Project Final Report

『 The Brisbane Bullets App 』

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Executive Summary

The Brisbane Bullets Basketball Club (BBBC), a prominent team in Australia's National Basketball League (NBL), boasts a rich history and a passionate fan base. With recent changes in ownership, the club embarked on a digital transformation journey to redefine the fan experience through innovative technology. The core issue addressed by this project is leveraging digital technology to enhance fan interaction and engagement. The challenge lies in creating a seamless, interactive platform that not only disseminates information but also fosters a sense of community and belonging among supporters.

Key Outcomes

The primary outcome of the project is the development of a cutting-edge mobile fan application. This app serves as a bridge between the club and its loyal supporters, providing seamless access to team updates, match information, and interactive features. By integrating news updates, video content, game schedules, and roster details, the app offers fans a comprehensive hub for all things BBBC-related. Additionally, innovative engagement tools like interactive polls, fan forums, and live chat options enhance fan participation, fostering a stronger community and sense of belonging among supporters.

Key Issues/Challenges

During execution, the team faced the challenge of designing a user-centered, feature-rich application to significantly enhance the fan experience. Through thorough user research and iterative design, the team continuously optimized the app's interface and functionality. We also overcame technical integration issues and the complexities of implementing real-time interactive features. By addressing these challenges, the team successfully launched a high-quality app that meets the needs of fans and elevates their engagement with the Brisbane Bullets Basketball Club.

1. Analysis

All ICT projects come with a set of unknowns that require critical and creative thinking to address. In our project for the Brisbane Bullets Basketball Club (BBBC), we faced several such uncertainties. This section summarizes how our team applied these thinking strategies and performed the necessary analyses to tackle these unknowns. It also outlines the specific tasks completed by team members to achieve the "done" criteria for each evolutionary development increment outcome.

Identifying and Understanding Unknowns

Our project began with a thorough identification of potential unknowns, including:

- User requirements and expectations for the mobile fan app.
- Technical constraints and integration challenges with existing systems.
- Market competition and benchmarking against similar applications.
- Data privacy and security considerations for user interactions.

Applying Critical and Creative Thinking

To address these unknowns, we employed both critical and creative thinking approaches:

1. **Critical Thinking**:
    - **Basic functions**: For a mobile application, at first we need to meet basic requirements.
    - **Problem Analysis**: We conducted root cause analysis to understand the underlying issues related to user engagement and interaction.
    - **Data-Driven Decisions**: We utilized data analytics to assess user behavior, preferences, and pain points, ensuring our solutions were backed by empirical evidence.
    - **Risk Assessment**: We performed risk analysis to anticipate potential issues and develop mitigation strategies.
2. **Creative Thinking**:
    - **Brainstorming Sessions**: Our team held regular brainstorming sessions to generate innovative ideas for app features and functionalities.
    - **Design Thinking**: We adopted a design thinking approach, focusing on user-centric design to enhance usability and engagement.

- **Prototyping and Testing**: We created prototypes and conducted usability tests to refine our ideas and ensure they meet user needs effectively.
- In this project, we will create a predict system to **enhance engagement** of fans. This is the requirement from BBBC team.

Detailed Analysis and Research

To further address the unknowns, we conducted detailed analyses in several key areas:

1. **User Research**:
    - **Surveys and Interviews**: We conducted surveys and interviews with BBBC fans to gather insights into their expectations and preferences.
    - **User Persona Development**: Based on our research, we developed user personas to guide our design and development process.
2. **Market and Competitive Analysis**:
    - **Competitor Benchmarking**: We analyzed similar fan engagement apps in the market to identify best practices and potential gaps.
    - **SWOT Analysis**: We performed a SWOT analysis to understand our strengths, weaknesses, opportunities, and threats in the context of the project.
3. **Technical Analysis**:
    - **Technology Stack Evaluation**: We assessed various technology stacks to determine the most suitable ones for our app development.
    - **Integration Feasibility**: We evaluated the feasibility of integrating the app with existing systems, such as BBBC's website and social media platforms.
4. **Security and Privacy Analysis**:
    - **Data Protection Measures**: We researched best practices in data protection and implemented robust security measures to safeguard user information.
    - **Compliance with Regulations**: We ensured our app complied with relevant data privacy regulations, such as GDPR and Australia's Privacy Act.

Requirements:

This part has 2 sections: Functional requirements and non-functional requirements.

