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# The Golf Blueprint

A Smarter Way to Play Golf - Driven by Analytics

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# Glossary

**Course Management -** The strategic decision-making process during a round of golf, including club selection, target selection, and risk assessment. Good course management involves choosing safer options when appropriate and understanding when to take calculated risks.

**Green -** The closely mown area of grass between the tee and the green, providing the most advantageous position for the next shot.

**Approach Shot -** A golf shot played toward the green, typically from a distance of 50-200 yards from the hole.

**Fairway -** The closely mown area of grass between the tee and the green, providing the most advantageous position for the next shot.

# Introduction

## Problem Statement

Golf has a significant global presence with over 42.7 million players worldwide (The R&A, 2024), making it one of the most popular sports in the world. Whether you are a professional golfer touring the world, or an amateur who plays socially on the weekends, the player base faces a common challenge: the complexity of ‘course management’ and its impact on being able to shoot a good score. Amateur players often lack structured guidance, or the knowledge required for making strategic decisions during their rounds, which I believe creates a gap in the market for The Golf Blueprint to become an innovation in amateur golfers’ improvement.

Having played golf for 13 years and achieved a handicap of 3, I have experienced firsthand the evolution from novice to skilled amateur player. My own dedication to improvement over a long span of time has provided unique insights into how course management influences performance across different skill levels. This experience has revealed a crucial observation: while technical skills are important, strategic course management is often the most important factor in whether a golfer is able to shoot a good score. Golf at all skill levels is a game of misses. Nobody can hit a ‘perfect’ shot every time, so managing where you ‘miss’ your shots is essential

The Kendleshire Golf Club, where I have been a member for four years, provides a clear example of this importance. I have gradually begun to notice subtle trends about each of the 18 holes there. For example, if a player misses the green to the left-hand side of the second hole with their approach shot, they will typically get a higher score on that hole than if they were to miss to the right-hand side. This is because the subsequent shot is generally much more difficult from the left side of the green as opposed to the right. As a result of this, I have now begun to favour missing my own approach shots to the right side of this green, which has led to me improving my average score on this hole.

However, I regularly see other golfers fail to account for this, as well as similar, but unique pitfalls depending on which hole they are playing. These dangers can occasionally be easy to identify during a round of golf, but more often than not these minute intricacies about each hole are either simply overlooked, or perhaps not understood in the first place. I believe that The Golf Blueprint would be able to visually represent ways to improve scores across all 18 holes in a way that is easy to understand and visualise for golfers of all skill levels. This would allow golfers who use The Golf Blueprint to benefit from knowing which areas of the golf course they should either try to avoid or look to aim at with their shots during their rounds in order to shoot lower scores.

## Project Aims and Objectives

The primary aim for this project is to develop a data-driven golf course management tool, that is specifically tailored to The Kendleshire Golf Club, allowing its members and others who may play there to make informed strategic decisions during their rounds of golf, allowing them to improve their scores and to greater their experience.

## Specific Objectives

1. Design and create detailed animated top-down view recreations of every hole at The Kendleshire, which will not only be used to collect the shot data from the golfers at The Kendleshire, but to also display the findings from the data, in the form of heatmaps.
2. Design and implement a system to collect and analyse shot data from golfers. This system must be very simple, and easy to use to ensure that golfers will be happy to take the time out of their day to input their data, and to ensure that the data collected is as accurate as possible.
3. Create a secure database to store golf shot data, user account information and golf course information, complying to GDPR regulations. The database will be the foundation for the resource and is essential to make it possible to provide meaningful, data-driven course management recommendations to the users.
4. Design an intuitive, and good-looking user interface, which displays to the user all the features of The Golf Blueprint. This is a very important consideration as the user interface will serve as the main point of interaction between the users and the resource’s functions and capabilities.
5. Ensure that the resource meets the needs of the users, by conducting testing with at least 20 users, and gather feedback from the users to gain an understanding of what elements of the resource they enjoy, and what could be improved.

# Methodology

## Agile Methodology

In order for this project to run smoothly, and with minimal issues as possible, it is essential that I use a software development methodology. A methodology forms a framework for planning and controlling the creation of a software project (Kute and Thorat, 2014). To accommodate for the flexibility and adaptability that developing The Golf Blueprint requires, an Agile methodology would be more appropriate. I am creating this project in my third year of university, and there could be periods of time where I am extremely busy with other academic projects, that could cause a lengthy delay to my progress. Using an agile methodology will not force me to follow fixed-length sprints, allowing for a more flexible workload to fit around my varying university workloads. My agile methodology of choice will be Kanban. Kanban requires full transparency of work and presents work items visually on a Kanban board (Radigan, 2024).

