



CAPSTONE PROJECT 2
Final Year Project Report

Enhancing Soft Skill Development in Higher Education Institutions through Gamified Strategies

by

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Semester: September 2023

Date: 7 December, 2023

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Abstract

This research explores the intersection of higher education and career readiness, acknowledging the shifting landscape where employers increasingly prioritize soft skills alongside conventional hard skills. The study identifies a lack of motivation among higher education students to actively participate in extracurricular activities for soft skill development, resulting in a deficiency of essential skills required by employers and a gap in career readiness. To address this, the research proposes the incorporation of gamification strategies and elements to impact both extrinsic and intrinsic motivation, thereby enhancing user engagement in extracurricular and soft skill development. The project's objectives encompass the identification of gamification elements, the development of a gamified prototype, and the evaluation of its impact on soft skill development. The methodology involves systematic literature studies to comprehend essential soft skill development, motivation factors in extracurricular activities, career readiness, gamification strategies and elements, and their impact on motivation. The system is designed and implemented using selected development stacks and tools, with evaluation conducted using the Intrinsic Motivation Inventory (IMI) and User Motivation Inventory (UMI) from Self-Determination Theory. The results indicate an overall positive perception of both intrinsic and extrinsic motivation among users interacting with the gamified system. The study sets the stage for future research to further establish the benefits of gamification elements in impacting user motivation.

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Chapter 1

Introduction

1.1 Overview of Project

In the contemporary job market, the demand extends beyond academic performance and technical proficiency to encompass essential soft skills such as adaptability, effective communication, and teamwork. Despite this increasing demand, recent graduates exhibit a noticeable deficiency in these crucial skills, as reflected in the 4.1% unemployment rate and the significant proportion of underemployed graduates in Malaysia. This research, recognizing the untapped potential of extracurricular activities for soft skill enhancement, strategically introduces gamification as an innovative approach to motivate students and bridge the existing gap in their skill set. By integrating game elements into non-game contexts, the project aims to create interactive and rewarding learning experiences that foster a sense of achievement and competition among university students. The overarching objective is to synergize academic and non-academic skill development, ensuring that students are not only equipped with theoretical knowledge but also possess the practical acumen demanded by the complexities of the modern workplace.

To achieve this, the project outlines three key objectives. Firstly, it seeks to identify the elements of gamification and their correlation with motivational factors and soft skills development, particularly within the context of career readiness. Secondly, the project aims to develop a prototype of a gamified personal development system specifically tailored for higher education

students. Thirdly, to evaluate the impact of gamification strategies on student's motivation using the proposed system. The project aspires to inspire university students to actively engage in various extracurricular activities on campus. By addressing the specific gaps in the current educational scenario, notably the issues of insufficient motivation for extracurricular involvement and the lack of essential soft skills and work readiness among students, the proposed system aims to have a direct and positive impact on individuals at a crucial stage in their higher education, enhancing their overall development and preparing them for future professional challenges.

1.2 Project Background

Education plays a pivotal role in shaping an individual's knowledge, fostering critical thinking, practical skills, and character development. While historically, the focus has been on reading and writing skills, the contemporary job market demands more than just technical proficiency, extending beyond academic performance (Chapman et al., 2023). Employers now seek versatile candidates who excel intellectually and embody qualities that highlight the significance of soft skills such as adaptability and an understanding of diverse perspectives in determining employability (Kanar & Bouckenooghe, 2021). Despite the ongoing emphasis on academic success, the apparent deficiency in soft skills among recent graduates is increasingly evident.

Recognized as a key avenue for developing these crucial soft skills, extracurricular activities (Mefteh, 2021) face the challenge of motivating students to actively engage in such activities (Huffman et al., 2019). Within the field of education, gamification emerges as an innovative approach to fostering student engagement and enhancing soft skills (Wael Abbass Hafez et al., 2023). This strategy involves incorporating game elements into non-game contexts, thereby creating interactive and rewarding learning experiences (Toda et al., 2019c). The immersive nature

of gamification is particularly highlighted for its potential to bridge the gap in soft skill development, cultivating essential attributes such as teamwork, leadership, and effective communication.

1.3 Problem Statement

The current job market demands a diverse skill set, placing importance not just on technical proficiency but also on essential soft skills crucial for effective teamwork and adaptability. However, Malaysia's 2021 unemployment statistics reveal a persistent gap, with 4.1% unemployment among graduates and 33.9% facing skill-related underemployment indicating that nearly one-third of employed graduates were in roles that did not align with their qualifications and skills (Graduates Statistics, 2021). Despite the recognized role of extracurricular activities in cultivating these skills, there is a notable lack of motivation among higher education students to actively participate (Egorova & Ruiz, 2021). This lack of motivation contributes to a deficiency in soft skills, adversely impacting graduates' readiness for the complexities of the modern workplace (Hirudayaraj et al., 2021).

1.4 Project Objective

The project aims to synergize academic and non-academic skill development, fostering a generation of students equipped not only with theoretical knowledge but also with the practical acumen and adaptability demanded by the contemporary job market. Through gamification, the project aims to instill a sense of achievement and competition, motivating students to actively participate in extracurricular activities and, in turn, enhancing their overall career readiness and employability.

This project has a few objectives that need to be achieved. The objectives are:

1. To identify the elements of gamification and its relationship with motivational factors and soft skills development toward career readiness.
2. To design and develop a prototype of gamified personal development for higher education students.
3. To evaluate the impact of gamification on mitigating the lack of motivation among higher education students.

1.5 Project Scope

This project targets university students to explore gamification's role in developing academic and non-academic skills in the domain of higher education. It addresses the challenges of motivating students for active participation in extracurricular activities. The project involves designing and developing a gamified personal development system tailored for university students. Gamification elements, user authentication, profile management, and features fostering soft skills challenges and event participation will be integrated. A phased approach emphasizing iterative enhancement and modular, incremental development will guide the system's development. Testing and refinement will ensure the system's functionality, performance, and reliability align with the intended objectives. Evaluation within the project scope assesses the impact of gamification on student engagement and soft skills development, including evaluating the impact of gamification element on user's motivation in learning skills from extracurricular.

1.5.1 Module of Proposed System

In response to the need for comprehensive soft skills development among university students, the proposed system is designed to address the soft skills and work readiness challenges among recent graduates. By leveraging the element of gamification, the module aims to encourage students' active participation in extracurricular activities. As an engaging and rewarding learning platform, the proposed system aligns academic and non-academic skill development, equipping students not only with theoretical knowledge but also with the practical skills demanded by the complexities of the modern workplace. Table 1.1 shows the list of modules of the system.

1.	User Authentication Module	Responsible for user registration, login, and account management.
2.	Soft Skills Module	The core module encompasses various soft skills development modules, each focusing on specific skills. This module includes one submodule.
a.	Task Module	Manages the tasks within each soft skills module, including reading articles, interactive quizzes, and practical submissions.
3.	Gamification Module	The Gamification Module is divided into 5 submodules then handles each gamification element individually.
a.	Points Module	Manages the accumulation and distribution of points based on user activities such as completing tasks, quizzes, and participating in events.
b.	Leveling Module	Tracks user levels based on earned points and unlocks achievements as users progress.
c.	Badge Module	Tracks and awards completion badges to users upon successfully finishing a soft skills module.

d. Achievement Module	Tracks and awards extra achievements based on specific milestones, such as starting the first module or reaching Level 5.
e. Leaderboard Module	Displays a leaderboard showcasing users with the highest points, fostering a sense of competition and recognition.
7. Event Participation Module	Manages users' submissions for attending campus events, awarding points accordingly.

Table 1.1: Module of Proposed System

1.7 Summary

This chapter lays the foundation for the project, addressing the contemporary job market's demands and the deficiencies observed in recent graduates' soft skills. It introduces the strategic use of gamification to bridge these gaps and outlines the project's objectives, background, problem statement, and scope. The proposed system's modules, such as User Authentication, Soft Skills, Gamification, and Event Participation, are summarized, emphasizing their role in comprehensive skill development.

Chapter 2

Literature Review

2.1 Introduction

In the dynamic landscape of higher education and professional development, the acquisition of both hard and soft skills is pivotal for students' success. This literature review explores transferable skills, with a particular focus on soft skills, detailing their development, significance in employability, and the role of extracurricular activities in fostering these skills. Additionally, it dives into the motivational factors driving students to engage in extracurricular pursuits and the impact of gamification in education. The review also compares three online learning platforms, Google for Developers, Gimkit, and Coursera, and assesses their effectiveness in incorporating gamification elements. Lastly, it explores various Software Development Life Cycle models, with a justification for the selection of the Iterative Enhancement Model for the proposed gamification system.

2.2 Soft Skills in Higher Education

In higher education, both hard skills and soft skill development, known as transferable skills, are fundamental for preparing students in meeting personal, academic and professional requirements (De Prada et al., 2022) and can be applied outside the academic field of study (Olesen et al., 2020). Soft skills are non-technical and interpersonal skills that are essential for success in the workplace (Matteson et al., 2016; Hirudayaraj et al., 2021).

Sharma (2018) refers to soft skills as a skill that allows you to interact with others effectively and work well in a team. Soft Skills such as communication, teamwork and problem solving are essential in the workplace Matteson et al. (2016) and allow one to communicate clearly, resolve conflict, and manage work effectively (Sharma, 2018). Hirudayaraj et al. (2021) stated that there is no universally accepted classification of what constitutes a soft skill, numerous researchers use terms such as employability skills, non-technical skills, people skills and transferable skills to refer to soft skill.

Employability Soft Skills	Tec21 Transversal Competences
Self-Skills	Self-directed learning
Personal Skills	Intellectual curiosity
Learning Skills	Ethics and responsibility Problem Solving Critical thinking
Social Skills	Information technology Teamwork Communication Communication in foreign languages Global perspective
Systemic skills	Leadership Citizenship Innovation Entrepreneurship

Table 2.1: Employability Soft Skills

Source: Olivares et al. (2019)

Based on Table 2.1, the soft skills required by the labor market were categorized into 5 sections which are Self-Skills, Personal Skills, Learning Skills, Social Skills and Systemic Skills. Employability Soft Skills refers to the characteristics that improve an individual's social interaction, contributing to enhancing job performance and employability (Olivares et al., 2019).

Base competency	Description	Skills
Managing Self	The ability to develop practices and routines for dealing with uncertainty in a changing environment	Learning Personal organization and time management Personal Strengths Problem solving and analytic
Communicating	The ability to interact effectively with other to gather, integrate and convey verbal and written resources	Interpersonal Listening Oral Communication Written Communication
Managing People & Task	The ability to accomplish work through planning, organizing, and controlling organizational resources	Coordinating Decision-making Leadership and influence Managing Conflict Planning and organizing
Mobilizing Innovation and Change	The ability to conceptualize, initiate, and manage significant change in the organization	Ability to conceptualize Creativity Innovation Change Risk Taking Visioning

Table 2.2: Base Competencies Skills

Source: Matteson et al. (2016)

The soft skills that are essential for success in the workplace are categorized into four base competencies (Evers, Rush & Berdrow, 1998, as cited in Matteson et al., 2016). Based on Table 2.2, the first base competency is **Managing Self** which refers to individuals who can manage themselves effectively in managing their work & time, able to adapt to changes, and able to deal with stress effectively. The second base competency is **Communicating** which refers to individuals who can communicate effectively, able to listen actively, and build relationships with others. Thirdly, **Managing Task and People**, which an individual can manage people and projects, and possess strong leadership. Lastly is the **Mobilizing Innovation and Change**, which refers to

individuals who can come up with new innovative ideas, suggest areas of improvement and implement changes.

2.3 Soft Skills Development in Enhancing Career Readiness

The development of soft skills is essential for developing graduates' adaptability, flexibility, and overall employability among graduates (Olesen et al., 2020). As the labor market continues to evolve, these soft skills are crucial for students in higher education to navigate its challenges (Olesen et al., 2020). Research conducted by Hirudayaraj et al. (2021) showed employers' perspectives, revealing a general satisfaction with the technical skill, but most of them are concerned about the lack of basic soft skills in the workplace. Employers increasingly value soft skills such as people skills, leadership skills, adaptability and social maturity when hiring entry-level positions (Sharma, 2018).

The significance of soft skills development in employability is underscored by (Saad Fadhil et al., 2021), where findings align with the broader research indicating the importance of soft skills in the contemporary workplaces.

In the current working industry, employers are looking for employees who have strong soft skills, such as the ability to communicate effectively, work well in a team, and adapt to change (Saad Fadhil et al., 2021). Moreover, the author also identified six soft skills that were found to be the most important for employability: communication skills, teamwork, learnability, motivation, attitude, and integrity. Building on this insight, the research done by Hirudayaraj et al. (2021), emphasized that most of the employers prioritize well-rounded candidates with diverse experiences who could learn and communicate effectively instead of looking at technical skills or

CGPA, and soft skills are often the final deciding factor in the hiring process for engineering graduates.

A research study done by Saad Fadhil et al. (2021) also indicates the importance of a student's capabilities in communication, creativity and problem solving in uncertain situations. Students should be able to interact effectively with others, work collaboratively in teams, and take on leadership roles when necessary. The author argues that these soft skills are essential for success in today's rapidly changing industrial landscape. By incorporating soft skills training into their curriculum, universities can produce graduates who are well-equipped to meet the challenges of the future. Marinescu et al. (2017) emphasize the importance of both hard and soft skill in students' academic experiences for their future employability. The research study found that there is a significant improvement in students' leadership skills through participation in extracurricular activities (Marinescu et al., 2017).

2.4 Motivational Factors in Extracurricular Participation

Understanding the motivational factors that drive students to engage in extracurricular pursuits is crucial for fostering a vibrant and enriching campus environment. Motivation can be divided into two types, internal and external (Egorova & Ruiz, 2021). In this context, intrinsic motivation, driven by internal factors such as curiosity, interest, and a sense of challenge, contrasts with extrinsic motivation, which is fueled by external factors like expectations of others, rewards, and punishments (Liu et al., 2019; Chapman et al., 2023; Mohanty & Christopher, 2023). Huffman et al. (2019) found that the main motivation for students to participate in the gamification extracurricular system (DegreePlus) are to explore new opportunity and experience, acquire transferable skills, and earn points for prizes through gamification.

Egorova & Ruiz (2021) emphasize that students in higher education lack motivation in learning, resulting in low-quality studies. The author specifically highlights the influence of the pandemic and online learning on student motivation. The study done by Razali et al. (2020) suggests that gamification can influence both intrinsic and extrinsic motivation in students. While it can increase extrinsic motivation through rewards and recognition, it also has the potential to cultivate intrinsic motivation by creating a fun and engaging learning environment (Razali et al., 2020). This aligns with Ong et al. (2013), which concludes that intrinsic academic motivation is the ideal form of academic motivation, as it leads to a lifelong love of learning. Building on this, Sun & Hsieh (2018) conducted a research study revealing that the application of gamification elements in the education learning system significantly increased students' intrinsic motivation and emotional engagement. Interestingly, the study found no significant effect on extrinsic motivation, indicating that gamification might be a more potent driver of internal motivation.

Furthermore, Chapman et al. (2023) identifies four key motivations driving students to participate in extracurricular activities: monetary gains, skills acquisition, personal enjoyment, and social interaction. The research found that Early-year students tend to prioritize enjoyment and financial aspects, while final-year students emphasize skill development and social networking, aligning with their career goal. Huffman et al. (2019) found that students are primarily motivated by the opportunity to explore new experiences, acquire transferable skills, and earn points for prizes through gamification. Interestingly, gamification's impact varied, with high-participation students being more significantly driven by it. However, the study also highlights that, even without gamification, a substantial percentage of students would still participate, indicating the intrinsic value of the program beyond the initial draw of gamification. This suggests that the program has

intrinsic value to students and that gamification may be an initial draw to participate, but students continue to participate for its intrinsic value once they understand its benefits (Huffman et al., 2019; Liu et al., 2019).

In summary, the literature concludes student motivation in both academic and extracurricular contexts, emphasizing the importance of balancing intrinsic and extrinsic motivators and recognizing the potential of gamification to play a pivotal role in shaping these motivations.

2.5 The Impact of Extracurricular Activities in Career Readiness and Employability

Career readiness and employability are primary goals in higher education, extending beyond academic knowledge to cover a comprehensive set of skills crucial for success in the professional world (De Prada et al., 2022). Career readiness involves preparing students for their chosen fields by fostering technical expertise, soft skills, and a proactive mindset. Employability reflects an individual's ability to secure and maintain employment, considering not just technical competence but also a range of transferable skills contributing to workplace success.

Emphasizing the significance of employability skills and developing these skills particularly in campus activities, Kovalcik (2019) highlights the importance of soft skills are crucial by employers in hiring decisions, and often considered as important as field knowledge. Employers consider graduates' interpersonal skills and professional skills during the hiring process, and graduates with a network of professional contacts and strong social skills, believing that such graduates are more likely to succeed in the workplace (Jackson et al., 2022).

Extracurricular Activities (ECAs) play a key role in enhancing employability skills in higher education (Mefteh, 2021). Evidence from various studies, Kanar & Bouckenooghe (2021) and Mefteh (2021) suggests that ECAs play a significant role in developing soft skills valued by employers, improving professional identity, and boosting employment self-efficacy. Engaging in these activities provides students with opportunities to increase self-esteem, apply and refine soft skills in real-world contexts (Stuart et al., 2011). Krishnan et al. (2021) found that successful interviewees exhibited high proficiency in expressing key employability skills such as problem-solving, leadership, interpersonal skills, adaptability, teamwork, and personal qualities. Sharma (2018) revealed that several studies have shown that soft skills are more important for long-term job success than hard skills. Additionally, Saad Fadhil et al. (2021) confirmed that soft skills have significant correlation with employability which brings to the conclusion that soft skills are the critical factors for employability in Malaysia.

Despite this demand, there exists a noticeable deficiency in these skills among recent graduates, as evidenced by the 4.1% unemployment rate and the substantial proportion of underemployed graduates in (Graduates Statistics, 2021). As reported in LinkedIn Business - Global Talent Trends (2019), employers are increasingly prioritizing soft skills over hard skills when hiring new employees. The report found that 92% of talent acquisition professionals believe soft skills are equally or more important to hire for than hard skills. Additionally, 89% of talent acquisition professionals said that when a new hire doesn't work out, it's because they lack critical soft skills. However, there is a consistent disagreement between students and employers regarding their preparedness, which is identified as skills articulation gap (Kovalcik, 2019). Author argues that

the skill articulation gap is not necessarily a skills gap, but rather a gap in students' ability to articulate their skills to potential employers.

