Task 1: Analysing the Problem and Designing a Solution

Riget Zoo Adventures Digital Solution

Activity A - Problem Analysis Document

T Level Digital Production, Design and Development

Occupational Specialism Assessment - March 2024

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1. Introduction

1.1 Document Purpose

The purpose of this document is to analyse the problem presented by Riget Zoo Adventures (RZA), research potential digital solutions, identify the functional and non-functional requirements, and propose a compliant solution that meets both the client's business needs and the expectations of their diverse user base. This analysis will form the foundation for the design and development phases of the project.

1.2 Client Overview and Problem Statement

Riget Zoo Adventures is a local attraction that offers a safari-style wildlife zoo, an on-site hotel, and educational visit programmes. Currently, the client lacks an integrated digital solution to manage customer interactions, bookings, and educational materials. They require a comprehensive digital platform that will allow customers to access information about attractions and facilities, make reservations for zoo tickets and hotel stays, and access educational resources for school visits. The client has identified through market research that customers want account registration functionality, accessibility features to support users with different needs, and a loyalty and reward scheme to encourage repeat visits.

1.3 Analysis Objectives

1. To research and evaluate existing digital solutions within the tourism and leisure sector to identify best practices and potential features for the RZA platform.
2. To identify emerging technologies that could enhance the user experience and provide competitive advantages for RZA.
3. To define clear functional and non-functional requirements that address both client needs and user expectations.
4. To ensure the proposed solution complies with relevant legal requirements, industry regulations, and professional standards.

2. Analysis of Existing Solutions

2.1 Importance of Reviewing Existing Solutions

Reviewing existing digital solutions in the tourism and leisure sector is crucial for several reasons. It allows us to understand what features users expect from similar platforms, identify successful design patterns and user interface conventions, learn from the mistakes and limitations of existing solutions, and benchmark our proposed solution against industry standards. By analysing competitors, we can ensure that our solution for RZA not only meets basic requirements but also provides innovative features that give them a competitive edge.

2.2 Selected Solutions for Analysis

I have selected three well-established digital platforms from attractions similar to RZA for analysis: Chester Zoo, Longleat Safari Park, and Chessington World of Adventures. These were chosen because they offer similar services (zoo

experiences, hotels, educational programmes) and cater to comparable target audiences.

2.2.1 Chester Zoo

Chester Zoo's website and booking platform is one of the most comprehensive in the UK zoo sector.