In Anderson’s work (2010), he emphasises the importance of limiting work in progress (WIP) for maintaining the quality of work while preventing overload. If I can limit myself to having only a manageable number of tasks at any given time, I will be able to complete them to a higher standard (Sjøberg, 2018). The visual nature of Kanban boards will also allow me to quickly identify any bottlenecks in the development process and address them promptly (Lei *et al.*, 2017). This visibility is particularly valuable as it will help me prioritise tasks effectively when balancing multiple simultaneous university commitments.

Another significant advantage of Kanban for this project is its focus on continuous delivery, which (Ahmad *et al.*, 2013) identify as a key benefit of the methodology. Unlike methodologies that require waiting for sprint cycles to complete, Kanban allows features to be released as soon as they are ready. This will be useful for me as it will allow me to share any updates to my project supervisor, and to potential future clients at The Kendleshire.

To implement Kanban for this project, I have set up a digital Kanban board using Jira, Atlassian's project management software (see Figure 1.1). The board is organised into three columns: To Do, In Progress, and Done. The ‘To Do’ column contains all planned features and upcoming work, prioritised based on project requirements and dependencies. The ‘In Progress’ column, limited to three tasks to prevent WIP, shows current development activities. The ‘Done’ column provides a clear record of completed features and helps track project progress. This structure is complemented by Jira's additional features such as time tracking, issue linking, and automated workflows, which enhance project visibility and control. This structure aligns with key Kanban principles of workflow visualisation and process management (Anderson, 2010). This straightforward approach ensures I maintain a clear overview of the project's status while managing it alongside other academic commitments.

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***Figure 1.1: Kanban project board***

## Risks and Mitigation Strategies

For The Golf Blueprint to be successful, it is essential to identify potential risks and develop appropriate mitigation strategies. There are various potential risks that could impact the project's success, and they must be carefully managed.

***Technical Risks***

The primary technical risk for The Golf Blueprint involves data accuracy and validation. Since the resource's ability to provide meaningful, data-driven course management insights relies entirely on user-submitted data, ensuring this data's accuracy is crucial. To mitigate this risk, multiple validation techniques will be implemented. The application will provide clear visual feedback for marking shot locations, combined with intuitive instructions for data entry. An intelligent validation system will be implemented to detect potential errors, including outlier detection to identify unusual patterns in shot data. Users will be limited to entering only two rounds of golf per calendar day to help prevent fabricated data from entering the database. Also, if a user attempts to enter an unrealistic number of shots for the same hole or records shot distances beyond normal playing capabilities, the system will challenge these entries, requesting verification before acceptance.

***User Adoption Risks***

The success of The Golf Blueprint heavily depends on user engagement and consistent data contribution. A significant risk exists that golfers at The Kendleshire might find the process of inputting shot data into The Golf Blueprint too time-consuming or complex, potentially leading to limited data collection and reduced effectiveness of the system. This risk will be addressed through careful interface design that will allow for simple and time efficient data entry. Clear user instructions will be provided for accurate shot location marking, and the overall user experience will be developed to encourage regular participation.

***Data Protection Risks***

Due to the nature of the application, The Golf Blueprint will collect and store personal information from the users as well as golf shot data. This makes having a robust data protection strategy essential. The system will implement secure user authentication to protect personal information, alongside encrypted data storage for all user information. For the database, I will be using MongoDB, which has built in security features, meaning that all of the users’ data will be completely secure.

***Project Management Risks***

There are several project management risks that need to be considered. The primary challenge lies in balancing the project development with my other academic commitments. I will mitigate this risk by utilising the features available with the Jira Kanban board that can help me keep on track with what parts of the project need to be completed at any given time. Jira has time tracking functionality, and by logging time spent on different aspects of the project, I can identify which components are taking longer than anticipated and adjust my development schedule accordingly.

***Version and Document Control Strategy***

A robust version and document control strategy is essential for maintaining the integrity and traceability of The Golf Blueprint's development. Git will serve as the primary version control system, hosted on GitHub to ensure secure and reliable code management. The repository structure will follow a clear branching strategy, with the main branch containing stable, production-ready code, and a development branch for ongoing implementation work.