Overall, the evidence suggests that ECAs have a positive impact on career readiness and employability by enhancing soft skills, building professional networks, and improving students' confidence and self-efficacy in securing employment opportunities. However, Kovalcik (2019) suggest that higher education not only focus on preparing students with skills but also to educate them on effectively articulating these skills for bridging the perceived gap between student and employer expectations whereas Krishnan et al. (2021) study suggests incorporating specific learning objectives related to communication skills in employability courses to enhance graduates' readiness for the job market. Hirudayaraj et al. (2021) suggests that higher education should create more opportunities for students to be involved in ECUs in developing their soft skills in addition to technical skills.

2.6 Gamification Taxonomy

Gamification is the integration of game elements, mechanics and design principles into a non-game context to achieve positive impacts in motivating and improving the engagement. A gamification taxonomy is a classification system for the different types of game elements that can be used in the gamification. Toda et al. (2019b, 2019c) proposed a taxonomy of gamification elements designed for the analysis and evaluation of gamified systems in educational settings. The taxonomy serves as a valuable tool for analyzing and evaluating gamified educational systems, providing a structured framework to assess the implementation of various gamification elements. It is a useful tool for designers, teachers, and instructors who are interested in using gamification to create engaging and motivating experiences.

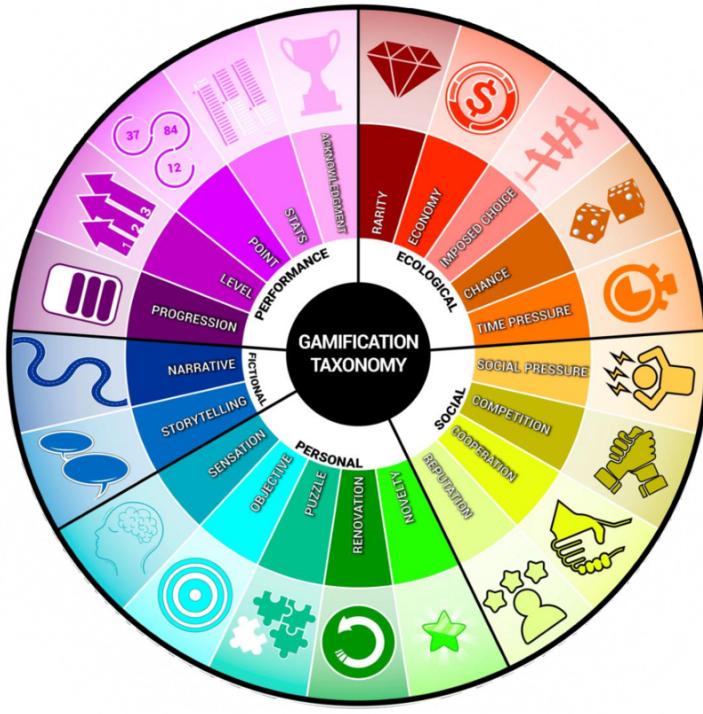


Figure 2.1: Gamification Taxonomy

Source: Toda et al. (2019a)

Based on Figure 2.31 the taxonomy includes five distinct dimensions, each encompassing various gamification elements to provide a comprehensive framework for assessment. The first dimension is **Performance/Measurement Dimension**, which includes elements such as acknowledgement, level, progression, point and stats. These elements are used to track and measure user performance, and to provide feedback. The second dimension, labeled as **Ecological Dimension**, includes elements such as chance, imposed choice, economy, rarity and time pressure. These elements create the environment in which the gamified experiences take place, these elements can be used to influence user behavior and engagement. **Social Dimension** as the third dimension which allows users to interact with each other and collaborate on tasks, includes elements such as competition,

cooperation, reputation, and social pressure. **Personal Dimensions** on the other hand are designed to improve user experience and increase user's engagement by using elements such as novelty, objectives, puzzle, renovation, and sensation. Lastly, the Fictional Dimension's elements such as narrative and storytelling help create a sense of immersion and excitement for users.

The taxonomy presented in Figure 2.1 shows the foundation to understand the diverse dimensions of gamification elements. This classification becomes particularly relevant when exploring the 21 gamification elements proposed by Toda et al. (2019b) for educational purposes, as detailed in Section 2.7. The taxonomy provides a structured framework for comprehending how these elements, such as points, badges, leaderboards, and narratives, contribute to the overall effectiveness of gamification in education, influencing user behavior, motivation, and engagement.

2.7 Element of Gamification

Gamification involves the incorporation of game elements into non-game contexts to enhance engagement and motivation. Understanding these gamification elements is crucial in developing a motivational and engaging gamification system. According to the proposed taxonomy by Toda et al. (2019b), there are 21 gaming elements that can be applied for educational purposes. Several studies have demonstrated that gamification strategies that incorporate both cooperative and competitive elements can be more effective in motivating learners and promoting engagement than strategies that rely solely on cooperation or competition. Points, badges, and leader boards (PBL) serves as a valuable tools and are commonly used game mechanics that can be effectively integrated into blended gamification strategies (N6).

TABLE III
GAME ELEMENTS AND Affected BEHAVIOUR.

Concept	Description	Affected Behaviour
Acknowledgement	All kind of feedback that praises the players' specific actions. Some examples and synonyms are badges, medals, trophies.	Engagement
Chance	Randomness and probability characteristics to increase or decrease the odds of certain actions or outcomes. Some examples and synonyms are randomnesses, luck, fortune.	Engagement
Competition	When two or more players compete against each other towards a common goal. Some examples and synonyms are Player vs Player, scoreboards, conflict.	Engagement Motivation
Cooperation	When two or more players collaborate to achieve a common goal. Some examples and synonyms are teamwork, co-op missions.	Motivation
Economy	Transactions within the game, monetising game values and other elements. Some examples and synonyms are markets, transaction, exchange.	Engagement
Imposed Choice	Decisions that the player is obliged to make in order to advance the game. Some examples and synonyms are judgements, forced choices. (<i>not to be confused with Narrative</i>).	Engagement Motivation
Level	Hierarchical layers present in a game, which provide a gradual way for the player to obtain new advantages as they advance. Some examples and synonyms are character levels, skill level.	Engagement
Narrative	Order of events where they happen in a game. These are choices influenced by the players' actions. Some examples and synonyms are the strategies the player uses to go through a level (stealth or action), also the good or bad actions that influence the ending, karma system. (<i>not to be confused with Imposed Choice</i>).	Motivation
Novelty	New, updated information presented to the player continuously. Some examples and synonyms are changes, surprises, updates.	Engagement
Objectives	Guide the players' actions. Quantifiable or spatial, from short to long term. Some examples and synonyms are missions, quests, milestones.	Motivation Engagement
Point	Unit used to measure users' performance. Some examples and synonyms are scores, number of kills, experience points.	Motivation Engagement
Progression	This allows players to locate themselves (and their progress) within a game. Some examples and synonyms are progress bars, maps, steps.	Engagement
Puzzles	Challenges within the game that should make a player think. Some examples and synonyms are actual puzzles, cognitive tasks, mysteries.	Engagement
Rarity	Limited resources and collectables. Some examples and synonyms are limited items, rarity, collection.	Engagement
Renovation	When players are allowed to redo/restart an action. Some examples and synonyms are extra life, boosts, renewal.	Engagement
Reputation	Titles that the player accumulates within the game. Some examples and synonyms are titles, status, classification.	Engagement Motivation
Sensation	Use of players' senses to create new experiences. Some examples and synonyms are visual stimulation, sound stimulation.	Engagement
Social Pressure	Pressure through social interactions with another player (s) (playable and non-playable). Some examples and synonyms are peer pressure, guilds.	Engagement Motivation
Stats	Visible information used by the player, related to their outcomes within the game. Some examples and synonyms are results, health bar, magic bar, HUD, indicators, data from the game presented to the user.	Engagement
Storytelling	It is the way the story of the game is told (as a script). It is told within the game, through text, voice, or sensorial resources. Some examples and synonyms are stories told through animated scenes, audio queues or text queues during the game.	Engagement
Time Pressure	Pressure through time within the game. Some examples and synonyms are countdowns, clock, timer.	Engagement Motivation

Table 2.3: Gamification Elements

Source: Toda et al. (2019b)

According to Table 2.3, the main purpose of gamification elements in education is to affect behavior which improves motivation and engagement. Author proposed 21 gaming elements including acknowledgement, points, level, badges, leaderboards, and narratives. According to Table 2.3, the main purpose of gamification elements in education is to affect behavior which improves motivation and engagement. Author proposed 21 gaming elements including acknowledgement, points, level, badges, leaderboards, and more. Acknowledgements, points, and

badges act as tangible representations of accomplishments, fostering a positive feedback loop. Leaderboards introduce a competitive aspect, enhancing motivation, while narratives contribute to creating a purposeful and immersive learning experience. These elements leverage psychological reward systems, fostering achievement and progression. Lameier et al. (2018) categorized motivation factors into intrinsic and extrinsic motivators, emphasizing the role of social motivations. Social interactions and explicit recognition play a pivotal role, aligning with the gamification elements identified by Toda et al. (2019b).

Ferriz-Valero et al. (2020) research findings suggest that the implementation of gamification in education setting has significant effects on students' motivation, particularly in terms of extrinsic motivation (ER). The rewards and punishments embedded in the gamified structure, such as experience points (XP) or health points (HP), influenced behaviours regulated by external contingencies and tangible rewards were considered essential for the success of gamification. Park & Kim (2022) research findings suggest a focus on the use of points as one of the gamification experience in educational environments, particularly in the context of motivating learners. The author proposed eight type of gamification points including, Experiences points, Guild experiences, Ability points, Karma points, Exchange points, Group exchange points, Skill points, Peer review points. However, the author also mentioned that the improper use of points may lead learners to participate in learning activities solely to earn points without a genuine purpose, potentially nullifying the intended gamification effect.

In a comprehensive study conducted by Majuri et al. (2018), 128 empirical studies were analysed to investigate the implementation of gamification in educational context. The analysis aimed to find out the method in implementing gamification, the outcomes and the reported results. Their findings revealed a consistent positive impact on user engagement and motivation levels when incorporating gamification elements. Impressively, 71.43% of the analysed studies reported positive outcomes.

Affordance	Mainly positively oriented	Null or equal positive and negative	Mainly negatively oriented	Sum
Points, score, XP	38	13	1	52
Leaderboards, ranking	27	13	3	43
Badges, achievements, medals, trophies	25	12	2	39
Challenges, quests, missions, tasks, clear goals	27	8	2	37
Levels	19	7	2	28
Cooperation, teams	17	2	2	21
Quizzes, questions	15	3		18
Progress, status bars, skill trees	13	2	1	16
Social networking features	11	1	2	14
Performance stats, performance feedback	13	1		14
Timer, speed	12			12

Table 2.4: Gamification Element with Positive and Negative Results

Source: Majuri et al. (2018)

Table 2.4 shows the top 10 gamification elements identified by Majuri et al. (2018), associated with the highest positive effects, including Points, Leader board, Achievements, Challenges, Levels, Cooperation, Quizzes, Progress, Social Networking Features, and Performance Stats, with Timer also making the list. This comprehensive analysis provides valuable insights into the effectiveness of gamification in educational settings, highlighting specific elements that contribute significantly to positive outcomes in terms of user engagement and motivation.

Game element	Description	Benefits
Points	Numerical representation that shows players' contributions	They can motivate students by making them learn more in order to gain more points
Leaderboard	A board that shows students' rankings based on their scores	It can positively affect their learning behaviours and outcomes, since it increases competition
Badges	Virtual rewards for each achieved goal	They can increase students' motivation and engagement within the course
Feedback	Private and personalized information about students' performance	It can positively affect their motivation to learn
Progress Bar	A bar which shows students' progress toward a goal	It can give students a sense of progression
Avatar	Student's virtual representation within gamification	It can make student feel included and comfortable within their learning environment
Levels	Moderate the level of difficulty based on students' expertise	They can make students more engaged
Chat	Messages for both collaborating and socializing	It can make students feel related to each other

Table 2.5: Benefits of Gamification Elements

Source: Denden et al. (2021)

Table 2.5 shows the description of each gamification elements with their respective benefits. These elements will be considered to be used for the design of the gamified soft skill development of this project.

2.8 Gamification Strategy in Education

Gamification has emerged as a powerful and innovative strategy within the realm of education, transforming traditional learning experiences by integrating game elements and mechanics into non-game contexts. One of the key benefits of gamification in education is its ability to enhance student engagement. According to Lameier et al. (2018), gamification provides a motivational framework that taps into individuals' intrinsic desires for achievement, recognition, and competition. By incorporating elements such as points, badges, and leaderboards, educators create a dynamic and interactive learning environment, encouraging active participation and sustained interest (Majuri et al. 2018). This heightened engagement is particularly crucial in addressing challenges related to student motivation and participation in traditional educational settings.

Research indicates a positive correlation between gamification strategies and improved learning outcomes. In a study by Ferriz-Valero et al. (2020) students exposed to gamified elements demonstrated a higher level of perceived learning and knowledge retention compared to those in non-gamified environments. The competitive and goal-oriented nature of gamification motivates students to invest time and effort in mastering content, resulting in a deeper understanding of the material Wael Abbass Hafez et al. (2023). Furthermore, gamification allows for adaptive learning experiences, catering to individual learning styles and pacing.

Gamification serves as a valuable tools for skill development, extending beyond traditional academic knowledge. Evidence from various studies, Kanar & Bouckenooghe (2021) and Mefteh (2021) suggests that ECAs play a significant role in developing soft skills valued by employers. While a strong case for the effectiveness of gamification in influencing student behavior is evident

in a study Huffman et al. (2019) focusing on extracurricular activities by incorporating gamification strategies into their program. Students engaged in a gamified program demonstrated higher attendance rates compared to their non-participating peers.

While the benefits of gamification in education are evident, it is essential to acknowledge potential challenges. One notable concern is the risk of extrinsic motivation overshadowing intrinsic learning goals (Park & Kim, 2022). Designing gamified systems that strike a balance between rewarding achievements and nurturing genuine interest in the subject matter is crucial. Additionally, the effectiveness of gamification may vary based on individual preferences and gender differences, emphasizing the need for personalized and culturally sensitive approaches (N13). In conclusion, gamification strategies have emerged as a dynamic and effective approach to transforming educational experiences. By leveraging game elements to enhance engagement, motivation, and learning outcomes, educators can create more dynamic and interactive learning environments.

2.9 The Impact of Gamification in Education

The application of gamification has gained significant attention and has been extensively used in educational environments to enhance student's engagement and motivation (Dichev & Dicheva 2007; De Prada et al., 2022). Educational gamification in corporate game elements to make learning more interactive, stimulating, and goal-oriented, creating a positive and motivating atmosphere (Sun & Hsieh, 2018). Digital badges, which serves as a digital representation of skills and accomplishment, plays a role in validating one's capabilities within the gamification context (Alt, 2021). Research by Alt (2021) indicates that digital badges act as an effective motivational tool to encourage engagement and motivation among students. The research study from Hellín et

al. (2023) found integration of the gamification system has had a positive impact on students' motivation and engagement and gamified tool were identified to have a significant influence on students' motivation.

The impact of gamification on student motivation and engagement is emphasized by (Wael Abbass Hafez et al., 2023). The infusion of gamification elements into the educational context contributes to increased intrinsic motivation, fundamentally altering the educational experience to be more enjoyable. External rewards, such as points, badges, and leaderboards, are identified as contributors to heightened extrinsic motivation, propelling students toward academic pursuits with a renewed sense of purpose and accomplishment. The interactive and engaging nature of gamification not only captivates students' interest but also fosters increased engagement, shaping a more effective and rewarding educational journey.

The application of gamification elements to meet basic psychological needs, particularly the need for competence, is explored in the research conducted by (Alsadoon, 2023). The alignment of gamification elements with these psychological needs significantly enhances student motivation and performance. Positive reinforcement mechanisms, including points, badges, and leaderboard recognition, create an environment conducive to encouraging students to actively participate and excel in their academic endeavors. Gamification in earning badges and recognition drives two motivational purposes for students, namely learning and competitive orientation (Alt, 2021). In terms of learning orientation, students utilize digital badges (DBs) as a competitive tool, aiming to earn more badges than their peers. Simultaneously, the learning orientation aspect indicates that

students view digital badges to advance their learning. The pursuit of earning badges is not solely competitive but also a pathway for enhancing and deepening their educational experience.

A strong case for the effectiveness of gamification in influencing student behavior is evident in a study Huffman et al. (2019) focusing on extracurricular activities. Students engaged in a gamified program demonstrated higher attendance rates compared to their non-participating peers. The attraction of earning points or prizes served as a motivating factor for students, as seen in their sustained interest. However, the study also emphasizes the significance of program design and students' understanding of gamification aspects. The subsequent decrease in attendance rates after removing the program's participation requirement underscores the need for well-designed and clearly communicated gamification initiatives to ensure a lasting impact. However, a study done by Razali et al. (2020) found that the strength of the relationship between each gamification mechanic and motivation varied. Points were found to have the strongest positive impact on both intrinsic and extrinsic motivation, while rewards had a weaker positive impact on extrinsic motivation and a negative impact on intrinsic motivation.

Denden et al. (2021) identifies that personalities and gender differences significantly influence students' perceptions of game design elements in educational contexts. The authors finds that numerous studies in the literature emphasize the positive impact of gamification on education. These studies highlight benefits such as increased competence acquisition, enhanced attendance and participation, and improved motivation and engagement. However, some studies reveal the negative consequences such as leaderboards and badges may have a negative impact on students with low performance, and students' characteristics may be influenced based on their on their experience with gamified learning environments.

2.10 Review of Current System & Application

This section explores two notable online learning platforms with gamification features, Google for Developers and Coursera. It examines their features, structures, and the use of gamification to enhance the learning experience. The goal is to evaluate the effectiveness of their gamified approaches in motivating learners. Through a detailed analysis of each platform, this section offers insights for educators, developers, and learners navigating the dynamic landscape of online education.

2.10.1 Google for Developers

The first review of current system if the Google for Developer shows in Figure 2.2.

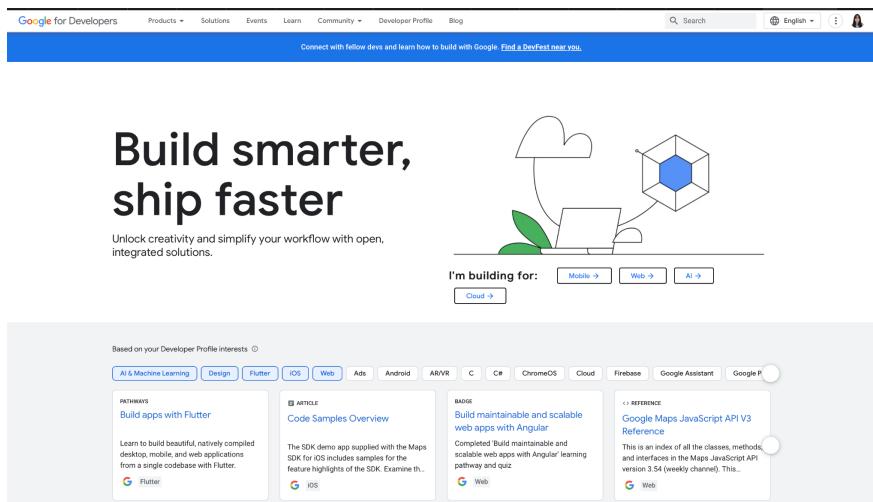


Figure 2.2: Homepage of Google for Developers

Google for Developers is a comprehensive platform for developers to learn about Google Technologies by providing resources, mentorship, programming courses, and networking opportunities in the tech industry. Other than that Google for Developers is also a community where developers can socialize and host a variety of events through Google Developer Groups (GDGs) and Google Developer Student Clubs (GDSCs).

