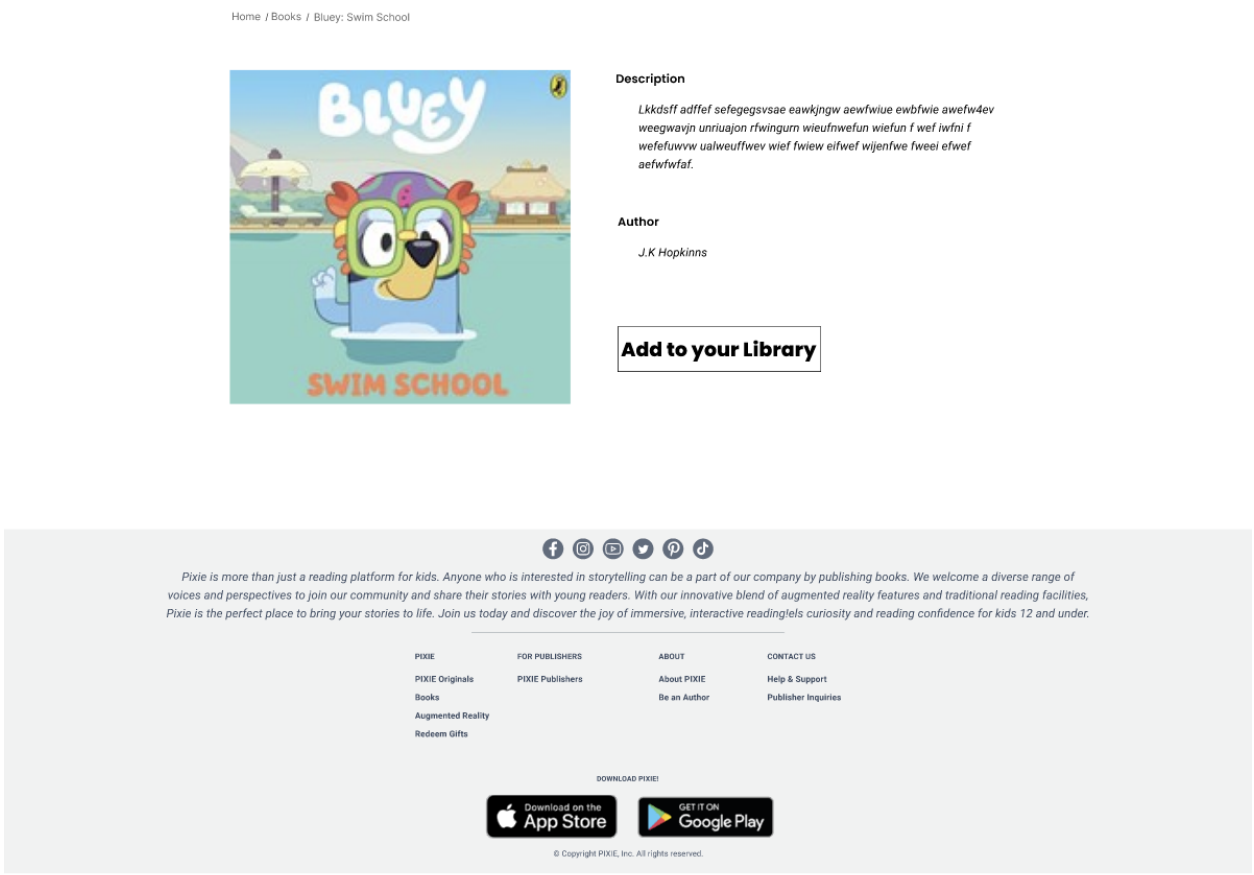
3.9.1.2.6 User Profile Page

Here, showing the personal information of the user and the books he had in his library and his favourites collection.



3.9.1.2.7 Book Page

Once you select a book you will be guided to a page like this showing the details of the book and an option to add this book to user's personal library.



3.9.2 *Hardware Interfaces*

When it comes to using our website, there are a few important things to keep in mind. Firstly, and perhaps most importantly, you will need to have an active internet connection in order to access all of the great features and content we have to offer. Whether you're browsing on your PC or using your mobile device, having a reliable internet connection is absolutely essential.

For publishers who are interested in using our platform to share their content, it's also important to ensure that you have all of the necessary documents and materials ready to go. This will ensure a smooth and seamless publishing process, and will help to ensure that your content reaches as many people as possible.