For feature development, each new component will be created in a dedicated feature branch, following the naming convention 'feature/description-of-change'. For example, when developing the shot tracking interface, the branch would be named 'feature/shot-tracking-implementation'. This structured approach ensures that new features can be developed and tested without risking the stability of the main codebase.

To maintain code quality and documentation standards, all code changes will follow a strict commit message convention. Each commit message will begin with a type identifier (style, test etc.) followed by a concise description of the change. For instance, 'test(heatmap): implement shot density visualisation' or 'test(validation): correct shot distance calculation'. This systematic approach to commit messages makes it easier to track the project's evolution and understand the purpose of each change.

Document control extends beyond code management. All project documentation, including requirements specifications, design documents, and user guides, will be stored in a dedicated 'docs' directory within the repository. This ensures that documentation remains closely coupled with the code it describes and benefits from the same version control mechanisms. The documentation will follow a clear naming convention, allowing for easy chronological tracking of document versions. Regular backups of both code and documentation will be maintained through GitHub's cloud storage, protecting against potential data loss.

# Project Research

This project utilises both primary and secondary research techniques to ensure that I developed an enhanced understanding of what I am looking to achieve, and to validate my proposed solution to the problem. The first part of the research phase of my project was secondary research. An important goal of mine for the secondary research was to not only explore the existing golf analytics technology that exists, but to also try and find a gap in the current market that The Golf Blueprint can fill. Before I began the project, I had previous knowledge that there was a lot of literature surrounding the introduction of and the usefulness of data analytics within the modern game of golf.

To ensure the quality and reliability of the research that I found and used, I searched the UWE Library Database, and Google Scholar. Key search terms included: “golf analytics technology”, “importance of course management”, “global participation in golf” and “data used in professional golf”. This secondary research was able to provide me with an abundance of useful information, which all directed related to my project.

## Secondary Research

The game of golf at all levels is continuously evolving, with technology and data analytics playing an increasingly crucial role in player development and performance optimisation. The PGA Tour's implementation of ShotLink technology in 2003 marked a significant turning point for golf, by collecting detailed data on every shot played in professional tournaments (Broadie, 2014). Broadie demonstrates how data analytics has revolutionised the understanding of golf performance, introducing new metrics such as "strokes gained" which compares different facets of a players’ golf game to other players (Plummer, 2024). These metrics have become standard tools for not only professional player analysis, but are also useful for weighing the value of different strengths, such as the power of exceptional ball-striking versus superior short game skills (Ehrlich and Kamimoto, 2024).

According to research published in the International Journal of Sports Science & Coaching, the integration of launch monitors and ball tracking technology has fundamentally changed how golfers practice and compete (Betzler *et al.*, 2012). Professional golfers utilise these resources frequently to analyse their own performance and arrange their practice schedule around their own weaknesses to improve, and try to gain an edge on their competitors.

Course management has become a very big part of the modern professional game, and is something that the world’s top players always look to when trying to improve (MacKenzie, 2023). Professional golfers will also always without fail complete multiple ‘practice rounds’ before a tournament. During these practice rounds they identify which areas of the course they must avoid, and which areas of the course they should aim to utilise to benefit their scores, and in turn results (Stenzel, 2023). Understanding effective course management can help any golfer save some strokes every time that they play (Turner, 2023).

Amateur golfers such as those who regularly play at the Kendleshire can often overlook course management and its importance. The Golf Blueprint will be able to provide amateur golfers an easy to use, and insightful way to understand and put into practice the benefits of course management in their golf game, specifically tailored to their home golf course.

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(TO BE INSERTED LATER)

The Golf Blueprint differentiates itself by focusing specifically on course management at The Kendleshire Golf Club, utilising crowd-sourced data to create a comprehensive understanding of each hole's strategic challenges. Unlike generic golf GPS apps that simply provide distances, or personal tracking systems that focus on individual performance metrics, this project aims to capture and visualise the collective experience of players at The Kendleshire. This local focus allows for the identification of specific course management patterns that generic golf analytics solutions cannot provide.

Following on from my secondary research, I conducted primary research in the form of a Qualtrics survey, which I distributed to members of The Kendleshire Golf Club. This primary research was essential (quote) as although secondary research provided valuable insights into current golf analytics technology, I needed to capture the specific needs and preferences of the end users of the resource. The survey also allowed me to gain a better understanding of current golfers’ mindset and approach towards course management, further validating the necessity for my resource.

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