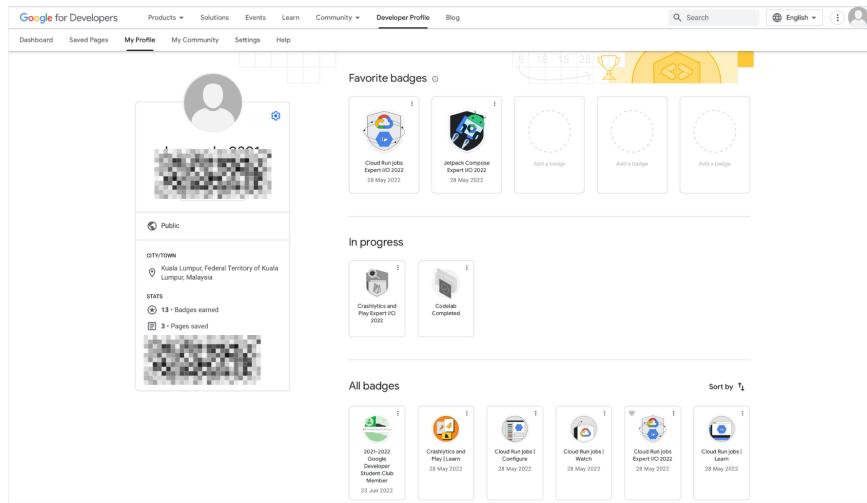


Figure 2.3: Gamification Badge - Google for Developers

Google for Developers fosters the development of soft skills using gamification elements. Google for Developers uses gamification to foster engagement and learning by awarding badges to individuals for completing tasks, such as attending events, participating in workshops, and completing any course available on the platform. These badges can be displayed on developers' profiles on Google for Developers and can be shared on social media.

The advantages of Google for Developers are the well-designed and user-friendly platform as the documentation is clear and easy to follow. The use of gamification elements also motivates individuals to learn new skills and Google's well-recognized reputation makes it a trustworthy website for credentials.

The main disadvantage of Google for Developers is that it is limited in terms of soft skills development. Most of the badges are awarded for learning Google technologies, which are considered hard skills. There are no specific courses on soft skills, but some courses do foster critical thinking and problem-solving skills. Students can develop their soft skills by participating in physical events, earning badges, and networking.

2.10.2 Coursera

The Second review of current system if the Coursera shows in Figure 2.4.

The screenshot shows the Coursera search interface with the query "soft skills" entered. On the left, there are filters for Subject (Arts and Humanities, Business, Computer Science, Data Science), Skills (Accounting, Algorithms, Amazon Web Services, Android Development), Level (Beginner, Intermediate, Advanced, Mixed), and Duration (Less Than 2 Hours). The search results page displays 121 results for "soft skills". Each result card includes a thumbnail image, the course title, the provider (e.g., IBM, University of London), a brief description of the skills gained, the rating (e.g., 4.6, 4.8, 4.7), and the number of reviews. Some courses are marked as "Free".

Figure 2.4: Coursera Soft Skills Courses

Coursera is an online learning platform that offers courses from top universities and companies around the world. Coursera covers a wide range of topics from professional skills development to soft skills development.

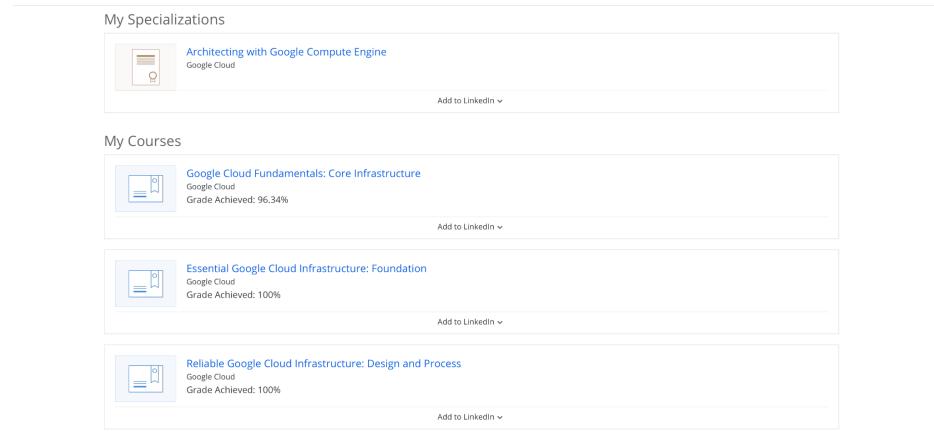


Figure 2.5: Coursera Achievement Acknowledgement

Coursera applied gamification on their platform to provide acknowledgement such as certificates. Even though the courses are self-paced, time pressure is also applied in their course structure such as deadlines and assignments to help students stay on track.

The advantages of Coursera offer courses from top universities and companies, with gamification elements to motivate and engage students, such as accredited certificates to enhance their resumes, and self-paced learning with time tracking to help them learn at their own pace.

The disadvantage of Coursera is that some of the courses can be expensive, especially if students want to earn the completion certification. The quality of Coursera courses can vary. Some courses are excellent, while others are not as good.

2.10.3 Gimkit

The third review of current system if the Gimkie shows in Figure 2.6.



Figure 2.6: Gimkit

Gimkit is a gamified learning platform that allows users to create interactive and engaging review games for their students. Students can answer questions on their own devices, and they earn points for correct answers. Gimkit also allows users to incorporate power-ups and game show elements into their games, which can make the learning experience more fun and exciting.

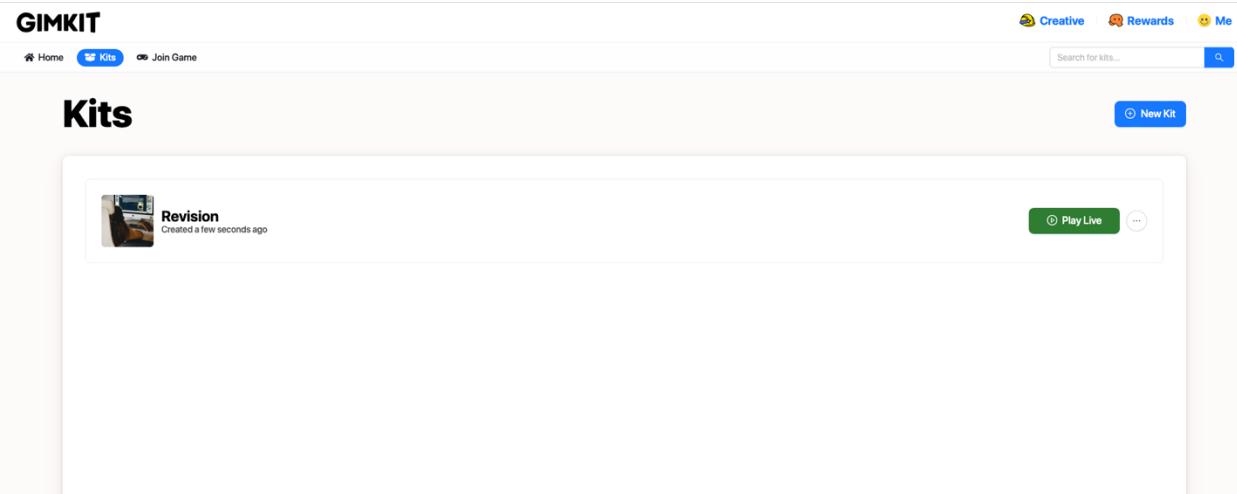


Figure 2.7: Gimkit Kit (Game Set Up)

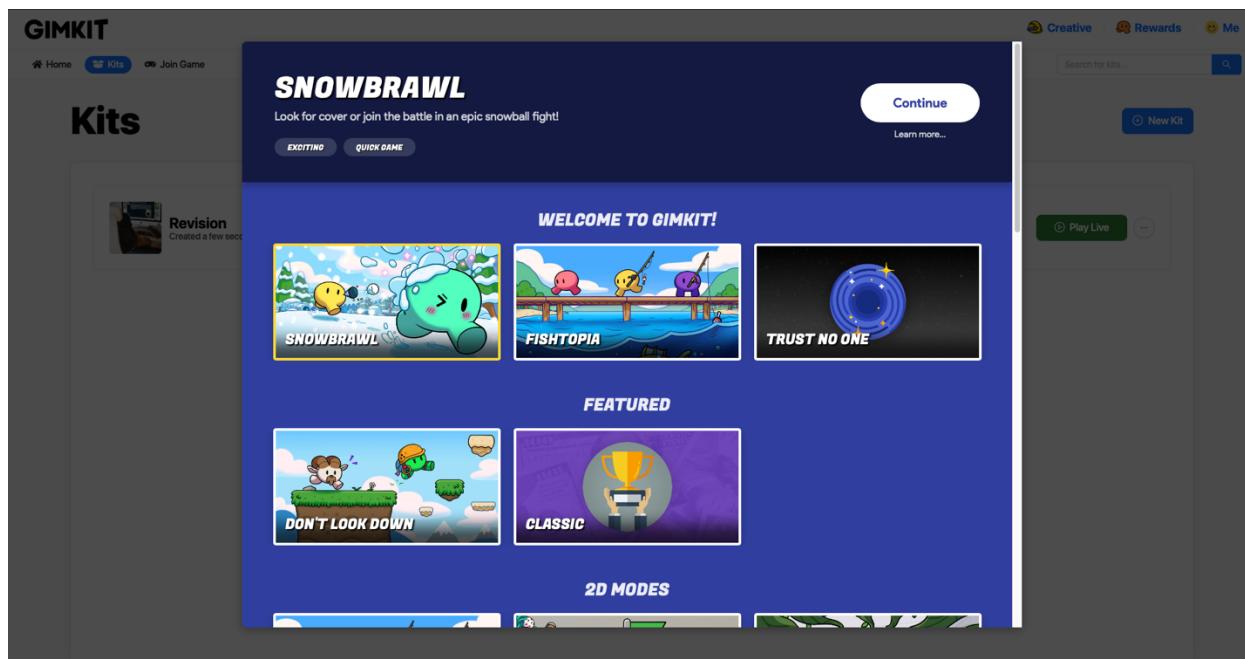


Figure 2.8: Game Modes



Figure 2.9: Game Play

Users start by setting up questions using the game kit, as illustrated in Figure 2.7. Once the questions are ready, they have the option to select different game modes, as shown in Figure 2.8. Moving into the gameplay, Figure 2.9 showcases users in control of the game character, referred to as "Gim." Throughout the game, users can track their scores and view the leaderboard upon completion, fostering a competitive and engaging experience, aligning with GimKit's approach.

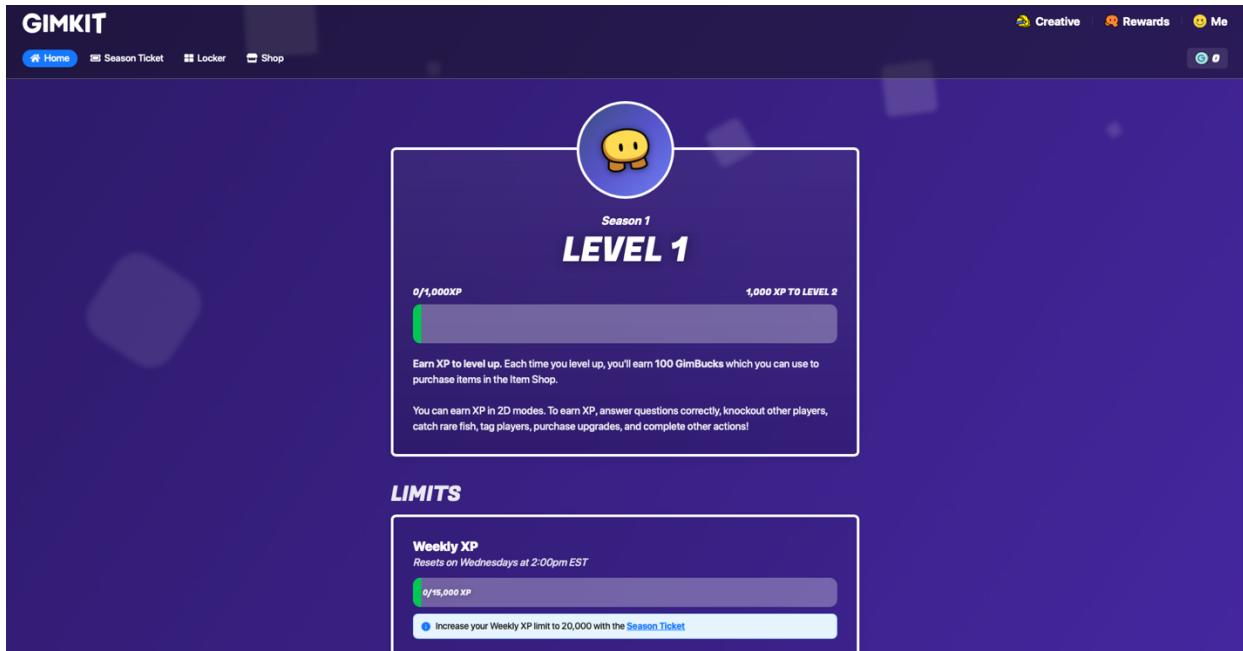


Figure 2.10: Gimkit Level & Experience Points

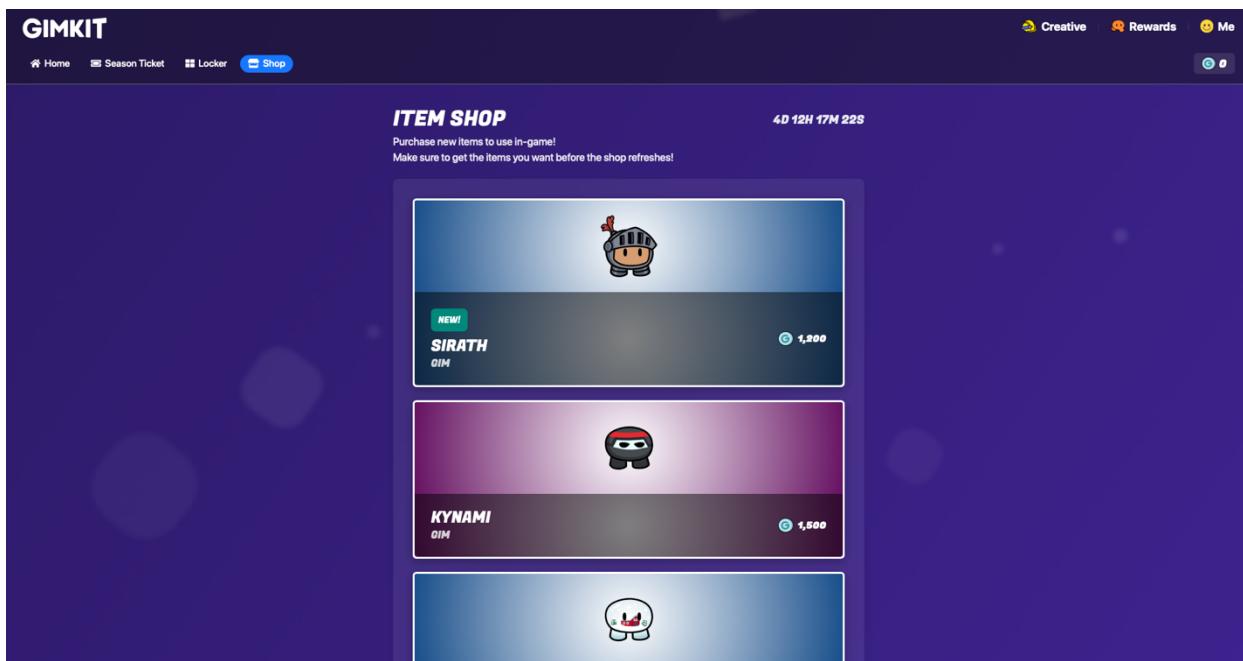


Figure 2.11: Gimkit Item Shop

The platform seamlessly integrates gamification elements, including avatars, experience points, levels, and coins, aimed at enhancing student motivation and engagement. As users actively participate in the 2D game and successfully answer questions, they earn experience points. Upon

leveling up, users gain "GimBucks," a virtual currency showcased in Figure 2.10. These GimBucks can be utilized in the item shop, shown in Figure 2.11, allowing users to purchase various cosmetic items to personalize their avatars and further enhance their gaming experience.

The advantages of Gimkit are that the platform not only provides an engaging and interactive learning experience but also offers a variety of game templates for teachers to choose from, catering to diverse objectives. With dynamic power-ups and game show elements, Gimkit injects an extra layer of excitement and healthy competition into the learning journey.

The disadvantages of Gimkit are that it might not be suitable for all content as Gimkit is more on quiz based. It may not be as effective for teaching more complex concepts or open-ended questions. Gimkit only provides limited game mode for free account. User will need to pay for a subscription fee for more exclusive content such as assigning assignments and access to all game modes.

2.10.4 Comparative Analysis of Different Gamification Application

The inclusion of Gimkit in the comparison with Google for Developers and Coursera adds another dimension to the analysis of online learning platforms. Gimkit's focus on gamified learning introduces an interactive and engaging approach to education, aligning with the trend observed in Google for Developers. Both platforms leverage gamification elements, such as badges and rewards, to motivate users in their learning journey.

Google for Developers stands out with its specialization in Google Technologies, fostering a community-centric environment. The platform's emphasis on mentorship and networking within the tech industry contributes to a unique learning experience. However, it is noted for its limitation in addressing soft skills development. Coursera, on the other hand, offers a diverse range of courses, encompassing both professional and soft skills. The incorporation of gamification, certificates, and time pressure further enhances the motivation and engagement of learners. While Coursera provides a more comprehensive educational experience, potential drawbacks include varying course quality and associated costs. Gimkit, with its gamification elements like avatars, experience points, and levels, aligns with the trend of creating an interactive learning atmosphere. The platform's advantages lie in its ability to make learning enjoyable and competitive, although it may be more focused on quiz-based content.

In summary, the comparison of Google for Developers, Coursera, and Gimkit underscores the significance of gamification in motivating learners. By understanding the strengths and limitations of these platforms, a perspective on integrating gamification into educational environments emerges. Each platform brings unique strengths, whether in specialized tech education, comprehensive course offerings, or interactive learning through gamification. System development can draw inspiration from these platforms to create an engaging development environment.