Functional Requirements

1. **Integration with Brisbane Bullets/NBL Website**: Seamless integration to provide up-to-date information and content.

2. **News**: Access to the latest team news, game results, player updates, and announcements.
3. **Schedule**: Display of the team's upcoming game schedule, including dates, times, and locations.
4. **Roster**: Detailed information on the team's roster, including player profiles and performance metrics.
5. **Standings**: Real-time updates on the team's standings within the NBL league.
6. **Statistics**: Comprehensive player and team statistics, such as scoring, rebounds, and assists.
7. **Videos**: Highlights, interviews, and other video content related to the team and games.
8. **Social Media Hub**: Engagement with the team's social media accounts directly within the app.
9. **Ticketek Integration**: Seamless ticket purchasing and event management.
10. **Brisbane Bullets E-Store**: Browsing and purchasing official merchandise directly through the app.
11. **Push Notifications**: Alerts about important news, game updates, ticket sales, and promotions.
12. **Match Predictions**: Users can predict match results and player performances.
13. **Reward System**: Points for successful predictions, redeemable for exclusive discounts in the eShop.

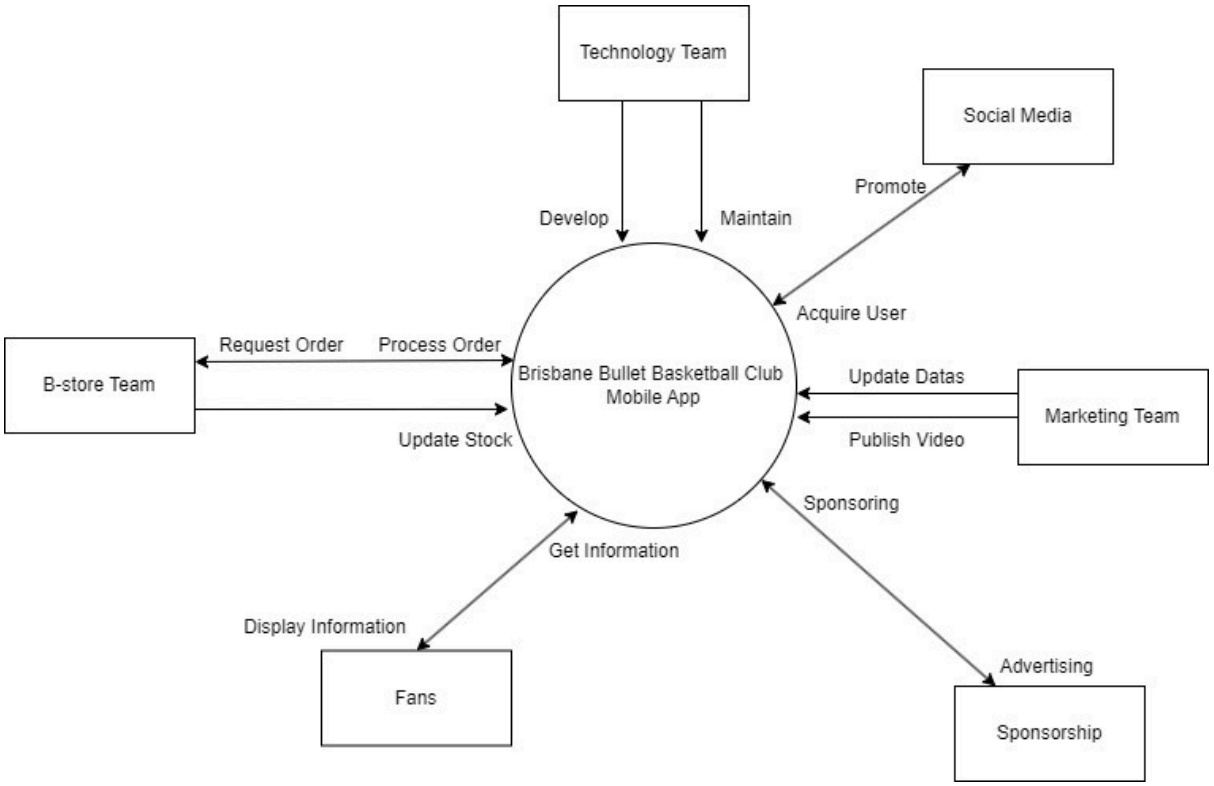
Non-Functional Requirements

1. **User Experience**: Prioritize a user-friendly interface and intuitive navigation.
2. **Performance**: Ensure responsiveness and efficiency, even during peak usage times.
3. **Security**: Implement strong security measures to protect user data and ensure secure transactions.
4. **Scalability**: Design for potential future growth in user base and feature expansions.
5. **Compatibility**: Ensure accessibility for both iOS and Android mobile devices.
6. **Reliability**: Maintain reliability and stability, with minimal downtime or technical issues.
7. **Regulatory Compliance**: Comply with relevant regulations and privacy laws to safeguard user data and privacy.