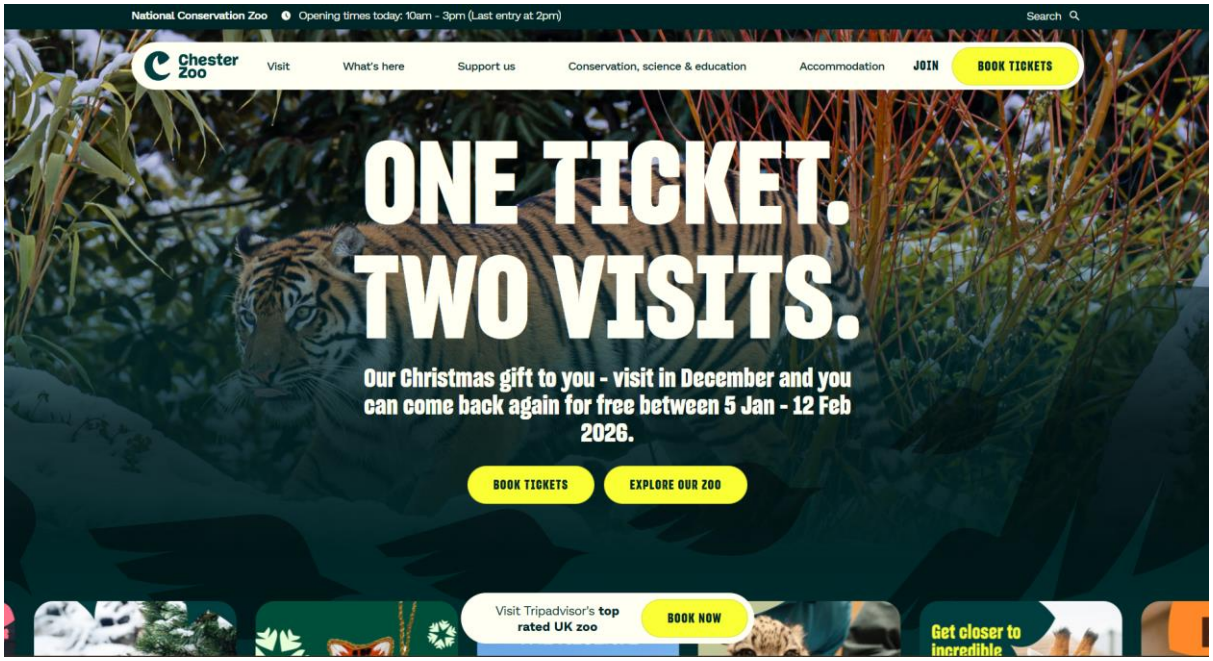

Figure 2.1: Chester Zoo Website Homepage

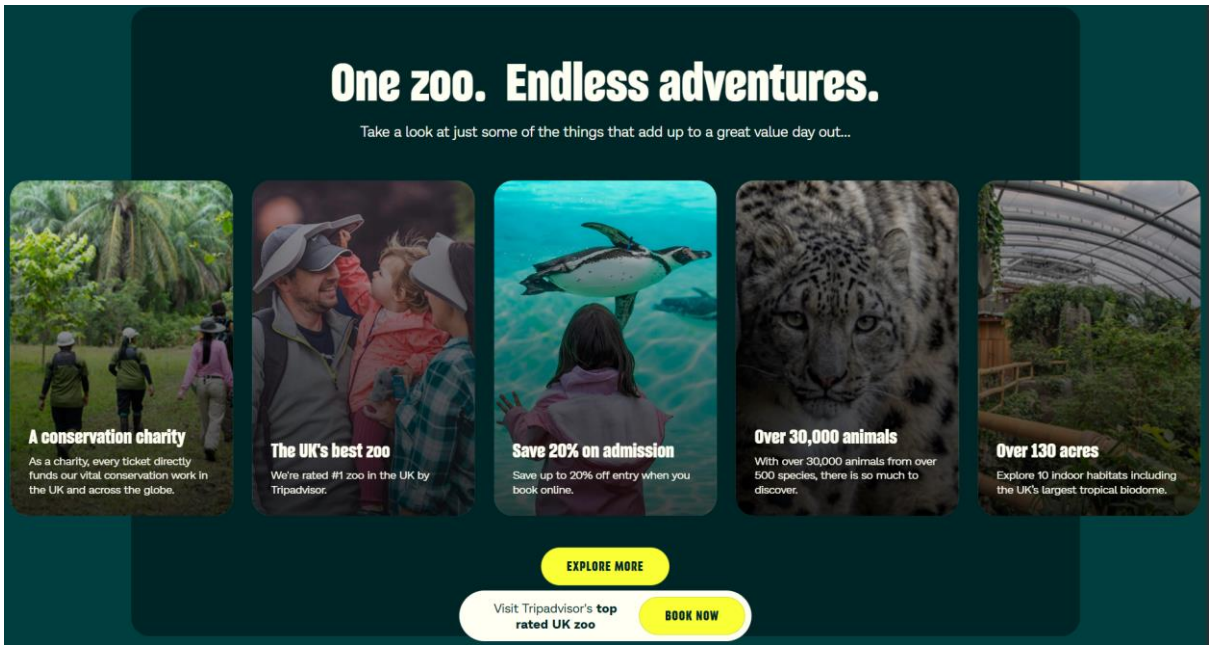

Figure 2.2: Chester Zoo Website Homepage

Strengths	Weaknesses	Opportunities
• Clean, modern interface • Excellent mobile responsiveness • Interactive zoo map feature • Strong educational resources	• Booking requires multiple steps • No integrated hotel booking • Limited accessibility options • No AR/VR features	• AI chatbot for queries • Personalised recommendations • Virtual tour capabilities • Enhanced loyalty programme

Table 2.1: Chester Zoo SWOT Analysis

2.2.2 Longleat Safari Park

Longleat offers both safari experiences and an on-site hotel, making it particularly relevant to RZA's requirements.