2.11 Software Development Life Cycle Model

Software Development Life Cycle Model (SDLC) is a systematic process used by software developers to design, develop, test and deploy high-quality software. SDLC involves a series of phases or stages that guide the development process from the initial concept to the final product. There are several types of SDLC, each with its own approach and characteristic.

2.11.1 Agile Methodology

The Agile Model is an iterative and incremental approach to software development that prioritizes flexibility and adaptability. Unlike traditional linear models, Agile embraces change and welcomes customer feedback throughout the development process.

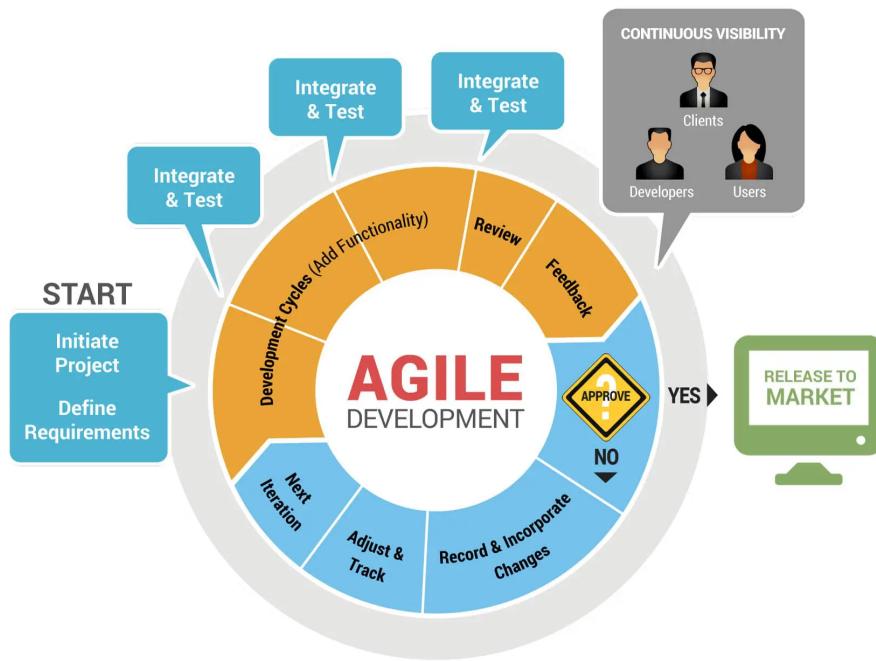


Figure 2.12: Agile Methodology Workflow

Source: <https://cyberhoot.com/cybrary/agile-method/>

Figure 2.12 shows the workflow for Agile Methodology. In Agile Methodology, the project is divided into small increments, with each iteration delivering a potentially shippable product increment. Agile methodologies, such as Scrum and Kanban, promote collaboration, continuous integration, and regular reassessment of priorities. This dynamic model allows teams to respond to changing requirements and deliver a product that better aligns with project needs.

One of the main advantages of the Agile Model is its responsiveness to change. By accommodating evolving requirements. The iterative nature of Agile promotes continuous improvement, as each iteration provides an opportunity to refine and enhance the product. The model fosters a collaborative and cross-functional team environment, leading to better communication and shared responsibility among team members.

However, the Agile Model may face challenges in projects with highly regulated environments or fixed requirements. The emphasis on adaptability can sometimes lead to scope creep if not managed effectively. Additionally, the Agile approach requires active and engaged participation from the customer throughout the development, which may not always be feasible. For large, complex projects, the constant changes and iterations may pose challenges in terms of tracking progress and managing dependencies.

2.11.2 Iterative Enhancement Model

The Iterative Model is a development approach that focuses on incremental progress through repetitive cycles.

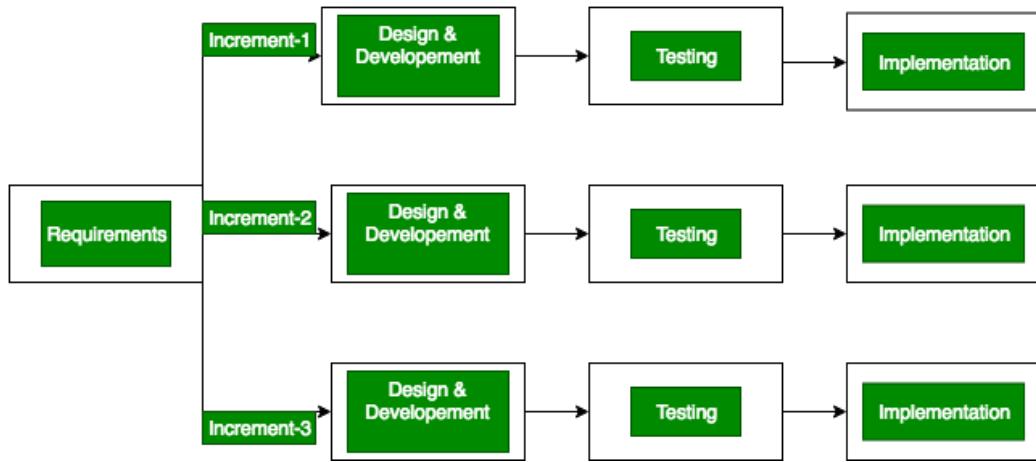


Figure 2.13: Iterative Enhancement Model Workflow

Source: <https://www.geeksforgeeks.org/difference-between-waterfall-model-and-incremental-model/>

Figure 2.13 shows the workflow of the Iterative Enhancement Model, each cycle involves a subset of the project's features, and iterations are repeated until the complete system is developed. Unlike the linear Waterfall Model, the Iterative Model allows for revisiting and refining previous stages considering new insights or changes in requirements. It combines elements of both Waterfall and Agile models, providing a balance between structure and flexibility.

The Iterative Model allows for early detection and correction of defects, as testing is integrated throughout the development process. Each iteration produces a potentially deliverable product increment, providing a tangible progress at regular intervals. This model is well-suited for projects

where requirements are not well-understood initially or are expected to evolve over time. Stakeholder feedback is actively sought and incorporated into subsequent iterations, ensuring a product that better aligns with user expectations.

However, the Iterative Model requires a robust project management approach to coordinate and manage multiple iterations effectively. The iterative nature may lead to potential delays if not managed properly, and there is a risk of scope creep if changes are not carefully controlled. Additionally, the model demands active involvement and collaboration from stakeholders throughout the development process.

2.11.3 V-Model

The V-Model, also known as the Verification and Validation Model, is a linear-sequential approach to software development that emphasizes the importance of testing at each stage.

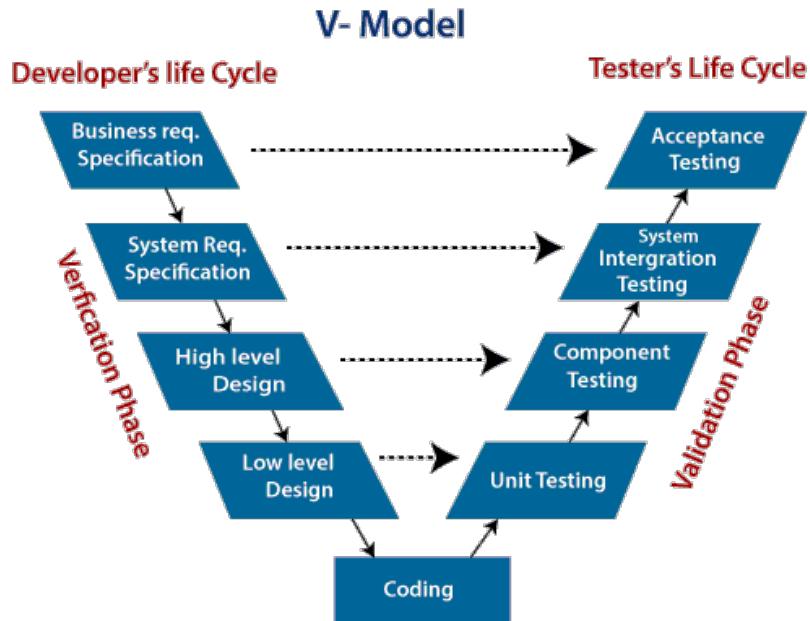


Figure 2.14: V-Model Workflow

Source: <https://www.javatpoint.com/software-engineering-v-model>

Figure 2.14 shows the workflow of V-Model. It is an extension of the Waterfall Model, where each development stage is associated with a testing phase. The model resembles the shape of the letter 'V,' representing the relationship between each development stage and its corresponding testing phase.

One of the main advantages of the V-Model is its clarity and simplicity. The relationship between development and testing phases is well-defined, making it easier to plan and execute testing

activities. The model promotes early testing, allowing for the identification and correction of defects at the earliest stages. It ensures that the final product meets the specified requirements, as testing activities are aligned with each development phase.

However, the V-Model is less flexible compared to Agile and Iterative models, as it follows a predetermined and linear path. Changes in requirements, which are common in many projects, can be challenging to accommodate once the development process has begun. The model may lead to delays in delivering a complete product, as testing is typically concentrated toward the end of the development cycle. The V-Model is most suitable for projects with well-defined and stable requirements.

2.11.4 Justification of Iterative Enhancement Model

Considering the nature of the project, the Iterative Model proves to be the most suitable development lifecycle model. The project involves the development of a gamification system with evolving and potentially unclear requirements. This model enables a phased development approach, with each iteration focusing on specific functions. The project will progress by building functions incrementally, beginning with tasks like user registration and authentication. Each function will undergo individual testing within its iteration, ensuring early defect detection and alignment with requirements. Subsequent iterations will introduce additional functionalities, leading to a final comprehensive system. This iterative process allows for flexibility, accommodating changes, and refining functions based on ongoing testing and stakeholder feedback, ultimately ensuring a robust and tailored gamification system.

2.12 Summary

This literature review covers the diverse landscape of transferable skills, emphasizing the importance of soft skills, their categorization, and their role in shaping career readiness. It underscores the demand for a balance between hard and soft skills in the contemporary job market, with a focus on the significance of extracurricular activities in bridging the skills gap. The motivational factors driving student participation in these activities are explored, emphasizing the potential of gamification as a tool to enhance engagement and motivation. The impact of gamification on student behavior, motivation, and the educational experience is discussed, offering insights into its application in platforms like Gimkit, Google for Developers and Coursera. Finally, the review navigates through Software Development Life Cycle models, with a preference for the Iterative Enhancement Model for the proposed gamification system, aligning with the dynamic and evolving nature of the project.

Chapter 3

Methodology

3.1 Introduction

Chapter 3 explores the practical methodology employed throughout the project's evolution. The structured approach encompasses three phases—Planning, Designing, Implementing, Evaluating as presented in Figure 3.1. The Planning Phase commences with a thorough literature review covering Soft Skills, Gamification, Motivation Factors, and Career Readiness. This forms a sturdy knowledge foundation, guiding subsequent phases. The chapter introduces systematic procedures, tools, and models guiding the project's journey, highlighting a dynamic and iterative development process.

3.2 Project Methodology

In Figure 3.1, the project methodology is structured across three phases—Planning, Designing, and Implementing. The Planning Phase involves in-depth research on soft skills, gamification elements, motivation factors, and career readiness, alongside the identification of essential system elements and features. As features progress iteratively, the collaborative efforts of Phases 2 and 3 materialize in the Implementation Phase. In Phase 3, priority is given to system development and testing, leading to the completion of the final developed system. This concurrent progression fosters a dynamic and adaptive development process, facilitating continuous refinement and enhancement in accordance with the principles of the chosen iterative model.

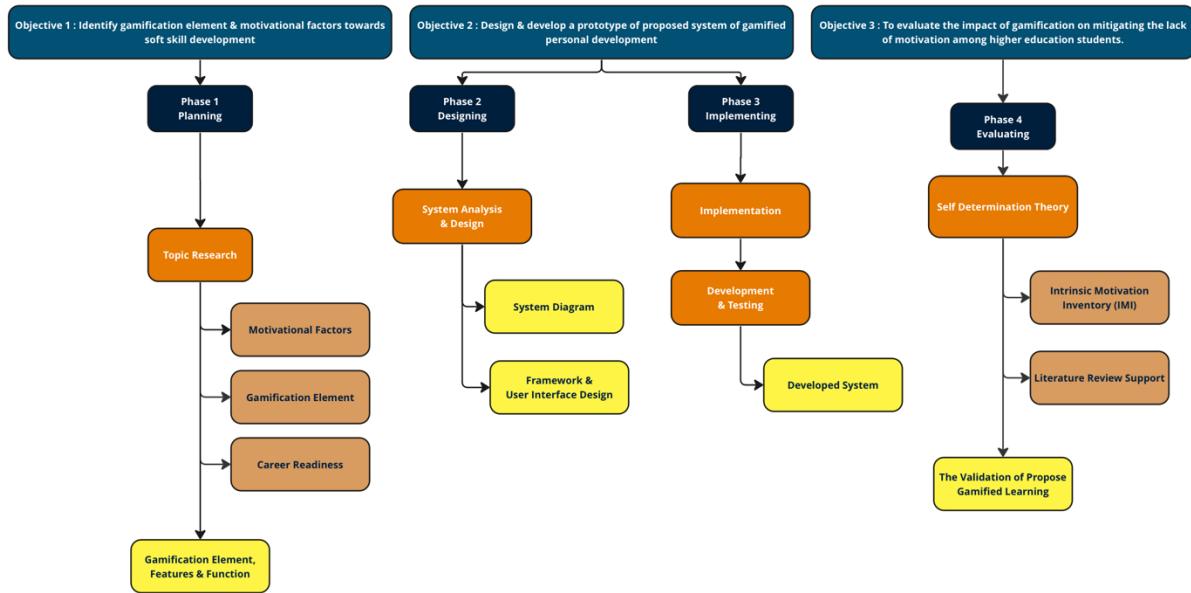


Figure 3.1: Project Methodology

3.3 Phase 1 - Analyze & Planning

3.3.1 Procedure

a. Topic Research

The initial phase of the project involves a comprehensive literature review, focusing on four key domains: Soft Skills, Gamification, Motivation Factors, and Career Readiness. The literature review is conducted systematically, employing established databases and academic repositories to gather relevant research articles, journals, and publications. The Soft Skills domain explores interpersonal skills, communication, teamwork, and leadership, providing a foundational understanding of the skills the system aims to develop. Gamification literature delves into the effective integration of game elements into non-game contexts, elucidating strategies to enhance user engagement and participation. Motivation factors are scrutinized to identify intrinsic and

extrinsic motivators that drive user behavior, contributing to the design of a motivating and rewarding system. The Career Readiness domain investigates the skills and attributes essential for professional success, informing the development of features aligning with real-world applicability. This literature review serves as a knowledge base, shaping the subsequent phases of the project by grounding them in established theories, best practices, and empirical findings.

b. Identify Gamification Element, Features and Function

To identify the gamification elements for integration into the system, a systematic filtering approach was applied. The ongoing research involves an extensive exploration of existing gamification strategies, considering factors such as user engagement, motivation, and educational outcomes. Keyword such as “Gamification Elements” and “Education” since 2017 was applied. Through a comprehensive review of relevant literature and empirical studies, the research aims to identify and evaluate the effectiveness of various gamification elements. These findings contribute to the selection of elements that align with the specific goals of the system, ensuring a tailored and impactful gamified experience for users in an educational context.

3.4 Phase 2 & Phase 3 - System Design & Implementation

3.4.1 Procedure

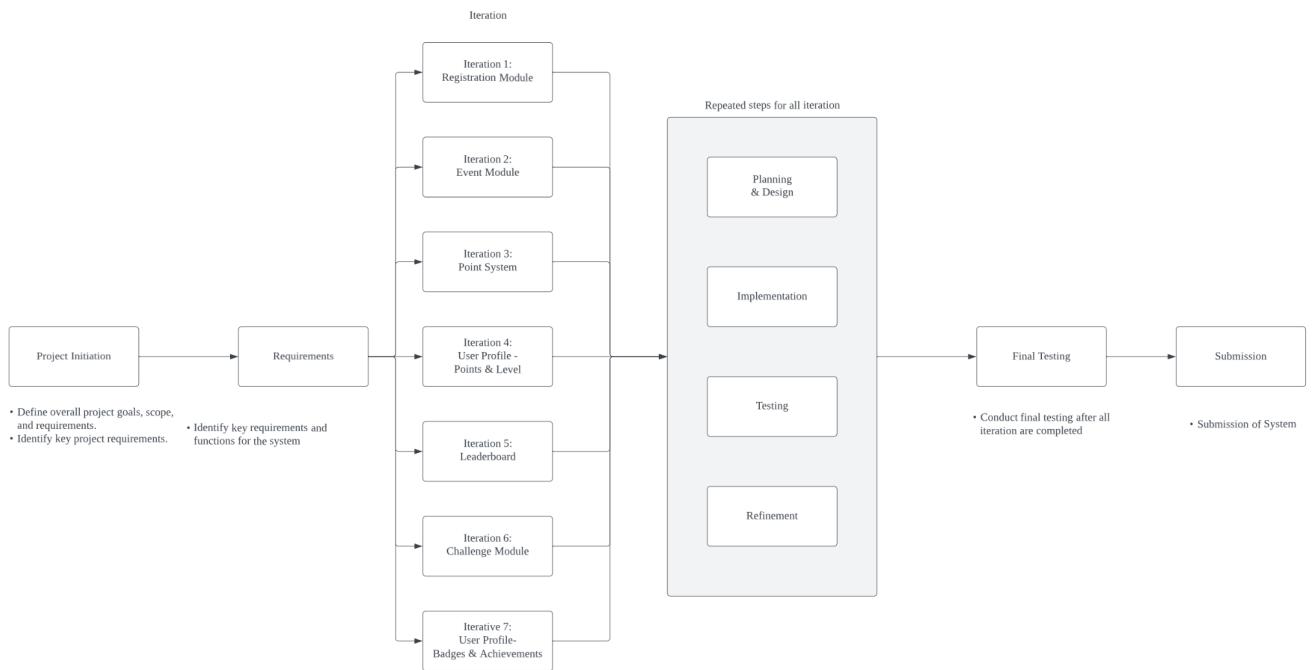


Figure 3.2: Iterative Workflow of the Project

Figure 3.2 illustrates the workflow of the adapted iterative enhancement model for the gamification system. It begins with the project initiation, where overall goals, scope, and requirements are defined, followed by a requirement phase that identifies the requirements and outlines the iterations. Each iteration, represented by a specific module, follows a consistent flow of activities. In an iteration, the process starts with planning the detailed requirements and designs of the module. The implementation phase involves coding the module based on the design, and subsequently, unit testing is conducted to ensure the module's functionality. Refinement allows changes for each

iteration based on the unit testing's results. This cycle repeats for each iteration, emphasizing a modular and incremental development approach. After all iterations are completed, a final testing phase is conducted to validate the entire system's functionality, performance, and reliability.