Through the application of critical and creative thinking, detailed analysis, and collaborative teamwork, we successfully addressed the unknowns in our project. Each team member played a crucial role in achieving the "done" criteria for each development increment, ultimately delivering a cutting-edge mobile fan app that enhances the BBBC fan experience.

2. Design

The app was designed with various stakeholders in consideration. These included the technology team responsible for its maintenance, the social media and marketing team tasked with promoting it, sponsors, the merchandise team overseeing the B-store, and the fans who would actively engage with the app. This can be visualized with the following diagram:



Technology Team: The app's architecture was designed with scalability and maintainability in mind. By using React Native for frontend development and Node.js for the backend, we aimed to streamline the development process and make it easier for the technology team to maintain and update the app in the future.

Social Media and Marketing Team: The app incorporated features to facilitate social sharing, such as the ability to access social media platforms directly from the app.

Sponsors: The app provides sponsorship opportunities through targeted advertising, sponsor banners within the app interface, and promotional campaigns tied to sponsored events or teams.

B-Store Team: The app included a dedicated B-store section where fans can browse and purchase team merchandise.

Fans: The primary focus of the app was to enhance the fan experience by providing real-time updates on matches, player performances, team news, and exclusive content such as interviews and behind-the-scenes footage.

For the design of the app itself, we first focused on the user interface (UI) and user experience (UX) design. We decided to develop the application using React Native due to its ability to be deployed across both iOS and Android platforms with a single codebase. This choice minimized our development time, as it eliminated the need to maintain separate codebases for each platform. Additionally, it ensured consistency in the user experience across different devices, which is crucial for providing a uniform look and feel.

React Native's component-based architecture was instrumental in creating a cohesive design. We developed high-fidelity designs, which emphasized visual appeal and consistency. Figma was a tool that we utilized to create detailed mockups, incorporating our chosen color schemes, typography, and branding elements. These high-fidelity designs were then transformed into interactive prototypes, allowing us to simulate user interactions and gather feedback easily whenever we had meetings with our stakeholders. This iterative process enabled us to refine the design based on user input, enhancing the overall user experience.