For those who plan on using our app, it's worth noting that an internet connection will also be required. Additionally, if you're interested in checking out our AR content, you'll need to make sure that your mobile device is compatible with this technology. Some devices may not be able to view AR content, so it's important to check beforehand.

To fully experience our AR content, you'll also need to give the app access to your camera. This will allow you to visualize the content in a more immersive and engaging way. And of course, you'll need to have a physical copy of the relevant book in order to access the AR content.

Finally, from an organizational perspective, it's important to note that a server will be required in order to run the necessary data. This will ensure that our platform runs smoothly and efficiently, and that all of our users have the best possible experience.

3.9 3 Software Interfaces

When it comes to building a website and mobile app that incorporates AR content, there are a few technical requirements that need to be considered. One of the main advantages of our platform is that users only need a web browser to access our website, which makes it incredibly accessible and easy to use. For publishing content, users can utilize third-party tools for designing and creating materials, which gives them greater flexibility and control over the content they create.

For mobile app users, software is required for visualizing AR content. This is an important consideration when building an app that incorporates AR capabilities, as the software needs to be able to accurately display the content in a way that is seamless and easy to use. From an organizational point of view, we need a database that syncs with both the website and app, which allows for a seamless user experience across both platforms.

In terms of the technical tools we use, our current choice for databases is MongoDB and Firebase, which are both powerful and reliable options for managing large amounts of data. For frameworks, we use React and React Native, which are both highly versatile and customizable tools for building web and mobile applications. We also use MaterialUI and Unity for designing the platform, which allows us to create a user interface that is both visually appealing and easy to navigate.

Overall, our platform is built on a solid technical foundation that ensures users have a seamless and enjoyable experience when using our website and mobile app. We are constantly exploring new technologies and tools to improve our platform and make it even more accessible and user-friendly.

3.9 4 Communications Interfaces

The system has a website as a supporting module for the customers and the database which the system uses is a firestore database. Therefore, HTTP /HTTPS Protocol is used as a communication interface for frequent transactions with the database as well as resource requests through the website and app. Also FTP for the file transferring between the databases and the devices.

3.10 Database Requirements

In our "Interactive Book Reader with Augmented Reality Content" project, efficient and secure database management is paramount to provide users with a seamless reading experience and to store augmented reality content-related data. Given the diverse requirements, we've outlined the following database needs:

Real-time Data Synchronization:

To ensure timely updates of augmented reality content, real-time data synchronization is essential. This functionality is vital, especially when users interact with augmented content in physical books.

Cloud-Based Storage:

The project aims to offer users the flexibility to access content from anywhere. Therefore, all relevant data, including user preferences, book libraries, and augmented reality markers, should be stored in a secure cloud-based database.

Scalability and Flexibility:

Considering the potential growth of the platform, the chosen database should be scalable to accommodate a growing user base and increasing content. It should also be flexible to adapt to changes and enhancements in the project.

Data Analysis:

To improve user experiences and provide personalized content recommendations, the system should be capable of implementing machine learning algorithms. Therefore, a database system that supports efficient data analysis and pattern recognition is preferred.

NoSQL Database:

Given the dynamic and diverse nature of the data, a NoSQL database is considered optimal. It allows for flexible data storage, retrieval, and management, which aligns with the varying types of content and user interactions expected in the project.

3.11 Licensing, Legal, Copyright, and Other Notices

Our product, PIXIE, is exclusively intended for enhancing children's reading experiences through augmented reality content. To ensure its proper use and protection, PIXIE is copyrighted and should only be used for educational and entertainment purposes as intended. Any other use, including reverse engineering, modification, distribution, or commercial use, is strictly prohibited. All associated trademarks, logos, and branding are protected by intellectual property laws and require permission for use. While PIXIE is designed for safety, users are advised to

exercise caution, especially with children. The platform is not liable for unintended use. PIXIE is committed to user privacy and data protection, adhering to relevant laws and regulations. By using PIXIE, users agree to these terms and conditions.

3.12 Applicable Standards

PIXIE adheres to a set of rigorous standards to ensure quality, safety, and user satisfaction. These standards encompass legal and regulatory compliance, including privacy laws such as COPPA (Children's Online Privacy Protection Act). PIXIE also aligns with industry standards for augmented reality usability and educational technology. Interoperability with commonly used devices and operating systems is a key consideration, following international standards where relevant. Accessibility standards are integrated to ensure PIXIE is inclusive for all users. These standards collectively contribute to PIXIE's commitment to providing a secure, high-quality, and user-friendly augmented reality reading platform.

4. Supporting Information

N/A