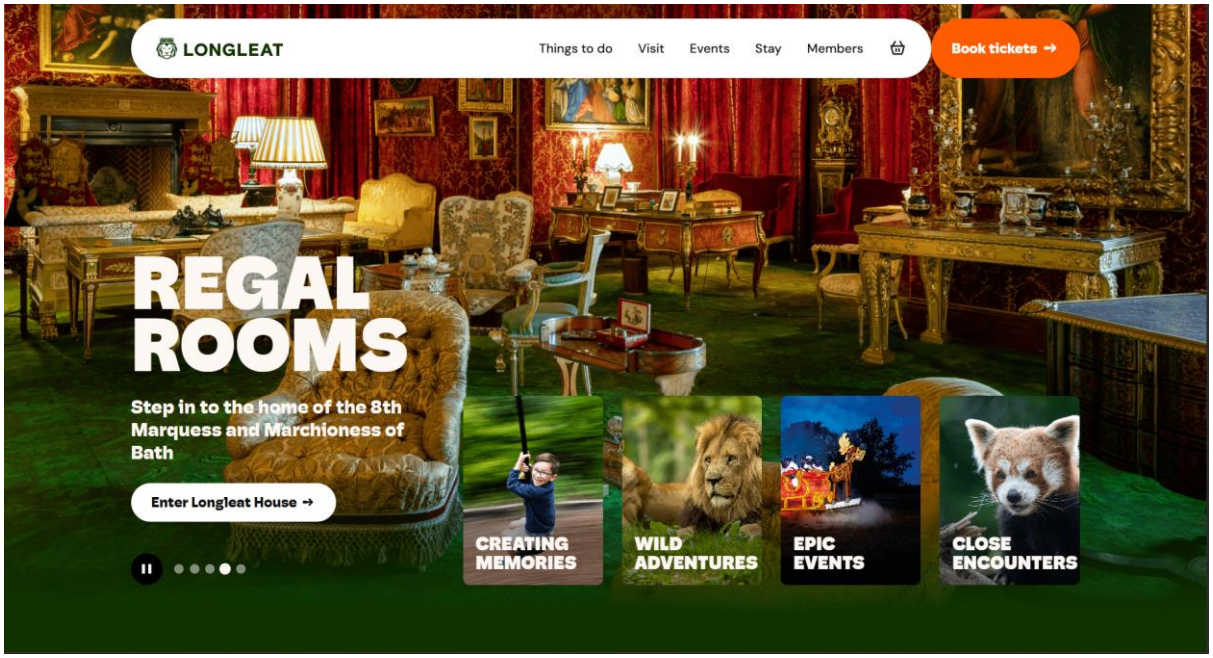

Figure 2.2: Longleat Safari Park Website

Strengths	Weaknesses	Opportunities
• Integrated hotel booking • Package deals available • Real-time availability • Good visual design	• Website feels cluttered • Educational section weak • No loyalty scheme • Mobile app lacks features	• Gamification features • Streamlined interface • Better educational resources • Social media integration

Table 2.2: Longleat Safari Park SWOT Analysis

2.2.3 Chessington World of Adventures

Chessington combines theme park attractions with a zoo and hotel, offering insights into managing multiple attraction types.