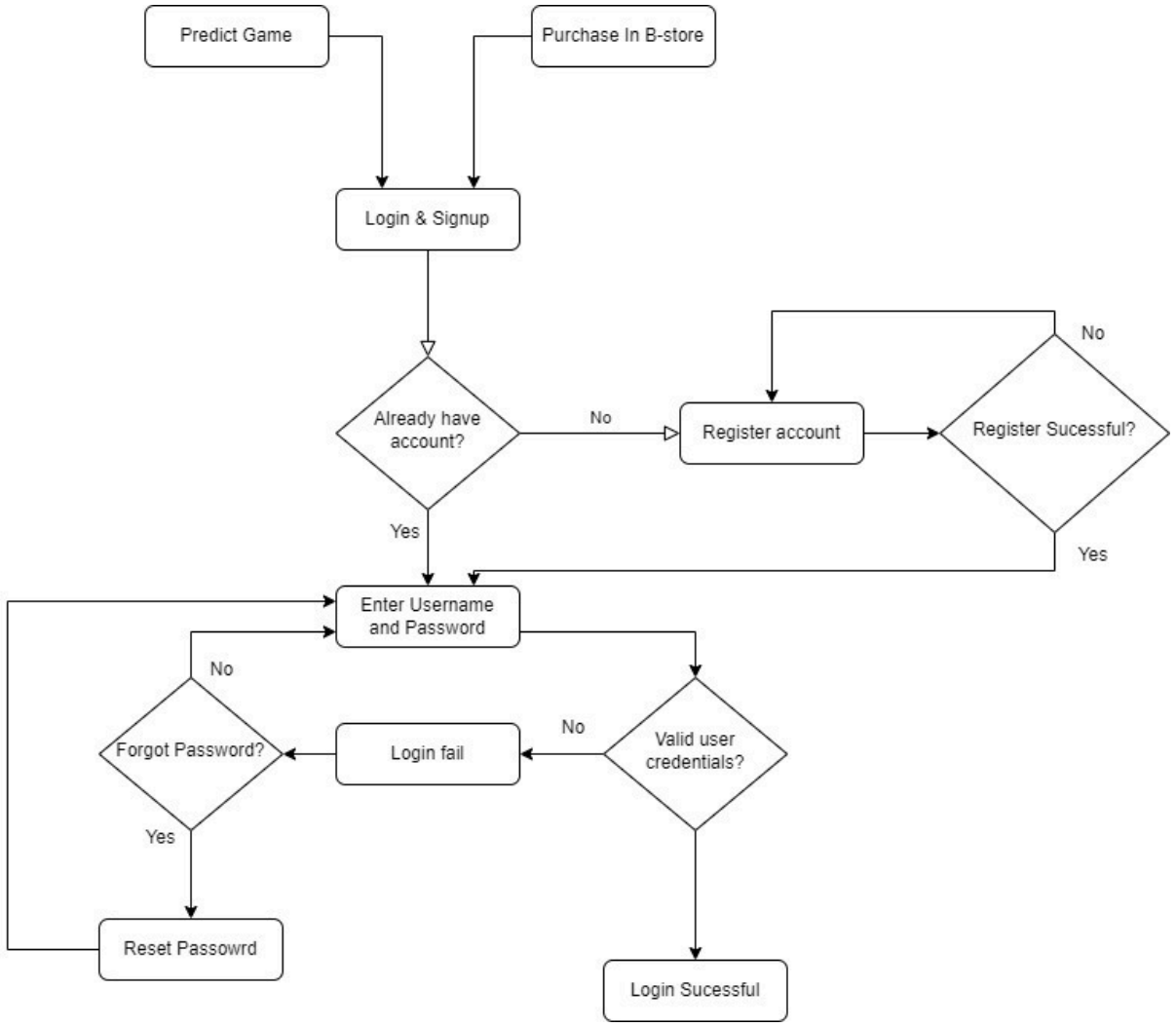
Furthermore, React Native's extensive library of pre-built components and third-party plugins accelerated the development process. We were able to integrate essential features like navigation and animations with ease, ensuring that the app was both functional and visually engaging.

For the backend, we implemented a MySQL database to store and manage a wide range of data crucial for the app's functionality, such as up-to-date player statistics, match information, and user login credentials. The database was designed to handle various types of data, ensuring efficient and secure information retrieval and storage.

We developed scripts to set up the initial database schema and seed it with essential data, such as initial player statistics and team information. This facilitated a smooth setup process and ensured the database was ready for use from the beginning. The backend API, built using Node.js and Express.js, interfaced with the MySQL database. The API endpoints handled 'GET' and 'POST' operations for various data types. For example, user creation and authentication endpoints managed registration, login, and user account management, while data retrieval endpoints allowed for fetching player statistics, match schedules, and news articles.

One of the key features of the app was the login function, which allows users to create an account and earn points through contests, which they could later redeem in the B-Store for merchandise. The following diagram illustrates the sequence of steps involved in the process of account creation and its associated actions. It outlines the user journey from the initial

registration stage through to account activation and subsequent utilization of the app's features.



In conclusion, the design of the app was crafted with thoughtful consideration of all stakeholders involved. By prioritizing scalability and maintainability for the technology team, social sharing features for the marketing team, sponsorship opportunities for sponsors, a dedicated merchandise section for the merchandise team, and real-time updates for fans, the app caters to a diverse set of needs. Through interactive prototyping and collaborative feedback sessions, we ensured that the app met the expectations of our stakeholders.

3. Outcomes

To validate the reliability and ensure the quality of the Brisbane Bullets Basketball club app, a comprehensive range of testing and quality control activities was meticulously executed using React Native, Visual Studio Code, Android simulation, and MySQL. These activities were designed to cover all aspects of the application, from individual components to complete workflows, ensuring that the app delivers a seamless experience for its users.

The process began with extensive unit testing, which is foundational in verifying that individual components function correctly in isolation. Using Visual Studio Code, developers write test cases for various pages such as the Accessories Page, Assists Leaderboard, and backend functions like authentication and data retrieval. This step ensured that each component behaved as expected, with specific focus on rendering, user interactions, and data processing. Unit tests helped catch early bugs and issues at the component level, making it easier to fix them before they could affect larger parts of the application.