A systematic approach is employed to identify features and functions using Use Cases, Functional Requirements, Prototyping, and the Iterative Enhancement model. User Stories are crafted to capture diverse user needs, serving as the foundation for detailed Use Cases that outline specific interactions between users and the system. These Use Cases are then translated into Functional Requirements, providing a blueprint for development. Prototyping visually represents proposed solutions, facilitating validation and iterative feedback. The Iterative Enhancement model guides the phased development and refinement of the system, with each iteration incorporating user feedback and evolving requirements. This methodology ensures a user-centric, adaptive, and well-documented process for identifying, validating, and enhancing features and functions throughout the project lifecycle.

3.4.2 Software Used

For planning and designing, a suite of collaborative and design tools is employed. The prototype will be developed using Figma, a robust tool for the creation of wireframes and user interface design. Canva complements the design process with its graphic design capabilities, enabling the creation of visually engaging elements. Lucidchart contributes to the planning phase by providing a platform for creating flowcharts and diagrams, aiding in the visualization of system architecture and workflows.

In the implementation phase, a stack of web development technologies is utilized. HTML, CSS, and JavaScript form the foundation for front-end development, ensuring an interactive and responsive user interface. PHP, a server-side scripting language, is employed for dynamic content generation and interaction with the database. SQL, in conjunction with PHPmyAdmin, manages the system's database, storing and retrieving information efficiently. XAMPP serves as the local development environment, providing the necessary tools for testing and debugging. Visual Studio Code (VSC) is the integrated development environment (IDE) of choice, offering a streamlined coding experience. GitHub, a version control platform, enables collaborative development and code management through Git, ensuring a systematic and organized approach to codebase maintenance. Overall, this comprehensive set of tools and technologies enable smooth planning, designing, and implementation of the gamification system effectively.

3.5 Phase 4 – System Evaluation

3.5.1 Participants & Procedure

Participants in this study will be drawn from the target population of higher education students. University students aged from 18-25, totaling around 10 participants, will form the participant group based on the users' need. A diverse sample will be sought to ensure representation across different academic disciplines, genders, and levels of academic achievement. The sample size will be determined to achieve statistical data and insights into the impact of gamification on motivation.

The survey-based evaluation will follow a structured procedure to assess the impact of gamification on motivation. Participants will be provided with a questionnaire adapted from the Self-Determination Theory (SDT) Intrinsic Motivation Inventory. The survey will include questions related to intrinsic motivation factors, perceived engagement, and the influence of

gamification on learning experiences. Consent will be obtained from participants, and their anonymity and confidentiality will be strictly maintained throughout the study. In this survey, Mean and Standard Deviation (SD) will be employed as statistical measures to evaluate the User Evaluation Questionnaire results. The mean provides a central tendency measure, representing the average response to each question in the User Evaluation Questionnaire. A higher mean might indicate positive feedback, suggesting that participants, on average, found the gamified elements to be motivating. Standard deviation (SD) measures the dispersion or variability of responses around the mean. A lower standard deviation implies that responses are clustered closely around the mean, indicating a higher level of agreement among participants. A higher standard deviation suggests greater variability in responses, indicating diverse opinions or experiences among participants.

3.5.2 Instruments

The primary instrument for this evaluation is a survey questionnaire adapted from the SDT Intrinsic Motivation Inventory and User Motivation Inventory (Brühlmann et al., 2018). Google Forms will be utilized to construct the survey questionnaire and collect the participants' responses. The questionnaire will consist of Likert-scale questions to measure various aspects of intrinsic motivation, engagement, and the perceived impact of gamification. Additionally, relevant literature review findings will serve as secondary instruments, providing a comparative analysis to support and contextualize the survey results. The combination of survey responses and literature insights will offer a comprehensive understanding of the impact of gamification on motivation.

3.5 Summary

In essence, Chapter 3 guides the project through foundational phases. The Analyze & Planning Phase combines topic research and the identification of gamification elements, features, and functions. Using Use Cases, Functional Requirements, Prototyping, and the Iterative Enhancement model, this phase ensures a comprehensive and user-oriented roadmap. Subsequent phases, System Design & Implementation, provide a visual representation of the iterative workflow and a suite of instruments empowering planning and designing. Website development tools seamlessly shape the gamification system. Phase 4 involves evaluating the system's impact on motivation through a structured survey adapted from the SDT Intrinsic Motivation Inventory. Participants from the target population of higher education students will provide insights, and their anonymity and confidentiality will be strictly maintained.

Chapter 4

System Analysis and Design

4.1 Introduction

Chapter 4 focuses on the System Architecture and Design. Section 4.2 present the finding for phase 1 that would be utilized in the future phases of the project, Section 4.3 provides the fundamental system requirements, emphasizing functional aspects such as user creation, authentication, and points systems. Section 4.4 will present the Use Case Diagram that shows the user interactions and functionalities. Detailed Use Case Descriptions follow in Section 4.5, providing insights into user actions and system responses. Section 4.6 introduces Sequence Diagrams, offering dynamic portrayals of key system processes. The structural organization of the system's database is explored in Section 4.7 through the Class Diagram. System architecture takes precedence in Section 4.8, selecting the three-tier Layered Architecture and detailing its components. Sections 4.9 shows the Finding of Phase 2. Section 4.10, 4.11 and 4.12 show the design of gamification elements, system design, and user interface, completing the journey through the Soft Skill Gamification System's Design. This structured approach ensures a comprehensive understanding of the system's structure, through its functional, visual, and structural elements.

4.2 Finding for Phase 1

In the literature review, researchers have proven the positive impact of gamification elements on motivation. Table 4.1 presents a comprehensive overview of the identified gamification elements gathered from previous studies.

Sources	Gamification Elements
Lameier et al. (2018)	Acknowledgement, Badges, Leaderboard, Points
Ferriz-Valero et al. (2020)	Badges, Leaderboard, Points (Experience Points, Health Points)
Majuri et al. (2018)	Badges, Challenges, Cooperation, Leaderboard, Levels, Performance Stats, Points, Progress, Quizzes, Social Networking, Timer
Denden et al. (2021)	Avatar, Badges, Chat, Feedback, Leaderboard, Levels, Points, Progress Bar
Sailer et al. (2017)	Avatar, Badges, Leaderboard, Narrative Stories, Performance Graph, Points, Teammates
Mazarakis & Bräuer (2018)	Badges, Feedback, Narrative, Progress Bar
Ratinho & Martins (2023)	Avatar, Badges, Coins, Competition, Cooperation, Feedback, Leaderboard, Levels, Points, Prize
Park & Kim, 2022	Points (Ability Points, Exchange Points, Experiences Points, Group Exchange Points, Guild Experiences, Karma Points, Peer Review Points, Skill Points)

Table 4.1: Identified Gamification Elements

4.2.1 Identified Gamification Element

According to the identified gamification element from Table 4.1, the website incorporates eight engaging gamification elements aimed at motivating users to enhance their soft skills.

Gamification Elements	Description
Badges	Badges and achievements will be awarded to users for completing tasks and achieving milestones. This will help to recognize users' accomplishments and motivate them to continue learning.
Leaderboards	Leaderboards will be used to track users' progress and compare their performance to others. This will help to create a sense of competition and motivate users to achieve their goals.
Points	The points will be earned through completing different soft skills modules and challenges, the points will contribute to the level of the user and also affect the ranking of the user in the leaderboard. This element will help in increasing user engagement.
Levels	
Challenges	Badges and achievements will be awarded to users for completing tasks and achieving milestones. This will help to recognize users' accomplishments and motivate them to continue learning.
Progress Bar	The progress bar will show user's progress in point earning for level up. Progress bar also will be use in soft skill module to show the user progress on the module.
Quizzes	Quizzes will be used on soft skill module to examine user knowledge on the respective soft skills.
Check-in (Adapted from Timer)	Check-in system was adapted from the concept "Timer". Where user could earn points everyday by checking in into the system

Table 4.2: Selected Gamification Element

Table 4.2 shows the gamification elements incorporated in the system. The Points system, a core element, rewards users for completing different soft skills modules and challenges. Accumulated points not only contribute to the user's level but also influence their ranking on the leaderboard, fostering healthy competition and increasing overall user engagement. The Levels system, falling under the Performance Dimension, provides users with a sense of progression, recognizing their achievements and encouraging continuous skill development. Leaderboards, emphasizing the Social Dimension, serve as a platform to track users' progress and compare their performance to others, fostering a competitive spirit and motivating users to achieve their goals. The Badges system, categorized under the Performance Dimension for Acknowledgment, awards users with badges and achievements upon completing tasks and milestones, recognizing their accomplishments, and inspiring a sense of achievement. Lastly, the Challenges system, contributing to the Personal Dimension, offers users opportunities to test their skills and earn additional rewards, adding a personalized and goal-oriented aspect to the gamified experience. Together, these gamification elements create a dynamic and motivating environment for users to actively participate in skill development.

4.3 System Requirement

The system requirements outline the essential elements and criteria that the gamification system must fulfill the project's objectives. By identifying suitable gamification elements through a comprehensive literature review study, the planned functions and features of the system can be strategically crafted. This involves user registration, authentication, and the integration of gamified elements like levels, badges, challenges, and events. These elements not only enhance user engagement but also contribute to skill development, progress tracking, and the meaningful recognition of user achievements, creating a motivating experience.

4.3.1 Functional Requirement

Functional requirements specify the functionalities and capabilities that the gamification system must possess to meet the outlined system requirements. Table 4.3 shows the functional requirement for the system, each functional requirement corresponds to a specific aspect of user interaction and system behavior. For instance, User Creation (FR-1) entails the ability of users to register using email addresses and passwords, emphasizing the importance of a straightforward onboarding process. User Authentication (FR-2) ensures secure access to user accounts by verifying login credentials. The subsequent requirements cover aspects such as user profiles (FR-3), level calculation and progress display (FR-4), badge and achievement showcase (FR-5), points system (FR-6) with associated milestones and history tracking, soft skills challenges (FR-7), and event participation (FR-8). These functional requirements collectively shape the interactive and motivational aspects of the gamification system.

No	Name	Description
FR-1	User Creation	<ul style="list-style-type: none"> Users are able to register for an account using email addresses and passwords.
FR-2	User Authentication	<ul style="list-style-type: none"> Users are able to login into their account. System will authenticate the user login credential.
FR-3	User Profile	<ul style="list-style-type: none"> Provide a user profile. The profile should be displaying relevant information, such as username, points, levels, progress, and achievements.
FR-4	Level & Progress	<ul style="list-style-type: none"> Calculate and display the user's level based on points earned. Show a progress bar indicating the user's progress towards the next level.
FR-5	Badge & Achievement	<ul style="list-style-type: none"> Display badges representing achievements and skills earned by users.
FR-6	Points System	<ul style="list-style-type: none"> Award points to users for completing challenges or achieving certain milestones. Update the user's points and level accordingly. Users are able to view point history.
FR-7	Challenge System	<ul style="list-style-type: none"> Allow users to complete challenges related to soft skills. Record and track completed challenges in the database.
FR-8	Event System	<ul style="list-style-type: none"> Allow user to submit and track their event activities Users are able to earn points through the event system.

Table 4.3: System Functional Requirements

4.3.2 Non-Functional Requirement

No	Name	Description
NFR-1	Performance	The system should respond to user interactions within 3 seconds without any error.
NFR-2	Compatibility	The system should be compatible with commonly used web browsers (e.g., Chrome, Firefox, Safari) to ensure accessibility for a wide range of users.
NFR-3	Maintainability	The system should be easier to maintain and update different components independently, contributing to overall system maintainability by applying layered software architecture pattern.

Table 4.4: Non-Functional Requirements

4.4 Use Case Diagram

Figure 4.1 shows the use case diagram that outlines the various interactions and functionalities within the User's Actor journey on the platform. The process begins with Registration, where users enter their information. This includes validation of the information and follows with account confirmation. Upon successful registration, the user may login into the system using their login's credential, which involves user authentication and session management.

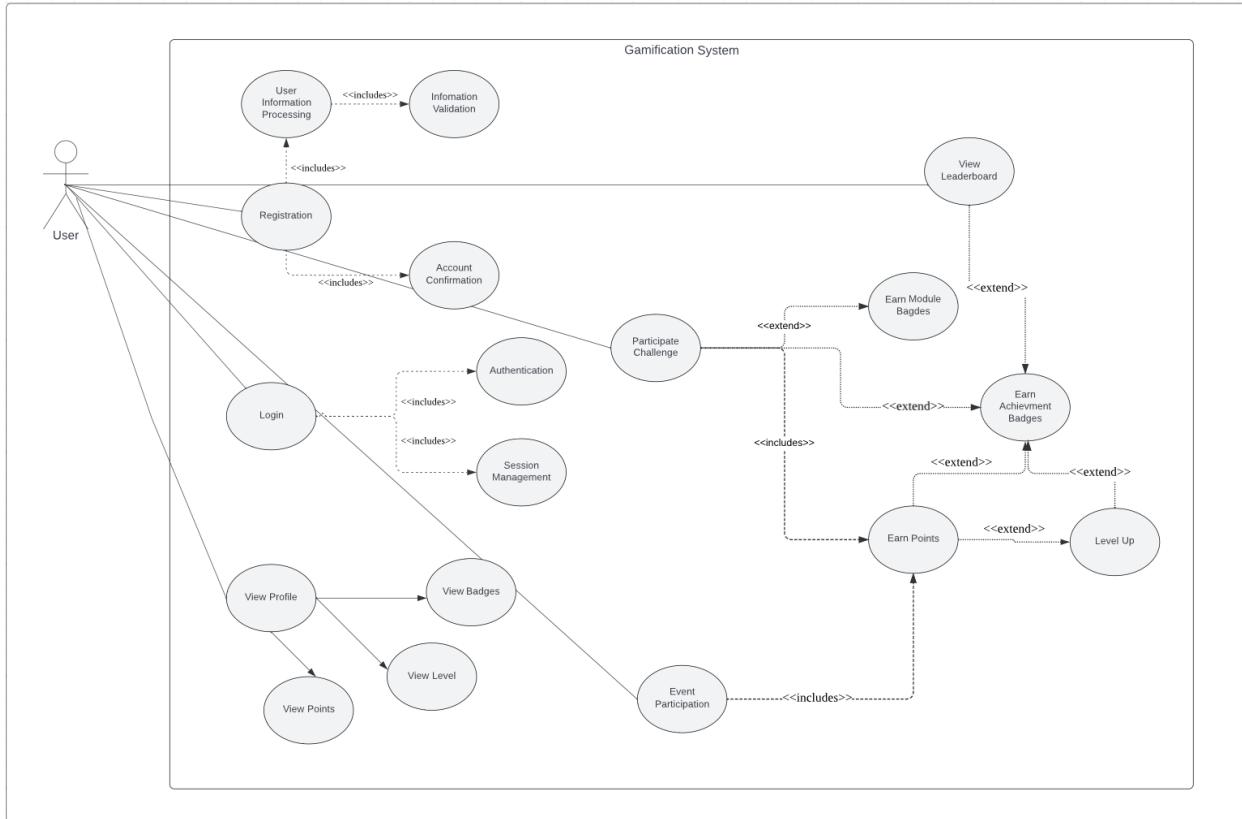


Figure 4.1: Use Case Diagram of Soft Skill Gamification System

Once a user is logged in into the system, users are able to explore their profile, viewing their level, points earned, and badges earned. To enhance user engagement, users can earn points through events and soft skills challenge participation. Upon completing all the challenges within a module,

users may earn a module completion badge and achievement badges if the criteria are met. These rewards and badges system recognize the user's accomplishment and engagement in the system.

Users could level up their account by earning points through various engagement activities. During the leveling up process, users can track their progress and could earn extra achievement badges. Earning points also allow users to compete on the leaderboard for a sense of competition, and they can earn badges upon reaching the first position.

4.5 Use Case Description

Table 4.5 until Table 4.9 shows the use case ID, brief description, primary actor, pre-conditions, post-conditions, actor action, system response, alternative flow for each use case.

Use Case ID: UC-001	User Creation (Register)
Brief Description	Users register for an account using username, email address and password.
Primary Actors	User
Preconditions	
1. The email address should not be registered previously. 2. Users should not be logged in	
Actor Action	System Response
1. The user enters their personal details including username, email address, password, and gender as optional	
	2. Verify if the user already has an account
	3. If an account doesn't exist, create one using the provided information
	4. Inform the user that the account has been successfully created

<p>Alternative Flow</p> <p>3a. In the event that a user has an account, then no new accounts can be established.</p>																	
<p>Post-Condition</p> <ol style="list-style-type: none"> 1. A new user account is created. 																	
<i>Table 4.5: User Registration Use Case</i>																	
<table border="1"> <tr> <td>Use Case ID: UC-002</td><td>User Authentication (Login)</td></tr> <tr> <td>Brief Description</td><td>Users log into their account, and the system authenticates their credentials.</td></tr> <tr> <td>Primary Actors</td><td>User</td></tr> <tr> <td>Preconditions</td><td> <ol style="list-style-type: none"> 1. Users must have a registered account. 2. Users should not be logged in </td></tr> <tr> <th>Actor Action</th><th>System Response</th></tr> <tr> <td>1. The user enters their email address and password.</td><td></td></tr> <tr> <td></td><td>2. Authenticate user's login credential corresponds to an account in the database.</td></tr> <tr> <td></td><td>3. Once the user's login credentials are verified, they are logged in and taken to the home page.</td></tr> </table>		Use Case ID: UC-002	User Authentication (Login)	Brief Description	Users log into their account, and the system authenticates their credentials.	Primary Actors	User	Preconditions	<ol style="list-style-type: none"> 1. Users must have a registered account. 2. Users should not be logged in 	Actor Action	System Response	1. The user enters their email address and password.			2. Authenticate user's login credential corresponds to an account in the database.		3. Once the user's login credentials are verified, they are logged in and taken to the home page.
Use Case ID: UC-002	User Authentication (Login)																
Brief Description	Users log into their account, and the system authenticates their credentials.																
Primary Actors	User																
Preconditions	<ol style="list-style-type: none"> 1. Users must have a registered account. 2. Users should not be logged in 																
Actor Action	System Response																
1. The user enters their email address and password.																	
	2. Authenticate user's login credential corresponds to an account in the database.																
	3. Once the user's login credentials are verified, they are logged in and taken to the home page.																
<p>Alternative Flow</p> <p>3a. If the user's login credentials do not match an account in the database, users are not able to login.</p>																	
<p>Post-Condition</p> <ol style="list-style-type: none"> 1. Users logged in into the system. 2. Users can view the full functionality of the website and their account. 																	

Table 4.6: User Authentication Use Case

Use Case ID: UC-003	Event Participation
Brief Description	Users manually enter their participation in physical event and system record their entries in the history and rewards the user with points.