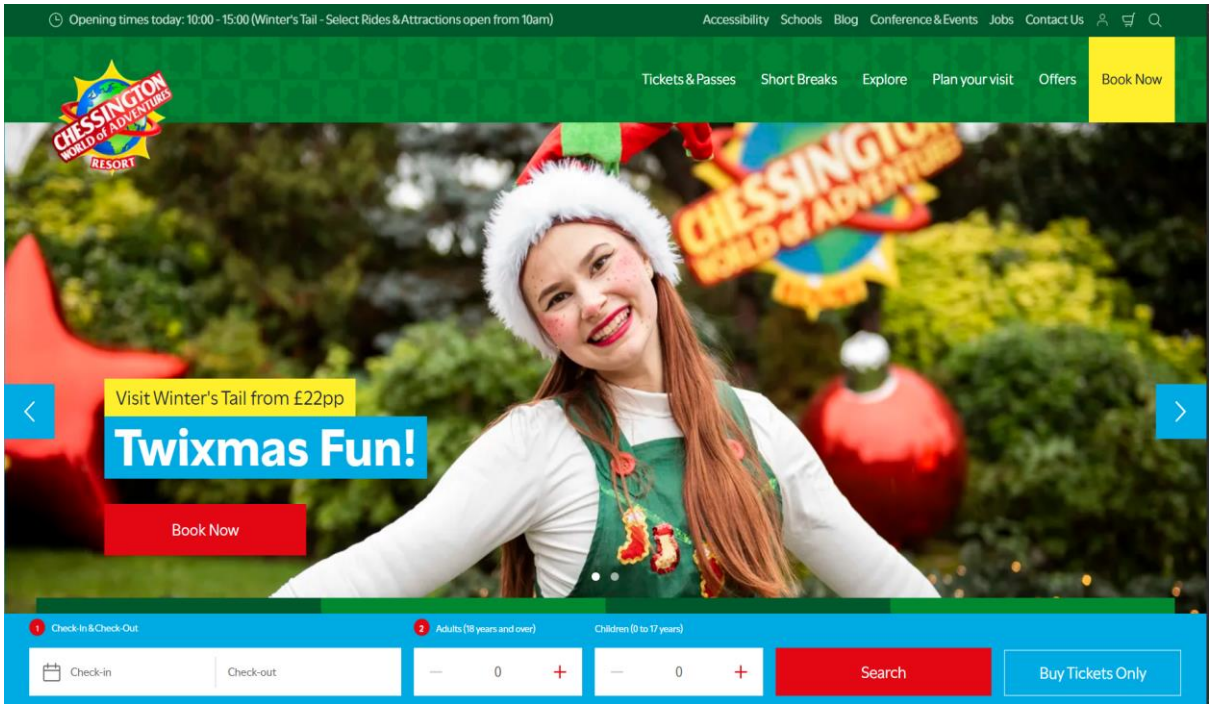

Figure 2.3: Chessington World of Adventures Website

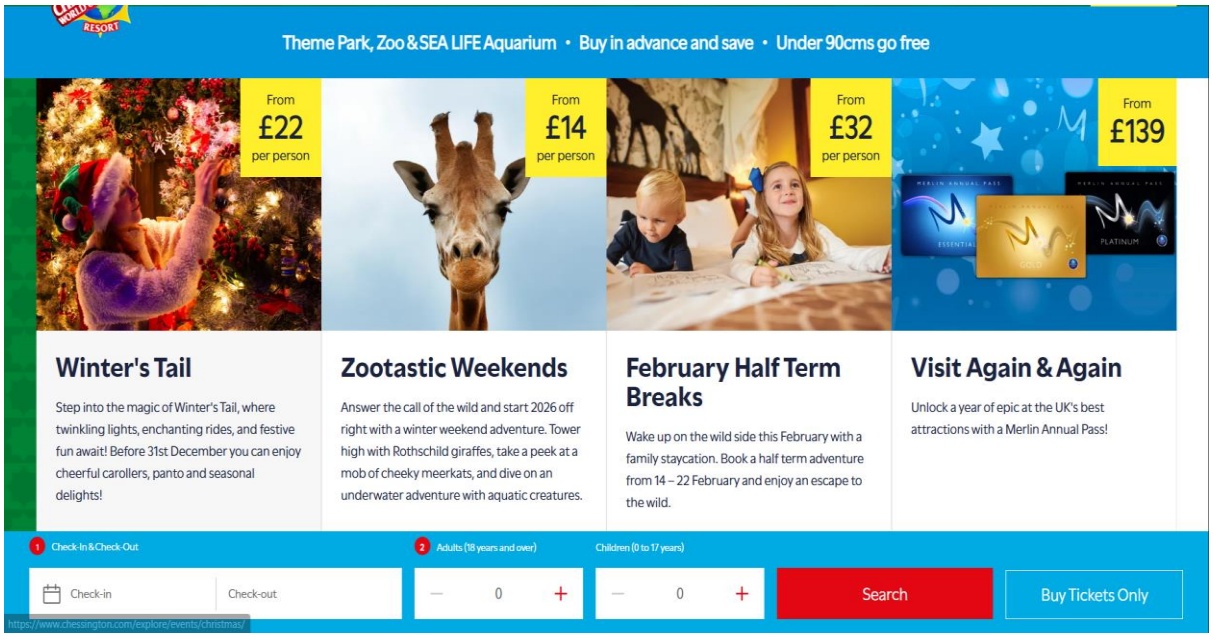

Figure 2.3: Chessington World of Adventures Website

Strengths	Weaknesses	Opportunities
• Annual pass with benefits • Mobile app with queue times • Good accessibility info • Easy package customisation	• Very commercial feel • Minimal educational content • Heavy focus on upselling • Complex pricing structure	• Better educational integration • Transparent pricing • Conservation messaging • Personalised experiences