Following unit testing, integration testing was performed to verify that different modules and services worked together seamlessly. This involved custom scripts and detailed manual testing processes within Visual Studio Code. Integration testing focused on the interaction between frontend components and backend services, ensuring that data was correctly exchanged, and functionalities were appropriately coordinated. For example, the integration between the user authentication service and the data management service was tested to ensure that user data was accurately retrieved and updated upon login or registration.

End-to-end (E2E) testing was conducted using the Android Emulator in Android Studio. This type of testing simulated real-world scenarios to validate complete application workflows from a user's perspective. Comprehensive test scenarios were created to mimic actual user behavior, such as signing up, logging in, making predictions on games, checking leaderboards, and purchasing accessories. E2E testing ensured that the entire user journey was smooth and free of interruptions, providing confidence that the application could handle typical user actions without errors or crashes.

Performance testing was another critical aspect of the quality control process. Custom scripts and MySQL profiling were used to assess the application's response times and load-handling capabilities under various conditions. These tests evaluated how well the app performed when handling multiple users simultaneously, ensuring that it could scale efficiently without significant performance degradation. Performance testing involved simulating high traffic scenarios to observe the app's behavior under load, identifying potential blocks, and optimizing code and database queries to enhance overall performance.

Automated testing was implemented using custom scripts in Visual Studio Code, streamlining the testing process and enabling continuous validation. Automated tests covered both unit and integration tests, allowing for frequent and consistent checks of the application's functionality. This approach helped catch issues early and maintained consistency throughout the development process. Automated testing also facilitated regression testing, which ensured that new updates and feature additions did not negatively impact existing functionality.

Regular code reviews and static analysis were integral to maintaining code quality and adherence to coding standards. Tools ChatGPT were used to perform static code analysis, identifying potential issues such as syntax errors, code style violations, and performance inefficiencies. Code reviews were conducted regularly, involving peer evaluations to ensure that the codebase remained clean, efficient, and maintainable. This collaborative process helped in identifying and rectifying potential issues before they could become problematic.

Regression testing, conducted using the Android Emulator, was crucial in ensuring the app's stability. Whenever new features were introduced or bugs were fixed, a suite of regression tests was run to verify that these changes did not disrupt existing functionality. This step was essential in maintaining the integrity of the application, ensuring that updates enhanced the app without causing unintended side effects.

Lastly, simulation testing using the Android Emulator validated the app's behaviour across different devices and screen sizes. This type of testing ensured that the app was responsive and performed consistently, regardless of the device it was running on. By testing on various Android versions and screen resolutions, the development team ensured that the app delivered a uniform experience to all users, addressing any device-specific issues that arose.

By leveraging these tools and methodologies, including React Native, Visual Studio Code, Android emulators, and MySQL, the application underwent thorough and rigorous testing and quality control. This comprehensive strategy ensured that the app was reliable, user-friendly, and high performing. Each testing phase, from unit testing to simulation testing, contributed to a robust quality assurance process that delivered a seamless and satisfying user experience, ultimately making the basketball club app a dependable and enjoyable tool for its users.

4. Group Reflection

Before collaborating with the Brisbane Bullets Basketball Club on the mobile application project, our team had no prior experience in mobile application development, nor did any of our members have a background in design. Therefore, when the project began, our first task was to learn how to design user interfaces (UI). During this process, we encountered various tools for the first time, such as Sketch, Adobe XD, and Figma. Given our lack of design experience, we were initially uncertain about what constituted good design. To overcome this challenge, we spent a significant amount of time researching resources and watching numerous instructional videos. Ultimately, we chose Figma for creating our prototypes due to its robust features that closely resemble actual mobile applications in both design and page transitions.

Despite our team's primary background in software development and data analysis, learning to use UI tools provided us with a deeper understanding of user experience. For instance, we learned how certain page designs and transitions can facilitate smoother navigation and interaction for users. This experience highlighted the importance of design principles and their impact on user satisfaction and engagement. Reflecting on this process, we realized that effective design is not just about aesthetics but also about functionality and usability. Our experience with UI design has transformed our approach to development, emphasizing the need for a user-centric mindset. We now appreciate that successful applications must balance visual appeal with practical functionality, ensuring that all users can interact with the app effortlessly. This comprehensive understanding of user experience will be a guiding principle in our future projects, as we strive to create applications that are not only aesthetically pleasing but also highly functional and accessible to a diverse user base.