Primary Actors	User
Preconditions	
1. Users must log in into the system	
Actor Action	System Response
1. The user fill in the event participation form	
2. Fill in details such as username, event name, hosting club, date, and time.	
	3. Record into user event history
	4. Rewards user with points
Alternative Flow	
1a. If user did not log in into the system, the user will not be able to fill in the form	
3a. If user has submitted 3 participation records, user will be award with Socialite Elite Badge automatically.	
4a. If this is user first time earning points, user will be awards with Point Pioneer Bagde automatically.	
Post-Condition	
1. User event form were recorded into the system.	
2. User has been rewarded with the correct number of points into their account.	

Table 4.7: Event Participation Use Case

Use Case ID: UC-004	Soft Skill Challenges
Brief Description	Users start a challenge from one of the soft skill modules and the system record their progress and rewards the user with completion points.
Primary Actors	User
Preconditions	
1. Users must log in into the system	
Actor Action	System Response
1. The user start one of the challenges	

2. User completed the task instructed inside the challenges	
	3. Record user completion into the system
	4. Rewards user with points
	5. Lead user to next challenges
<p>Alternative Flow</p> <p>1a. If user did not log in into the system, the user will not be able to start the challenges</p> <p>3a. If this is user first time participate in the challenge, user will be award with Module Explorer Badge automatically.</p> <p>4a. If this is user first time earning points, user will be awards with Point Pioneer Bagde automatically.</p> <p>5a. If user has completed all challenges, the module will be marked as completed, and user will be awards with Module Master Badge automatically.</p>	
<p>Post-Condition</p> <ol style="list-style-type: none"> 1. Each user progress were recorded into the system. 2. User has been rewarded with the correct number of points into their account. 3. User leaded to the next challenges. 	

Table 4.8: Soft Skill Challenges Use Case

Use Case ID: UC-004	User Points & Level
Brief Description	User earned points through different task and activities and level up their account.
Primary Actors	User
<p>Preconditions</p> <ol style="list-style-type: none"> 1. Users must log in into the system 	
Actor Action	System Response
1. User collect points from different activities and tasks.	
	2. System track the user points and level requirements
	3. Level up the user if user meet the level requirements

	4. Update user rank in the leaderboard according to the points earned.
Alternative Flow	<p>3a. If user level reached Level 1 and Level 5, user will be awarded with Skill Apprentice (Level 1) Badge, and Skill Sage (Level 5) Badge automatically.</p> <p>4a. If user reached first place in the leaderboard, the user will be awarded with Lead Voyager Badge automatically.</p>
Post-Condition	<ol style="list-style-type: none"> 1. User has been level up according to the number of points earned. 2. User level and progress has been updated on their account.

Table 4.9: User Points and Level Use Case

4.6 Sequences Diagram

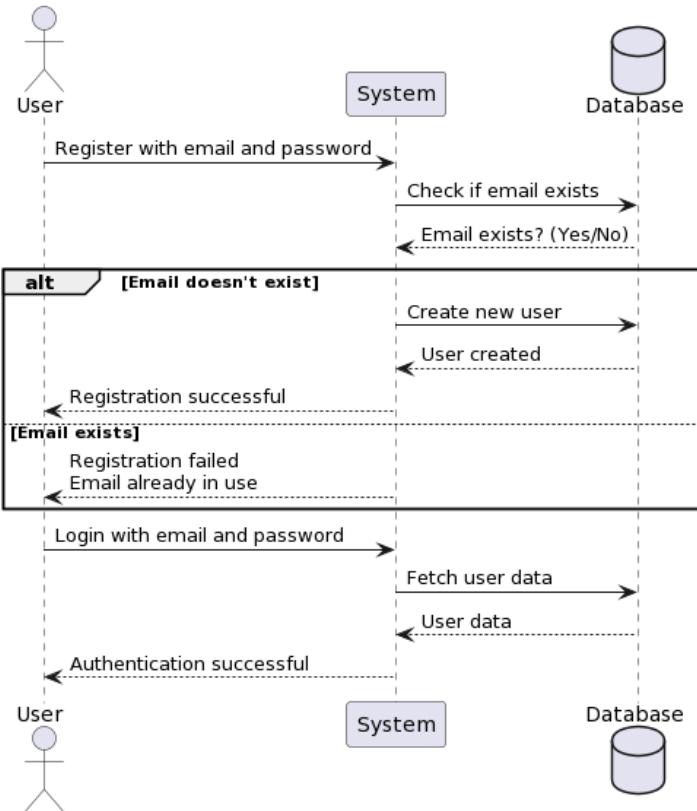


Figure 4.2: Sequence Diagram for User Creation & Authentication

Figure 4.2 illustrates the sequence diagram for user registration and login processes within the gamification system. This sequence diagram captures the flow of events during user registration and login, emphasizing the interaction between the user, system, and database components in the gamification system. The sequence begins with the "User" actor initiating the registration process by providing an email and password to the "System." The system, in turn, communicates with the "Database" to check if the provided email already exists. In the scenario where the email doesn't exist, the system proceeds to create a new user by interacting with the database. Once the user is successfully created, the system informs the user of the successful registration. On the other hand,

if the email already exists, the system notifies the user that the registration has failed due to the email being in use. The sequence then transitions to the login process, where the user provides their email and password for authentication. The system fetches the user data from the database, and upon successful authentication, communicates this information back to the user.

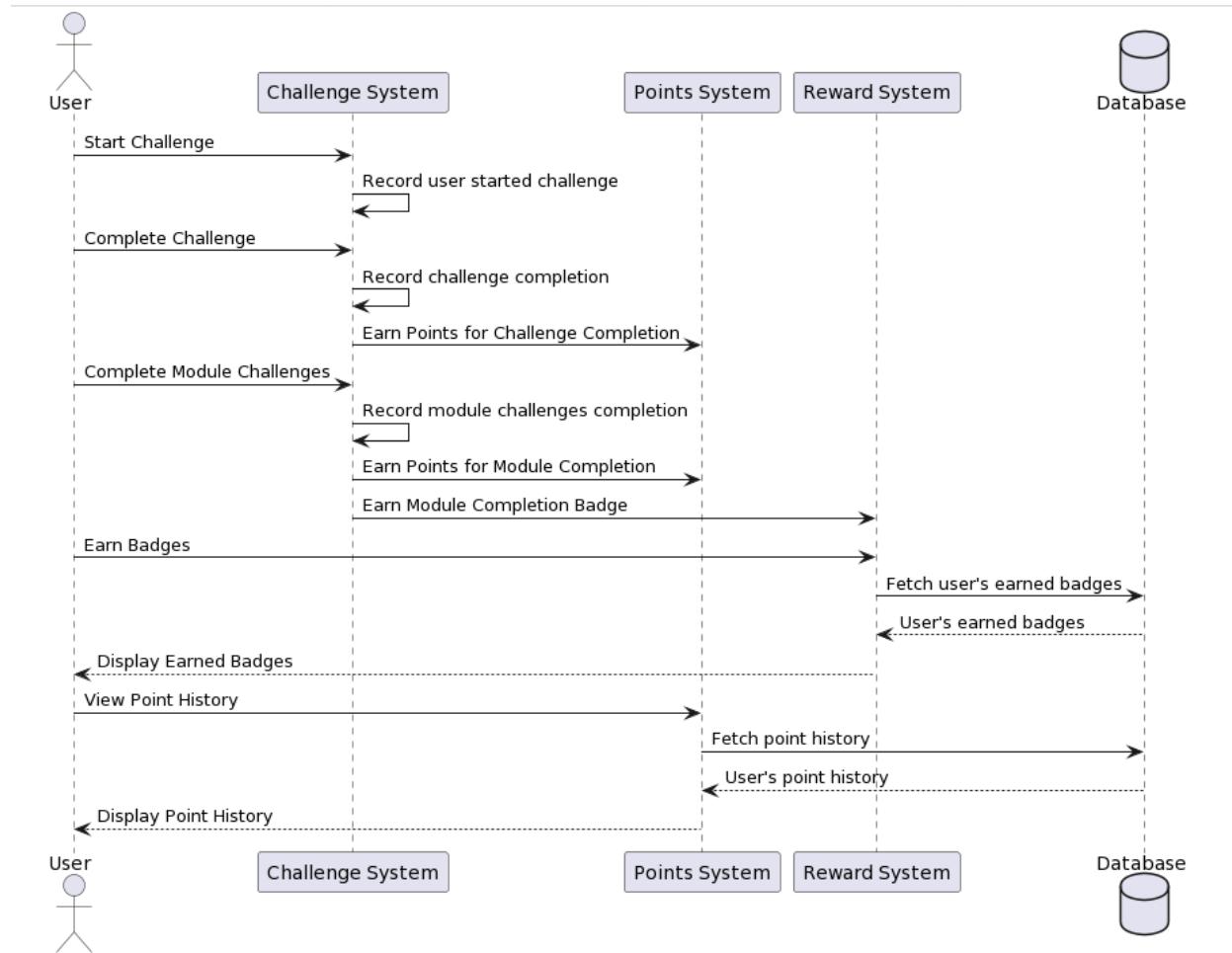


Figure 4.3: Sequence Diagram for Soft Skills Challenges & Rewards

Figure 4.3 illustrates the sequence diagram for soft skill challenges and rewards and the interaction between the user and essential components of the gamification system, namely the Challenge System, Points System, Reward System, and Database. The process begins as users start a

challenge using the Challenge System, which then records their engagement and collaborates with the Points System to award earned points. Progressing through challenges associated with a module triggers the recording of achievements and the allocation of points for module completion. Users are then rewarded with Module Completion Badges via the Reward System. Moving beyond challenges, users receive badges by interacting with the Reward System, which retrieves information from the Database about the user's earned badges. This information is presented to the user, offering a comprehensive display of their recognized achievements. Additionally, users can request the Points System to display their point history, with the Points System fetching this data from the Database. This seamless interaction ensures a cohesive and rewarding user experience in the gamified environment.

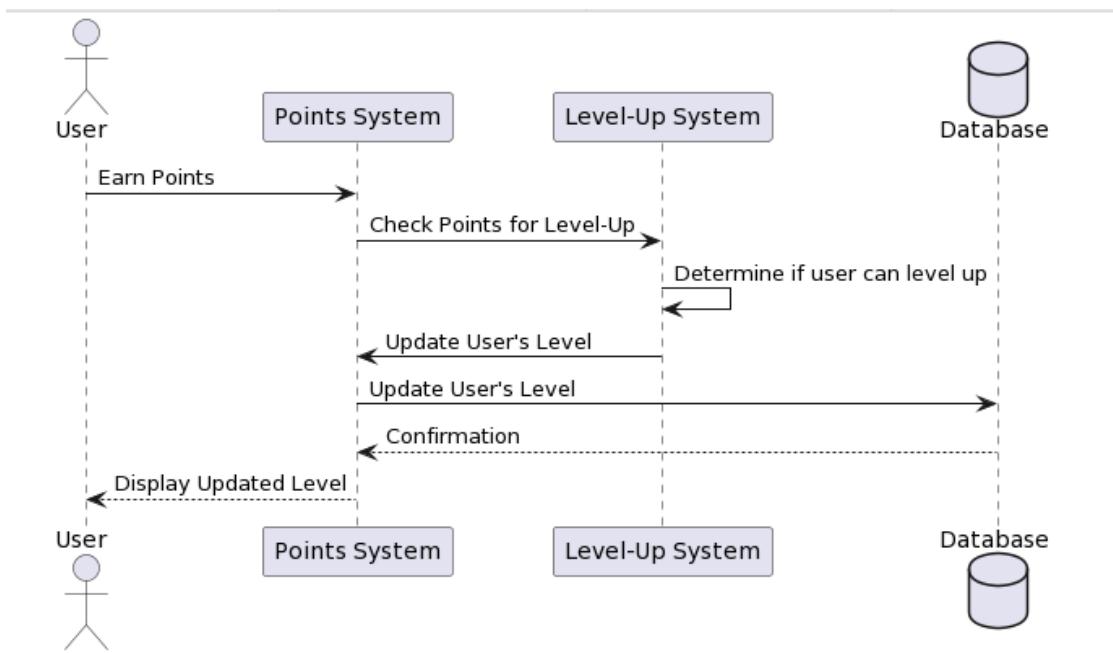


Figure 4.4: Sequence Diagram for User Points & Level System

Figure 4.4 presents a streamlined sequence diagram depicting the user's interaction with the Points System and Level-Up System components within the gamification framework. The user initiates the process by earning points through various activities. Subsequently, the Points System collaborates seamlessly with the Level-Up System to assess whether the accumulated points meet the criteria for a level-up. Internally, the Level-Up System meticulously evaluates the user's points and determines whether they have reached the criteria for a level advancement. If the conditions are met, the Level-Up System triggers the Points System to update the user's level, initiating a crucial update process. The Points System, in turn, interacts with the Database to confirm and store the updated user level securely. The user is then presented with the refreshed level information, displaying the outcome of their efforts.

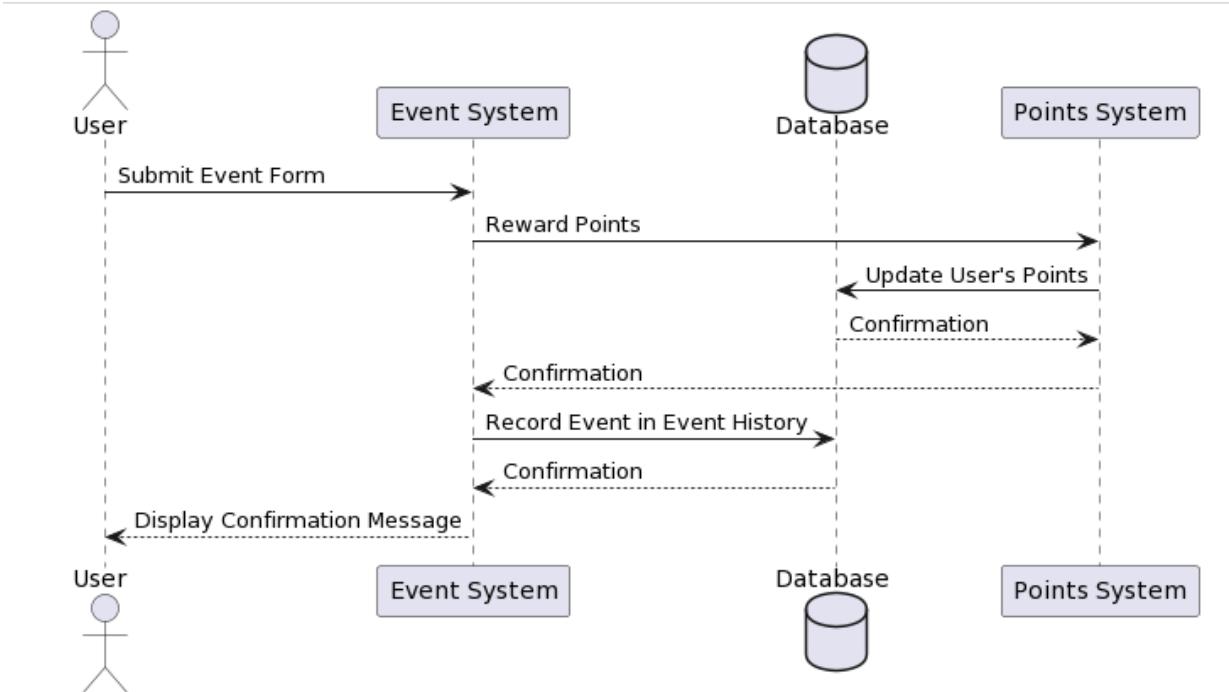


Figure 4.5: Sequence Diagram for User Event Participation

Figure 4.5 illustrates the sequence diagram for the Event System, including the user's interaction with the essential components of the gamification system, namely the Event System, Points System, and Database. The user initiates the process by submitting an event form through interaction with the Event System. Upon successful submission, the Event System collaborates with the Points System to reward the user with points for their active participation. The Points System, acting as a central hub for point-related activities, communicates with the Database to securely update the user's points, ensuring the accuracy and integrity of the recorded information. The Database, in turn, confirms the update back to the Points System. Simultaneously, the Event System records the user's participation in the event in the Event History, enhancing the user's profile with a comprehensive overview of their engagement.

4.7 Class Diagram

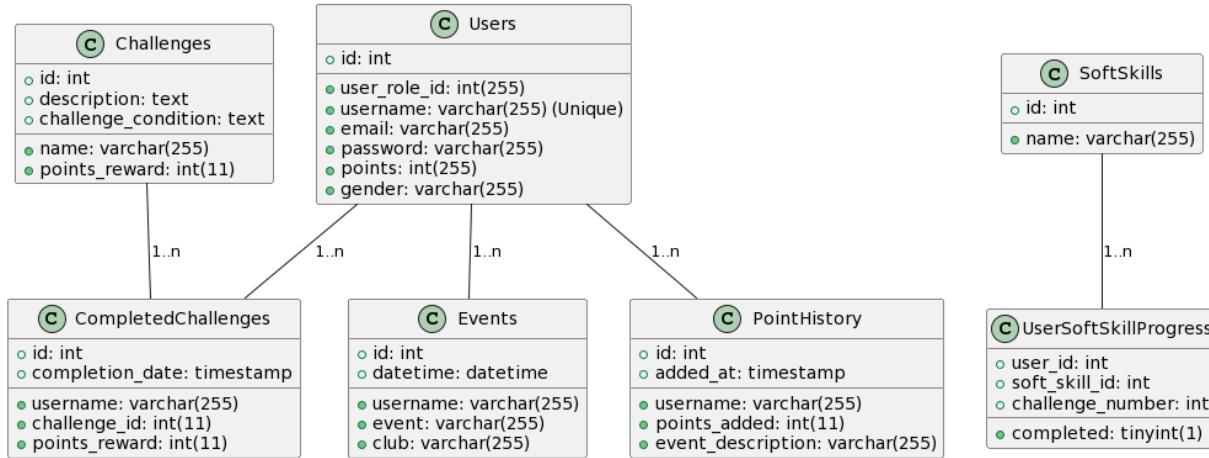


Figure 4.6: Class Diagram for Soft Skill Gamification System

Figure 4.6 shows the class diagram which reflects the structural organization of the gamification system's database, including key entities and their interrelationships. This structured representation

aids in understanding how various elements of the system interact and contribute to the gamified user experience.

The "Challenges" class represent the module's challenges, each identified by a unique integer ID and characterized by attributes such as name, description, challenge conditions, and points reward. Completed challenges are represented by the "CompletedChallenges" class, capturing data on users, associated challenges, awarded points, and completion timestamps. The "Events" class represents user participation in events, storing details like event name, hosting club, and datetime. Users, central to the system, are delineated by the "Users" class, featuring attributes like username, email, password, points, and gender. Various associations connect users with completed challenges, events, point history, and soft skill progress.