Table 2.3: Chessington SWOT Analysis

2.3 Gap Analysis - Why Existing Solutions Don't Fit

While each of the analysed solutions offers valuable features, none perfectly meets RZA's specific requirements. Chester Zoo lacks an integrated hotel booking capability, which is essential for RZA's business model. Longleat, whilst offering hotel integration, has an underdeveloped educational section and no loyalty scheme - both key requirements from RZA's market research. Chessington's commercial approach prioritises upselling over educational value, which conflicts with RZA's mission to support school visits. The proposed solution for RZA will need to combine the best elements of these platforms whilst addressing their weaknesses and incorporating innovative technologies.

3. Emerging Technologies

3.1 What Are Emerging Technologies?

Emerging technologies are new or developing technologies that have the potential to significantly alter business operations, industries, or society. In the context of digital solutions, these technologies offer innovative ways to enhance user experience, streamline processes, and provide competitive advantages. For RZA's digital solution, incorporating relevant emerging technologies can help attract more visitors, improve customer satisfaction, and support educational objectives.

3.2 Selected Emerging Technologies

3.2.1 AI-Powered Chatbot and Recommendation Engine

How it will be used: The RZA platform will feature an AI-powered chatbot that can answer customer queries 24/7, assist with booking processes, and provide personalised recommendations based on user preferences and past behaviour. The recommendation engine will analyse user data to suggest relevant attractions, educational programmes, and package deals.

Why it is beneficial: AI chatbots reduce the workload on customer service staff whilst providing instant responses to common questions. The recommendation engine increases customer engagement and can boost revenue by suggesting relevant add-ons or experiences. For educational visits, AI can help teachers find appropriate resources and programmes based on curriculum requirements.

3.2.2 Cloud Computing (AWS/Azure)

How it will be used: The entire RZA platform will be hosted on cloud infrastructure, likely Amazon Web Services (AWS) or Microsoft Azure. This includes web servers, databases, file storage for educational materials, and content delivery networks (CDNs) for fast loading of images and videos.

Why it is beneficial: Cloud computing provides scalability, allowing the system to automatically handle increased traffic during school holidays or special events without manual intervention. It offers high availability with built-in redundancy, ensuring the booking system remains operational. Cost-effectiveness is achieved through pay-as-you-go pricing, meaning RZA only pays for resources actually used.

3.2.3 Augmented Reality (AR) Experiences

How it will be used: The mobile application will include AR features that allow visitors to point their phones at exhibits and see additional information overlaid on the screen, such as animal facts, conservation status, and habitat information. For educational visits, AR can bring worksheets to life by animating diagrams.

Why it is beneficial: AR enhances the visitor experience by making learning interactive and engaging, particularly for younger visitors and school groups. It provides educational value that differentiates RZA from competitors and supports their mission to educate visitors about wildlife conservation. AR can also be used for wayfinding, helping visitors navigate the safari park.

4. Business Context

4.1 Client Overview

Riget Zoo Adventures (RZA) is a local attraction operating in the tourism and leisure sector. The organisation offers three main services: a safari-style wildlife zoo where visitors can observe animals in naturalistic environments, an on-site hotel providing overnight accommodation for guests, and educational visit programmes designed for schools and educational institutions. RZA positions itself as both an entertainment destination and an educational resource, emphasising wildlife conservation and learning opportunities.

4.2 Primary Business Goals

1. **Increase online bookings** - Currently, a significant portion of bookings is made by phone, which is resource-intensive. Moving customers to online booking will reduce operational costs and improve efficiency.
2. **Achieve an increase in educational visit bookings** - Schools represent a key market segment. Improved online resources and easy booking processes will attract more educational groups.
3. **Establish registered loyalty scheme members** - A loyalty programme will encourage repeat visits and build a customer database for marketing purposes.
4. **Improve customer satisfaction ratings** - Enhanced digital services should lead to improved customer experience and higher satisfaction ratings.