Following the design phase, our team embarked on the actual development of the application. Considering the distinct development environments for iPhone (Swift) and Android (Java), we recognized that achieving compatibility would be crucial. Therefore, we decided to learn and utilize React Native for development. React Native offers the advantage of using a single codebase to develop applications for both iOS and Android platforms, thereby saving time and resources. This cross-platform approach allowed us to streamline our development process and ensure consistency across different devices, which was essential for providing a uniform user experience.

Choosing React Native also provided our team with an opportunity to learn new technologies. Concurrently, some team members were enrolled in React courses, offering a perfect chance to deepen our understanding of the differences between React and React Native. For example, React is primarily used for web development, whereas React Native is tailored for mobile app development, with different handling of components, navigation, and performance optimizations. This project allowed us to grasp the intricacies of cross-platform development and adapt to the nuances of mobile app creation.

One specific challenge we encountered was optimizing performance across different devices. Mobile apps need to be responsive and efficient, and we learned various techniques in React Native to achieve this, such as using FlatList for rendering large lists efficiently and leveraging asynchronous storage for managing data. We also delved into native module integration, which allowed us to enhance the app's functionality by incorporating device-specific features that are not readily available in React Native. Furthermore, we learned the significance of thorough testing and debugging in the development process. These practices not only improved the quality of our code but also prepared us for future projects where robust testing and state management are crucial.

Working with industry partners provided invaluable experience beyond technical achievements, particularly in communication and collaboration. Effective communication is critical, whether in small meetings, large conferences, or daily email exchanges. We designated team members to handle communications, schedule meetings, track progress, pose professional questions, and respond to industry partner needs promptly. For example, when our industry partners could not provide the necessary API access, we had to proceed with development under these constraints and communicate our limitations politely and reasonably. This required us to develop clear, concise, and respectful communication strategies to maintain a good working relationship while ensuring project progress.

Regular weekly meetings with our industry partners were pivotal. Although these meetings sometimes seemed brief, they required substantial preparation to ensure quality and effective communication. Before each meeting, we meticulously prepared agendas, outlined discussion points, and anticipated potential questions or issues that might arise. This preparation ensured that our meetings were productive and focused, allowing us to address key concerns efficiently. Being proactive rather than passive during these meetings was crucial, as it enabled us to seize opportunities for improvement and maintain a professional image.

We also implemented a feedback loop, where we would review the outcomes of each meeting, identify areas for improvement, and adjust our communication strategies accordingly. This iterative process helped us refine our approach and become more adept at managing expectations and delivering on our commitments. For instance, if a meeting revealed a misalignment in project goals, we would promptly follow up with clarifications and adjustments to our project plan, ensuring that both our team and the industry partners were on the same page. Through repeated practice, we learned to manage meeting agendas effectively and communicate efficiently with our industry partners. We developed skills in active listening, where we focused on understanding the partners' perspectives and needs, and in articulating our responses clearly and confidently. This experience taught us that beyond technical skills, the ability to communicate and collaborate effectively is equally important for the success of any project.

Teamwork has always been a fundamental factor in any project. Regardless of the maturity of the technology or the competence of the team members, a project cannot proceed smoothly without effective teamwork. Our team comprised members from diverse backgrounds, each with different expectations and standards for the project's completion. Initially, this disparity led to misalignment, with some members being passive while others took on more responsibility. Such differences hindered effective collaboration. Balancing communication with industry partners and coordination within the team was challenging. Delays from team members could impact deliverables and jeopardize the entire project. To address these issues, we established specific tasks and milestones and used group chat for communication and discussion. Despite significant challenges, such as unresponsiveness, delays, and unresolved issues among team members, we learned to support, supervise, and remind each other. Reflecting on this process, we realized the critical importance of teamwork and how to collaborate effectively in a diverse team. We learned that setting clear expectations and maintaining open lines of communication are essential for aligning team members towards common goals. This project not only enhanced our technical skills but also taught us the value of mutual support and effective communication in overcoming obstacles and achieving project success.

In conclusion, the mobile application development project with the Brisbane Bullets Basketball Club provided us with invaluable insights and experiences. From learning new design tools and technologies to mastering cross-platform development and optimizing performance, we grew both technically and professionally. The challenges of effective communication and collaboration with industry partners and within our team underscored the importance of clear communication, active listening, and teamwork. These lessons will guide our future projects, ensuring that we continue to create user-centric, functional, and visually appealing applications while maintaining strong collaborative relationships.