The "PointHistory" class logs entries detailing points added to users, including the event's description and timestamp. Soft skills, encapsulated in the "SoftSkills" class, are defined by an ID and name, forming the basis for user skill progress tracking. The "UserSoftSkillProgress" class represents a user's progress in soft skills, tracking completion status for specific challenges associated with each skill. Throughout the diagram, associations illustrate the relationships between these classes, creating a comprehensive representation of the gamification system's data model.

4.8 System Architecture Pattern

Based on the requirements of the system, the most suitable system architecture pattern is Layered Architecture, specifically three-tier architecture. The layered architecture enforces a clear separation of concerns between presentation, business logic, and data access layer. This promotes maintainability and ease of understanding. The layered architecture provides flexibility in technology stack as different layers can be implemented using different technologies, and high adaptability to changes as changes can be implemented in their respective layers without causing the disruptions. Figure 4.7 provides an illustration of the layered system architecture pattern utilized for this project.

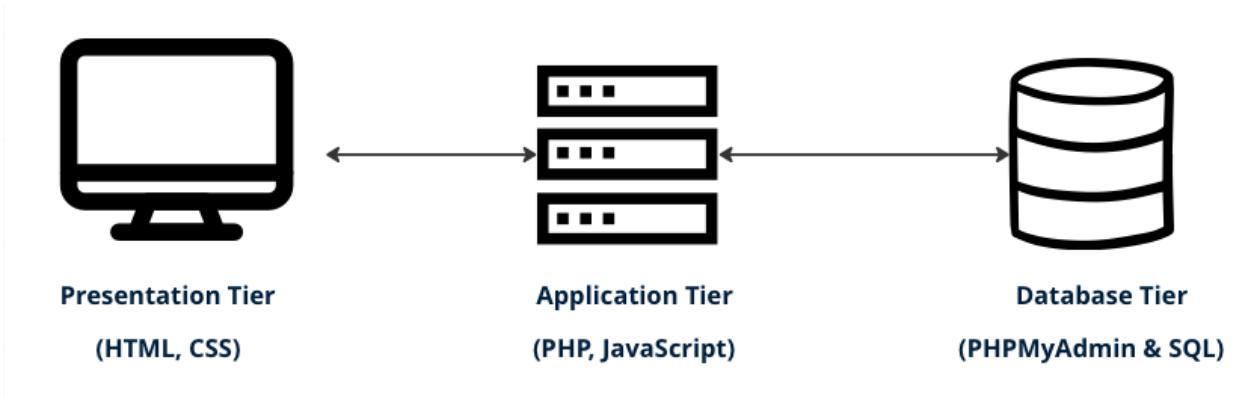


Figure 4.7: Layered Software Architecture Pattern

4.8.1 Layered Architecture Components

The layered architecture components table outlines the key technologies and responsibilities associated with each layer in the three-tier architecture. In the presentation layer, HTML5 and CSS3 are employed for user interface creation and client-side interaction, ensuring an engaging and responsive design. The application layer, powered by PHP and JavaScript, handles request processing, business logic implementation, and facilitates communication with the database. The data layer, comprising PhpMyAdmin and MySQL, manages data storage and retrieval, ensuring efficient and secure handling of information. This layered approach promotes a clear separation of concerns, enhancing maintainability, and facilitating technology stack flexibility for seamless adaptation to changes in the system. Table 4.10 shows the responsibilities of the selected technology stacks.

Technologies	Layer	Responsibilities
HTML5	Presentation Layer	<ul style="list-style-type: none">• User interface creation• Client-side interaction
CSS3		
PHP	Application Layer	<ul style="list-style-type: none">• Request handling• Business logic implementation• Database interaction
JavaScript		
PhpMyAdmin (MySQL)	Data Layer	<ul style="list-style-type: none">• Data storage• Data retrieval

Table 4.10: Layered Architecture Components

4.9 Findings for Phase 2

From identified the gamification elements in the findings for Phase 2 shown in Table 4.1. Eight elements were selected from Table 4.1 and shown in Table 4.2. The section below present the findings for Phase 2 which includes the Gamification Element Design and User Interface Design.

4.10 Gamification Element Design

Gamification Element Design includes the specific design aspects related to the incorporation of gamification elements within the system such as the design for Achievement Badges, Module Completion Badge, Points & Levels elements.

4.10.1 Achievement Badges

	Point Pioneer Description: Users need to earn their first point to receive this badge.
	Module Explorer Description: Users need to start any of the soft skills module challenges to receive this badge.

	<p>Module Master</p> <p>Description:</p> <p>Users need to complete any soft skill module to receive this badge.</p>
	<p>Lead Voyager</p> <p>Description:</p> <p>Users need to reach to the top of the leaderboard to receive this badge.</p>
	<p>Socialite Elite</p> <p>Description:</p> <p>Users need to participate in 3 events to receive this badge.</p>
	<p>Skill Apprentice</p> <p>Description:</p> <p>Users need to level up to level 1 to receive this badge.</p>

	Skill Sage Description: Users need to level up to level 5 to receive this badge
---	--

Table 4.11: Gamification Elements - Achievement Badges Design

Table 4.11 outlines the design details for Achievement Badges. Achievement Badges serve as visual representations of users' accomplishments within the gamification system. The design philosophy behind these badges aims to acknowledge and celebrate users' milestones and achievements. For instance, the "Point Pioneer" badge is awarded to users upon earning their first point, signifying the initiation of their journey within the system. Similarly, the "Leadership Voyager" badge recognizes users who reach the top of the leaderboard, showcasing their competitive spirit. The design prioritizes clarity and distinctiveness to ensure that users can easily recognize and take pride in their achievements.

4.10.2 Module Completion Badges

	<p>Leadership Completion Badge</p> <p>Description:</p> <p>Users need to complete the leadership module to receive this completion badge.</p>
	<p>Communication Completion Badge</p> <p>Description:</p> <p>Users need to complete the communication module to receive this completion badge.</p>
	<p>Teamwork Completion Badges</p> <p>Description:</p> <p>Users need to complete the teamwork module to receive this completion badge.</p>

Table 4.12: Gamification Elements - Module Completion Badges Design

Table 4.12 outlines the design details for Module Completion Badges. Module Completion Badges are designed to mark the successful completion of specific soft skills modules. The design considerations emphasize the relevance of each badge to its corresponding module. For instance, the "Leadership Completion Badge" signifies the completion of the leadership module, providing a visual representation of the user's proficiency in that particular skill area. These badges are crafted to be visually appealing and serve as a source of motivation for users to engage with and completely different skill modules.

4.10.3 Other Gamification Element

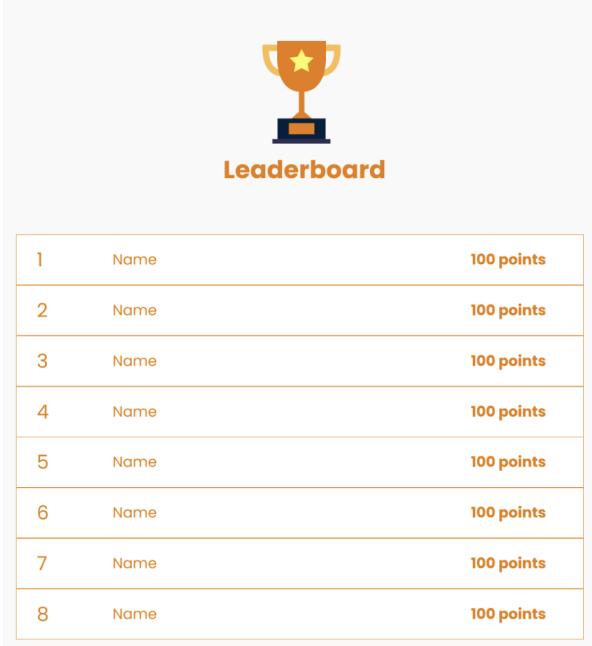
 <p>Points Earned</p> <p>100 points</p>	<p>Points Description: Users are able to view total points they earned</p>																								
 <p>LVL 5</p> <p>Earn 50 more points to reach next level</p> <p>LVL 6</p>	<p>Level Description: Users are able to check their progress on their profile.</p>																								
 <p>Leaderboard</p> <table border="1"> <tbody> <tr> <td>1</td> <td>Name</td> <td>100 points</td> </tr> <tr> <td>2</td> <td>Name</td> <td>100 points</td> </tr> <tr> <td>3</td> <td>Name</td> <td>100 points</td> </tr> <tr> <td>4</td> <td>Name</td> <td>100 points</td> </tr> <tr> <td>5</td> <td>Name</td> <td>100 points</td> </tr> <tr> <td>6</td> <td>Name</td> <td>100 points</td> </tr> <tr> <td>7</td> <td>Name</td> <td>100 points</td> </tr> <tr> <td>8</td> <td>Name</td> <td>100 points</td> </tr> </tbody> </table>	1	Name	100 points	2	Name	100 points	3	Name	100 points	4	Name	100 points	5	Name	100 points	6	Name	100 points	7	Name	100 points	8	Name	100 points	<p>Leaderboard Description: Users can view the leaderboard to experience a sense of competition.</p>
1	Name	100 points																							
2	Name	100 points																							
3	Name	100 points																							
4	Name	100 points																							
5	Name	100 points																							
6	Name	100 points																							
7	Name	100 points																							
8	Name	100 points																							

Table 4.13: Gamification Elements - Component Design

Table 4.13 shows other gamification elements' details such as Points, Level, Progress and Leaderboard. The gamification elements, including levels, points, progress, and the leaderboard, are designed to enhance user engagement. The level system provides a clear representation of skill development, progressing users as they accumulate points through challenges and modules. The point system serves as a measure of achievement, with a progress bar visually illustrating advancement towards the next level. Simultaneously, the leaderboard introduces a social

dimension, fostering competition by displaying user rankings. This design ensures to promote both motivation and a sense of community within the gamified environment.

4.11 User Interface Design

This section outlines the User Interface Design for the system including Color Scheme, Typography, Wireframe/Prototype.

4.11.1 Color Scheme

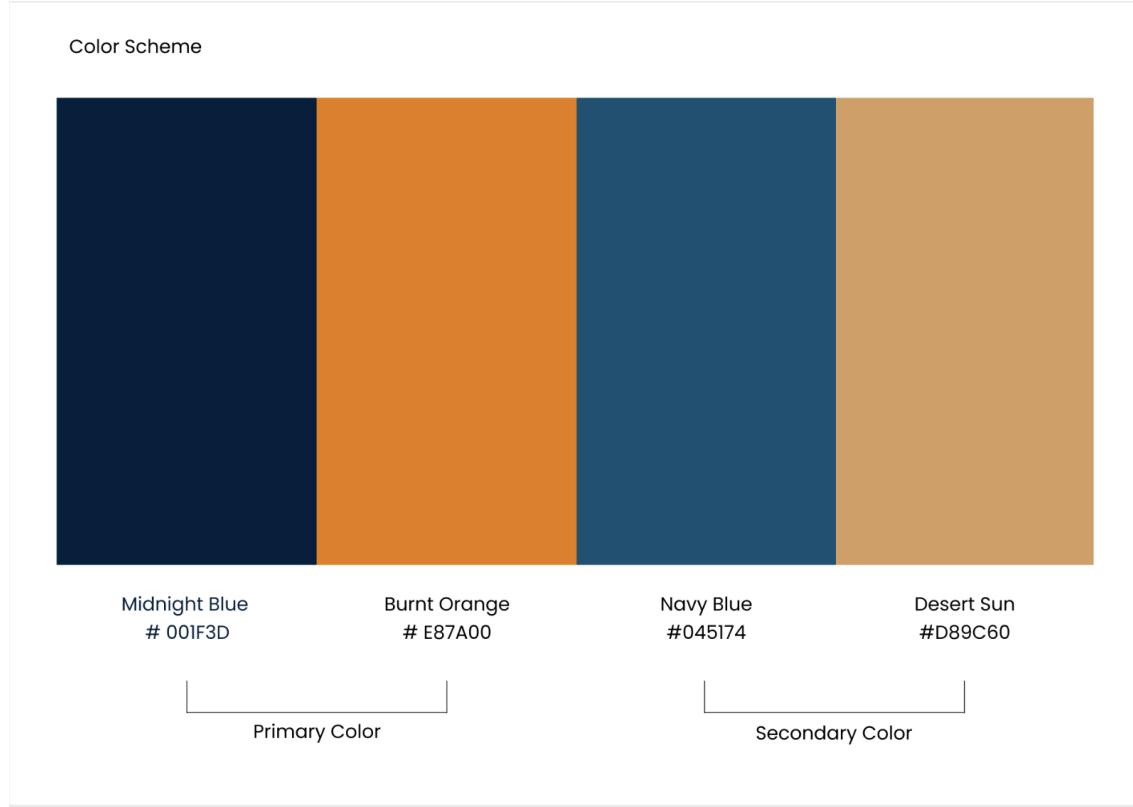


Figure 4.8: System Color Scheme

Figure 4.8 shows the color scheme of the system. The primary color scheme for this system is the combination of #001F3D (Midnight Blue), #E87A00 (Burnt Orange), #045174 (Navy Blue), #D89C60 (Desert Sun). The deep blue, representing professionalism and reliability, establishes a

sense of trust and credibility, which is crucial for a platform focused on skills development. On the other hand, the vibrant orange adds a dynamic and fun element, aligning with the gamification aspect and making the learning experience more engaging and enjoyable. This combination of colors not only conveys a sense of seriousness and expertise but also injects a touch of excitement and energy into the user interface.

4.11.2 Typography

The chosen typography for this system is **Poppins**. Poppins is a modern, sans-serif typeface known for its clean lines, versatility, and readability. The choice of Poppins aligns with the system's focus on soft skills development, providing a contemporary and approachable aesthetic. The clean and rounded letterforms of Poppins contribute to a friendly and accessible feel, ensuring that the textual content is easily readable and aesthetically pleasing. This typography choice aims to enhance the overall user experience by combining a professional look with a touch of modernity, reinforcing the system's commitment to effective and user-friendly communication.

4.11.3 Prototype

The section provides an in-depth exploration of the user interface designs through various iterations, offering a visual preview of key modules and functionalities within the gamification system. Each figure highlights specific aspects of the system, including the Register Module, Home Page, Soft Skills & Challenges, Event Tracker & Event History, User Profile & Points History, Display of Locked & Unlocked Badges, How to Earn Badges, and the Leaderboard. The prototypes show the system's navigational flow, elements, and interactive features, offering a comprehensive understanding of the user experience at different stages of the gamification platform's development.

Figma File : <https://www.figma.com/file/nn1UED0uzplwrB8fItzA8m/Soft-Skill-Gamification?type=design&node-id=0%3A1&mode=design&t=vFSdJkJczpRwk3y4-1>



Register

Login

Login

Don't have an account?
[Register Here](#)
[Back to Homepage](#)

[Already have account?
\[Login Here\]\(#\)](#)

Register

Figure 4.9: Prototype - Login/Register

Figure 4.9 depicts the user interface design of the Register Module from Iteration 1. Users are required to input their username, email address, and select their gender from the options “Male,” “Female,” or “Rather not to say.” Additionally, users need to set a password and confirm it. Both the username and email address must be unique, and the confirmation password must match the entered password for successful registration. Upon registering, users will be directed to the login page. Within the login page, users are prompted to enter their registered email and password for authentication.



Figure 4.10: Prototype - Home Page

Figure 4.10 showcases the user interface design of the Home Page (Iteration 1). Users are redirected to the Home Page upon logging into the system. The Home Page comprises three sections: the Banner Section, Benefit Section, and Soft Skills Section. In the Banner Section, a brief introduction to soft skills is provided. The Benefit Section highlights the gamification elements of the system, illustrating the rewards users can earn, such as points, levels, badges, and leaderboard rankings. Finally, the Soft Skills Section allows users to choose which soft skill module to explore, leading them to the respective soft skill pages based on their selection.

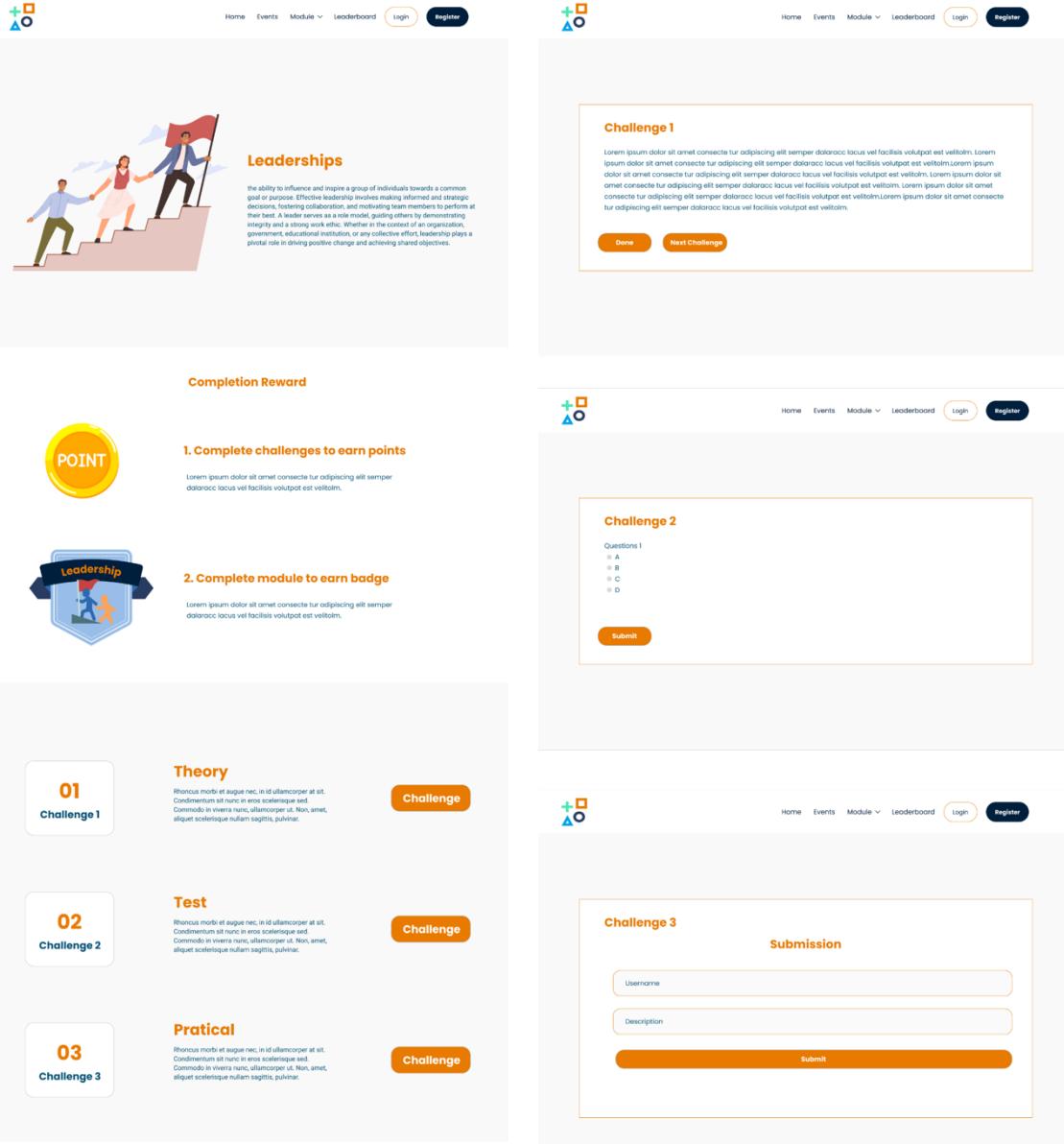


Figure 4.11: Prototype - Soft Skills & Challenges

Figure 4.11 presents the user interface design of soft skills pages, featuring three challenges: Theory (Challenge 1), Test (Challenge 2), and Practical (Challenge 3). The soft skills page consists of three sections: the banner section, rewards section, and challenges section. The banner section displays the soft skills' name and description. The rewards section outlines the incentives users

will receive upon completing the challenge or module. The challenges section allows users to initiate the challenges. In Theory (Challenge 1), users acquire basic theory knowledge about the soft skills. In Test (Challenge 2), users face three multiple-choice questions (MCQs) to assess their understanding of the soft skill. In Practical (Challenge 3), users submit their real-world experiences practicing the soft skill.