4.3 User Types

User Type	Description	Key Needs
General Visitors	Families, couples, and individuals visiting for leisure purposes	Easy ticket booking, attraction information, clear pricing, and mobile access
Hotel Guests	Visitors staying overnight at the on-site hotel	Room availability, package deals, and combined zoo and hotel booking
Teachers/Educators	School staff organising educational visits	Educational resources, curriculum links, group booking tools, and risk assessment support
Users with Accessibility Needs	Visitors with visual, hearing, motor, or cognitive impairments	Screen reader compatibility, keyboard navigation, clear layouts, and adjustable text
Administrators	RZA staff managing bookings, content, and customer accounts	Dashboard access, booking management, content editing, and reporting tools

Table 4.1: User Types and Their Needs

4.4 Project Constraints

1. **Budget:** The project has a fixed budget that must cover development, testing, deployment, and initial maintenance. This requires prioritisation of features and efficient use of resources.
2. **Timeline:** The solution should be ready for launch before the next peak season (spring/summer) to maximise business impact.
3. **Compliance Requirements:** The solution must comply with GDPR for data protection, the Equality Act 2010 for accessibility, PCI-DSS for payment processing, and industry-specific tourism regulations.
4. **Technical Infrastructure:** The solution must integrate with RZA's existing systems.

5. Requirements Analysis

5.1 Functional Requirements

Functional requirements define what the system must do - the specific features and functions that the digital solution needs to provide.

ID	Requirement	Description
FR01	User Registration	Users can create accounts with email/password, with options for social media login and two-factor authentication.
FR02	Zoo Ticket Booking	Users can select dates, ticket types (adult, child, concession), quantity, and complete secure payment with real-time availability.
FR03	Hotel Room Booking	Users can check room availability, view room types and amenities, select dates, and book accommodation with package deals.
FR04	Educational Resources	Teachers can access downloadable worksheets, lesson plans, and pre-visit materials organised by key stage and curriculum subject.
FR05	Booking Management	Users can view, modify, and cancel their bookings through their account dashboard. Email confirmations sent automatically.
FR06	Loyalty Programme	Points-based system where users earn rewards for bookings and visits, redeemable for discounts, merchandise, or experiences.
FR07	Interactive Map	Digital map showing all attractions, facilities, and animal locations. Users can search for specific animals or filter by area.
FR08	AI Chatbot	Automated customer support available 24/7 to answer common queries, assist with bookings, and provide park information.

Table 5.1: Functional Requirements

5.2 Non-Functional Requirements

Non-functional requirements define how well the system must perform - the quality attributes and performance standards the solution must meet.

ID	Requirement	Measurable Criteria
NFR01	Performance	Page load times under 3 seconds. System must support 500 concurrent users without degradation.
NFR02	Availability	99.5% uptime guaranteed. Maximum planned downtime of 4 hours per month for maintenance.
NFR03	Security	SSL/TLS encryption for all data transmission. PCI-DSS compliance for payments. Data encrypted at rest using AES-256.
NFR04	Accessibility	WCAG 2.1 AA compliance. Full keyboard navigation. Screen reader compatible. Minimum contrast ratio of 4.5:1.

ID	Requirement	Measurable Criteria
NFR05	Usability	Users can complete booking in under 5 minutes. System Usability Scale (SUS) score of 70 or above.
NFR06	Scalability	Architecture supports horizontal scaling. System can handle 200% normal traffic during peak periods.

Table 5.2: Non-Functional Requirements

5.3 Key Performance Indicators (KPIs)

The following KPIs will measure the success of the digital solution and are directly linked to the business goals outlined in Section 4.2.

KPI	Target	Related Business Goal
Online Booking Conversion Rate	40% increase within 12 months	Increase online bookings
Educational Visit Bookings	25% increase year-on-year	Grow educational market
Loyalty Scheme Registrations	10,000 members within 18 months	Build customer loyalty
Customer Satisfaction Score	4.5/5 average rating	Improve customer experience

Table 5.3: Key Performance Indicators

6. User Acceptance Criteria

User acceptance criteria define the measurable, testable conditions that must be met for the client to accept the delivered solution. These criteria are directly linked to the functional and non-functional requirements.

Criterion ID	Description	Acceptance Test
UAC01	Users can register and create accounts using email or social media login	Test user creates account with email. Test user logs in with Google account successfully.
UAC02	Users can book zoo tickets with date selection and payment	Complete booking from selection to confirmation in under 5 minutes. Email received within 2 minutes.
UAC03	Users can book hotel rooms with availability check	Room availability accurately reflects actual availability. Booking confirmation shows correct details.
UAC04	Educational resources accessible and organised by key stage	Teacher can filter resources by Key Stage 2. Downloads complete successfully.
UAC05	Website meets WCAG 2.1 AA accessibility standards	Pass automated accessibility audit (Lighthouse). Screen reader navigates all pages.
UAC06	Loyalty points correctly calculated and displayed	Points awarded match stated formula. Points balance updates within 24 hours.

Criterion ID	Description	Acceptance Test
UAC07	System performs within specified parameters	Page load times under 3 seconds. Performance maintained with 500 concurrent users.

Table 6.1: User Acceptance Criteria

7. Proposed Solution Overview

7.1 Problem Decomposition

Problem decomposition involves breaking down a complex problem into smaller, more manageable components. This approach is fundamental to software development as it makes the problem easier to understand, allows different components to be developed and tested independently, helps identify dependencies between different parts of the system, and enables more accurate estimation of development effort.

Main System Components

1. **Front-End Web Application:** The user-facing website that customers interact with. Includes the booking interface, information pages, educational resources, and account management.
2. **Back-End API Services:** Server-side services that handle business logic, data processing, and communication between components. Includes authentication, booking management, and payment processing.
3. **Database Layer:** Stores all system data, including user accounts, bookings, content, and loyalty programme information.
4. **Admin Dashboard:** Separate interface for RZA staff to manage bookings, update content, and view reports.
5. **AI/ML Services:** Handles chatbot functionality and recommendation engine processing.
6. **Integration Layer:** Connects with external systems, including payment gateways, email services, and RZA's existing hotel management software.

Software Development Methodology

The project will follow an Agile methodology, specifically Scrum, with two-week sprints. This approach is suitable because requirements may evolve based on client feedback during development, regular deliverables allow the client to see progress and provide input, the iterative nature allows for flexibility in prioritising features, and testing is integrated throughout development rather than left until the end.

7.2 Technical Stack

Layer	Technology	Justification
Front-End	React.js with TypeScript	Widely adopted with excellent community support. TypeScript adds type safety. Component-based architecture enables reusable UI elements.

Layer	Technology	Justification
Front-End	Flask with Jinja2 Templates	Server-side rendering using Flask's built-in templating engine. Enables consistent Python development across the entire application with no JavaScript build tooling required.
Back-End	Python with Flask	Lightweight and flexible microframework. Simple routing and request handling. Extensive ecosystem via pip and straightforward integration with Python AI/ML libraries.
Database	SQLite	Serverless, zero-configuration database ideal for small to medium workloads. Single-file storage simplifies deployment. ACID-compliant for transaction reliability.
Caching	Flask-Caching with SimpleCache	Built-in caching extension for Flask. Improves response times for frequently accessed data. Can use filesystem or memory-based caching without external dependencies.
AI Services	Python with TensorFlow	Python is the industry standard for AI/ML development. TensorFlow provides robust frameworks for chatbot and recommendations. Seamless integration with Flask backend.

Table 7.1: Technical Stack

7.3 Hosting and Security

Hosting Approach

The solution will be hosted on Amazon Web Services (AWS) using a combination of services. EC2 instances will host the application servers, with Auto Scaling groups to handle variable traffic. RDS (Relational Database Service) will host the SQLite database with automated backups. S3 will store static assets and educational resource files. CloudFront CDN will ensure fast content delivery across the UK.

Security Measures

- **Data Encryption:** All data transmitted using TLS 1.3. Data at rest encrypted using AES-256 encryption.
- **Access Control:** Role-based access control (RBAC) for admin functions. Multi-factor authentication available.
- **Payment Security:** Payment processing handled by Stripe, a PCI-DSS Level 1 certified provider.
- **Monitoring:** AWS CloudWatch for system monitoring. Regular penetration testing.

7.4 Emerging Technology Integration

- **AI Chatbot:** Integrated as a floating widget on all pages. Natural language processing handles customer queries.

- **Cloud Computing:** AWS services form the backbone of the entire infrastructure. Auto-scaling ensures performance during peak periods.
- **AR Features:** Mobile-first AR experience using WebXR standards. Triggered by scanning QR codes at exhibits.

8. Legal and Regulatory Compliance

8.1 What is Legal and Regulatory Compliance?

Legal and regulatory compliance refers to the process of adhering to laws, regulations, guidelines, and specifications relevant to business operations and software development. For RZA's digital solution, compliance ensures the protection of user data, fair access for all users, secure handling of financial transactions, and adherence to industry-specific requirements in the tourism sector.

8.2 Compliance Mapping

Law/Regulation	Requirement	How It Will Be Addressed
UK GDPR / Data Protection Act 2018	Personal data must be processed lawfully, fairly, and transparently. Users have rights to access, rectify, and delete data.	Clear privacy policy. Consent mechanisms. User account settings to manage data. Data encryption. Privacy impact assessments.
Equality Act 2010	Services must be accessible to people with disabilities. Reasonable adjustments must be made.	WCAG 2.1 AA compliance. Screen reader compatibility. Keyboard navigation. Adjustable text sizes. High contrast mode.
PCI-DSS	Payment card data must be handled securely with strict requirements for storage and transmission.	Use of PCI-compliant payment provider (Stripe). No card details stored on RZA servers. All payment pages served over HTTPS.
Consumer Rights Act 2015	Digital content must be of satisfactory quality, fit for purpose, and as described.	Clear booking terms and conditions. Transparent pricing with no hidden fees. Clear cancellation policy.
Cookie Law (PECR)	Users must be informed about cookies and give consent for non-essential cookies.	Cookie consent banner on first visit. Clear explanation of cookie purposes. Option to accept/reject non-essential cookies.

Table 8.1: Legal and Regulatory Compliance Mapping

9. Professional and Ethical Standards

9.1 What Are Professional and Ethical Standards?

Professional and ethical standards are guidelines that govern the conduct of individuals and organisations in a particular profession. In software development, these standards ensure that practitioners act with integrity, maintain competence, and consider the impact of their work on users and society.

9.2 BCS Code of Conduct

The BCS (British Computer Society) Code of Conduct provides a framework for ethical behaviour in IT. The following key principles will guide the development of the RZA solution:

9.2.1 Public Interest

Principle: You shall have due regard for public health, privacy, security and wellbeing of others and the environment.

Application: The solution will prioritise user safety by ensuring secure handling of personal and financial data. Accessibility features will ensure the platform is usable by people with disabilities. We will not implement manipulative design patterns (dark patterns) that could harm users.

9.2.2 Professional Competence and Integrity

Principle: You shall only undertake to do work or provide a service that is within your professional competence.

Application: The project scope has been carefully defined to match the development team's capabilities. Where specialist skills are required, we will use established third-party services. Regular code reviews and testing will ensure quality.

9.2.3 Duty to Relevant Authority

Principle: You shall carry out your professional responsibilities with due care and diligence.

Application: We will follow RZA's requirements whilst providing professional advice where needed. All legal and regulatory requirements will be met. Regular progress reports will keep the client informed.

9.2.4 Duty to the Profession

Principle: You shall accept your personal duty to uphold the reputation of the profession.

Application: The project will follow industry best practices including proper documentation, clean code practices, and comprehensive testing. All third-party code and resources will be properly licensed and attributed.

10. Risk Assessment and Mitigation

10.1 What is Risk Assessment?

Risk assessment is the process of identifying potential problems that could negatively impact a project, evaluating the likelihood and severity of these risks, and developing strategies to mitigate or manage them. Effective risk management is crucial for project success as it allows teams to proactively address issues before they become major problems.

10.2 Risk Assessment Matrix

Risk Description	Impact	Likelihood	Mitigation Strategy
Security Breach / Data Leak *(Technical)*	High	Medium	Implement security best practices. Regular penetration testing. Use certified third-party services for payments. Encrypt all sensitive data.
Budget Overrun *(Project Management)*	High	Medium	Detailed upfront estimation. Fixed-price contract for core features. Contingency buffer of 15%. Regular budget reviews.
Timeline Delays *(Project Management)*	Medium	High	Agile methodology with regular deliverables. Prioritised feature backlog allowing MVP launch. Buffer time built into schedule.
Scope Creep *(Project Management)*	Medium	High	Clearly defined requirements document signed off by client. Formal change request process. Impact assessment for all proposed changes.
Integration Issues *(Technical)*	Medium	Medium	Early technical investigation of existing systems. Prototype integration early in development. Regular testing with real system connections.
Low User Adoption *(Business)*	Medium	Medium	User testing throughout development. Marketing campaign for launch. Staff training. Incentives for online booking. Easy-to-use interface.

Table 10.1: Risk Assessment Matrix

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