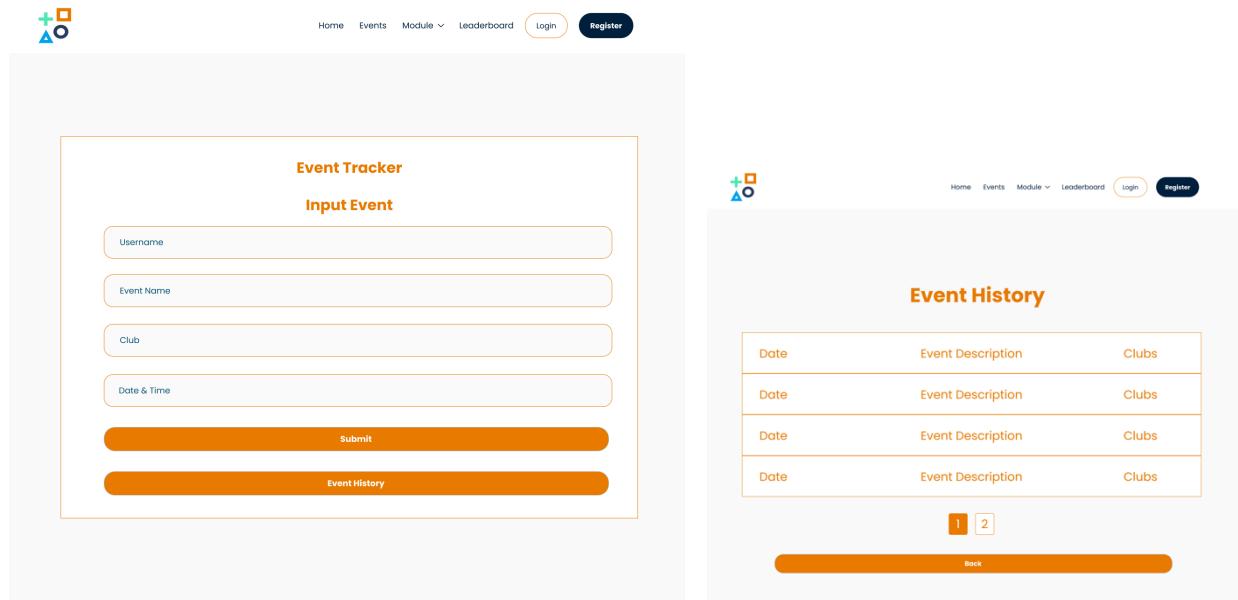


Figure 4.12: Prototype - Event Tracker & Event History

Figure 4.12 shows the user interface design of Event Tracker and Event History. This allows users to record and track their event participation on campus to earn points. Users can check their event history on the Event History Page. This feature enhances user engagement by enabling them to actively participate in on-campus events, contributing to their points and overall progress. The

Event History Page provides a comprehensive overview, allowing users to revisit their past event contributions and track their journey within the system.

The image displays two side-by-side prototypes of a user interface. The left prototype is the 'User Profile' page, featuring a user icon, a greeting 'Hello, Username', a level indicator (LVL 5 to LVL 6), points earned (100 points), ranking (No 1), badges earned (Leadership badge), and achievements (Level Up 1 and Level Up 5). It also includes buttons for 'Learn How to Earn Badges' and 'View Point History'. The right prototype is the 'Points History' page, showing a table with columns for Date, Event Description, and Points, and a navigation bar with page numbers 1 and 2.

Figure 4.13: Prototype - User Profile & Points History

Figure 4.13 shows the user interface design of User Profile and Point History. In the user profile, users can check their level, progress to the next level, total points earned, current ranking in the leaderboard, earned completion badges, earned achievement badges, and check their point history.

Users can conveniently track the locations and timestamps associated with their point earnings on the Point History Page. This User Profile design offers users a centralized hub to monitor their achievements, progress, and overall engagement within the system. The Point History Page provides a detailed log of when and where users earned points, offering a transparent view of their journey and contributions to the platform.

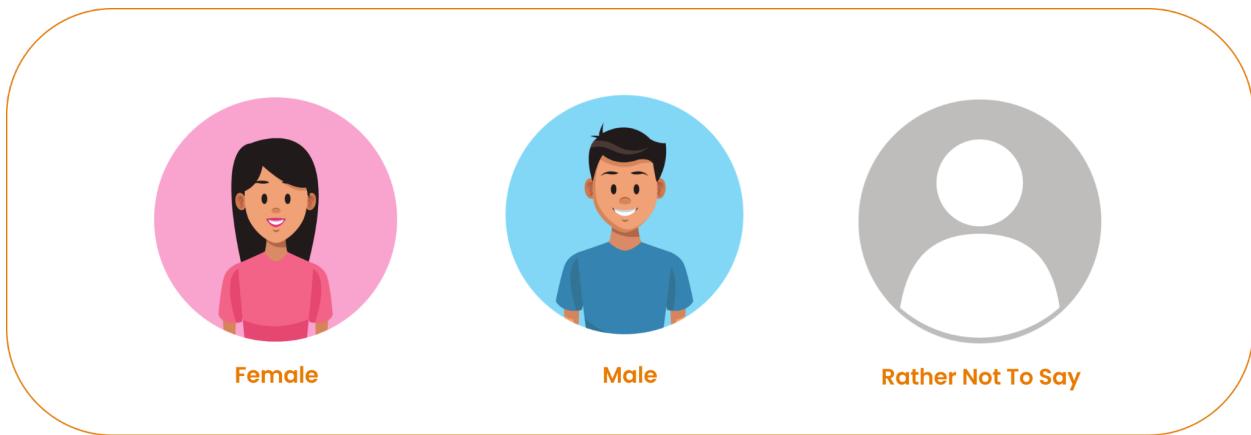


Figure 4.14: Prototype - Customize Profile Picture

Figure 4.14 shows the prototype design of the user's profile picture. During user registration, users need to select their gender in the registration form. The profile picture will be shown in their account based on their selection (Female or Male). If users choose not to disclose their gender, the profile picture will show as the general profile picture in their account, providing users a more customizable experience with their account.

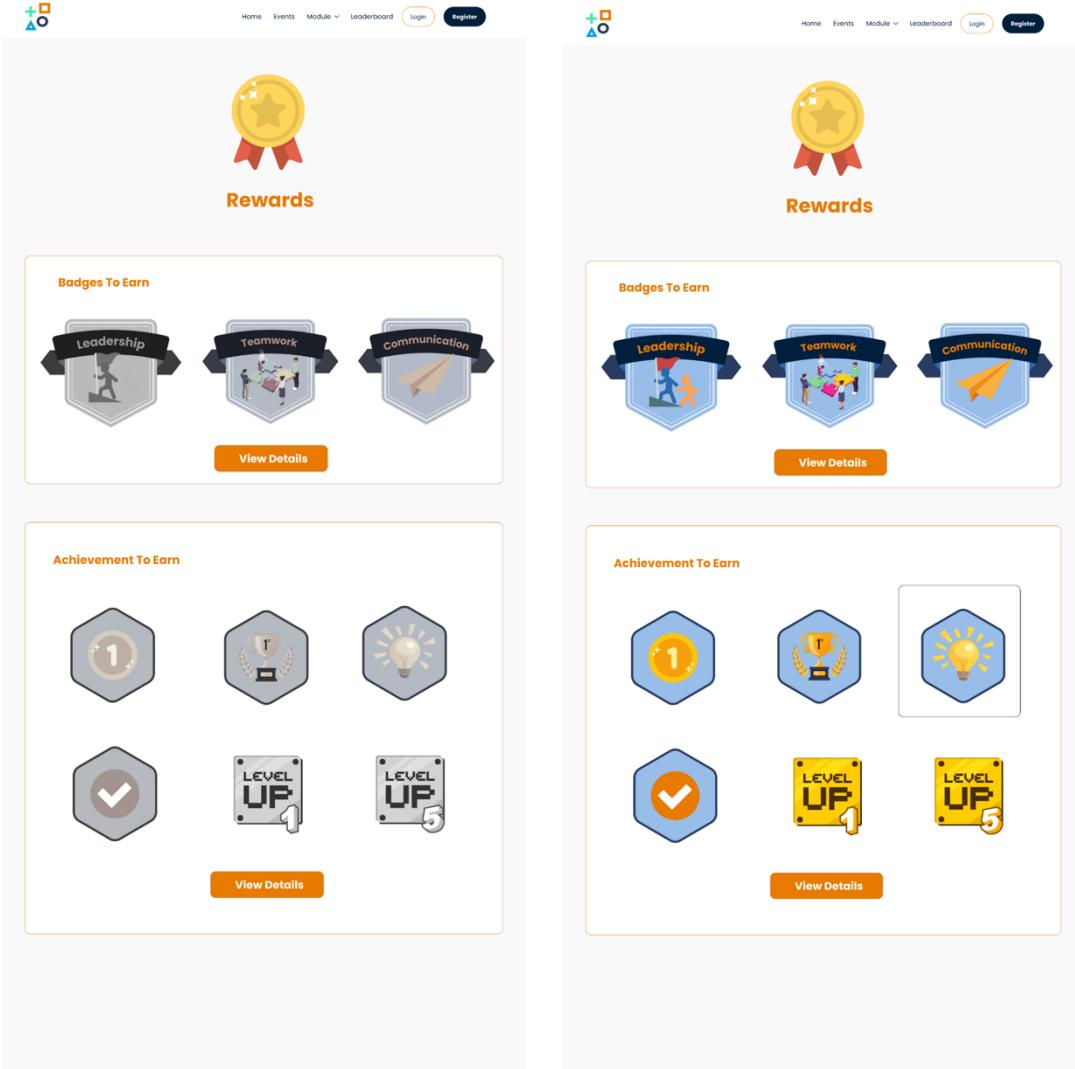


Figure 4.15: Prototype- Display Locked & Unlocked Badges

Figure 4.15 shows the user interface for badge display. The system categorizes badges into two types: Locked and Unlocked. Locked badges are represented in gray, indicating that users haven't achieved them yet. The colored version signifies that the user has successfully unlocked the achievement. The badge display serves as a visual representation of users' accomplishments in the gamification system. The distinct differentiation between locked and unlocked badges offers users a clear and motivating view of their progress and the achievements they have yet to unlock.

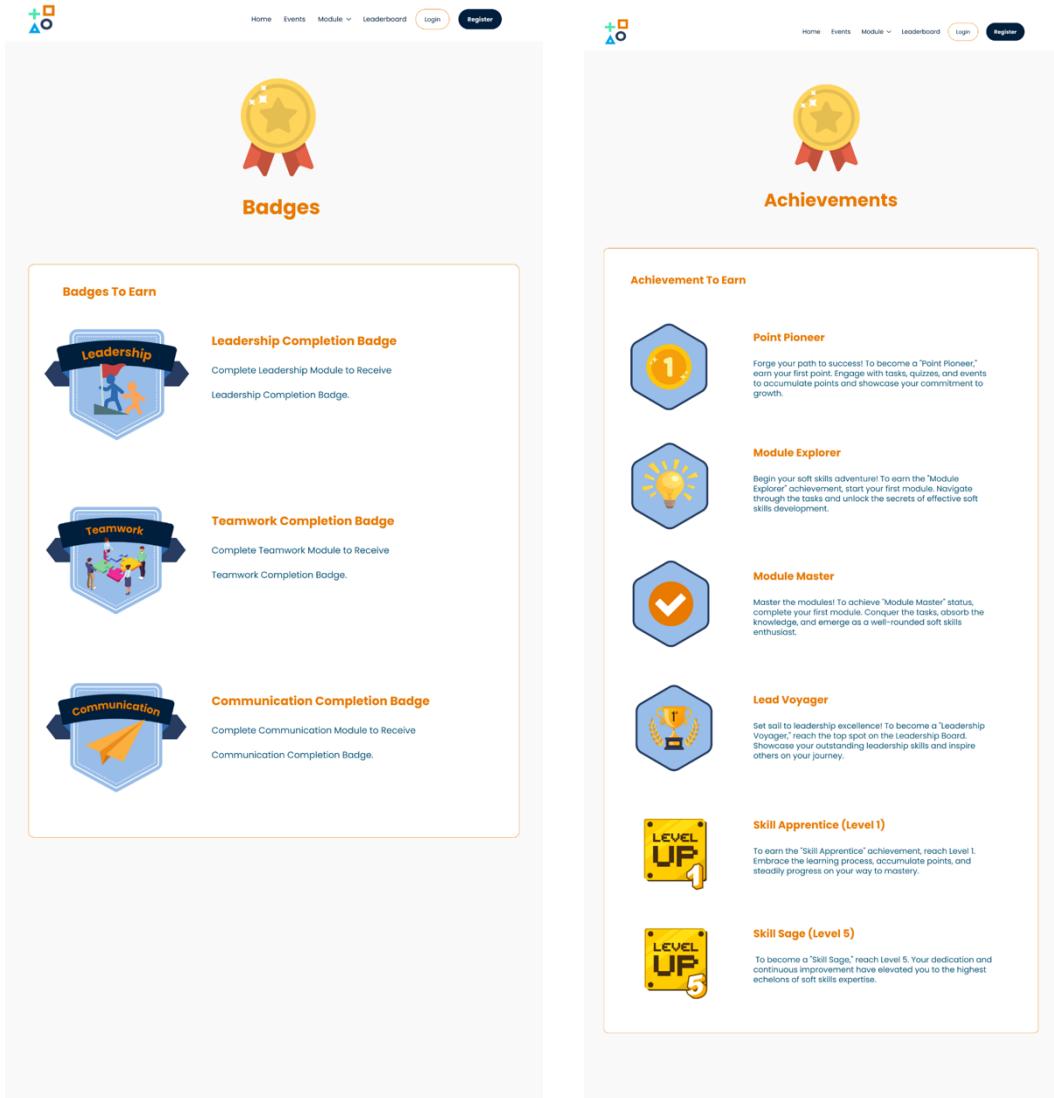


Figure 4.16: Prototype - How to earn badges

Figure 4.16 displays the user interface of Badge Details, providing users with insights into how each badge can be earned. Users can view badges along with their respective names and instructions on the criteria for unlocking them. Additionally, this page serves as a comprehensive guide, offering users clear instructions and criteria to achieve each badge, fostering motivation and a sense of accomplishment in their gamification journey.

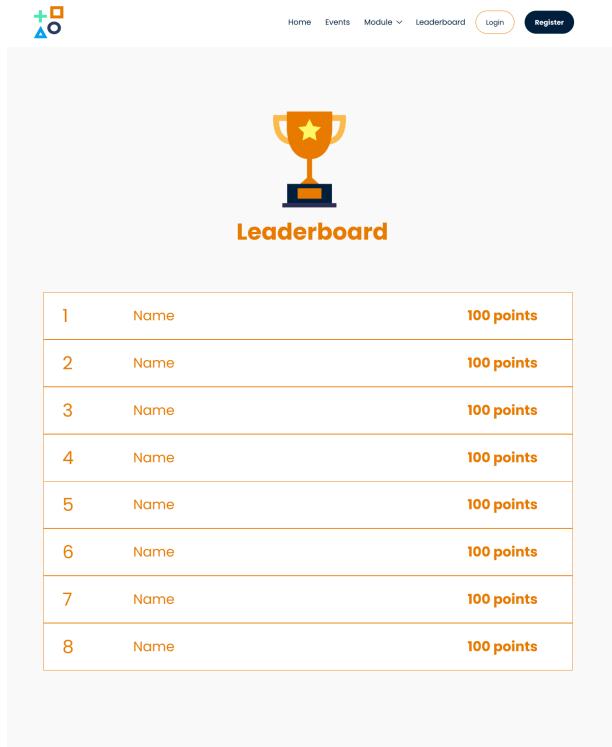


Figure 4.17: Prototype - Leaderboard

Figure 4.17 showcases the user interface design of the Leaderboard, providing users with a dynamic platform to track their progress and compare achievements with others. Users can view their current ranking, encouraging healthy competition and motivation. The leaderboard fosters a sense of community and accomplishment as users strive to climb the ranks, enhancing the overall gamified experience.

4.12 Summary

In summary, Chapter 4 navigates through the essential components of the Soft Skill Gamification System, presenting a detailed analysis of system requirements, use case diagrams, and use case descriptions. The chapter introduces the three-tier layered architecture pattern as the most suitable structural framework, emphasizing clarity and separation of concerns. Gamification elements such as points, levels, leaderboards, badges, and challenges, providing insights into how these elements contribute to user engagement and motivation. The chapter explores the design phase, outlining the color scheme, typography, and prototype for the user interface. Together, these elements form a foundation for the development of a gamified platform that not only promotes soft skill development but also creates an motivative and enjoyable learning experience.

Chapter 5

Implementation

5.1 Introduction

Chapter 5 focuses on the Implementation phase of the Soft Skill Gamification System, navigating through the development tools and languages utilized in this project. Section 5.2 provides an overview of the technology stacks, including HTML5, CSS3, PHP, JavaScript, PHPmyAdmin, MySQL, XAMPP, GitHub, Git, Visual Studio Code (VSCode), and Figma. This array of tools forms the backbone of the development process, contributing to the responsive user interface, server-side scripting, dynamic functionalities, and database management. Section 5.4 showcases the developed system, offering a visual presentation of the platform. Section 5.5 until Section 5.8, where the system undergoes testing through Test structure, Test Design, Test Defect Report, Test Coverage and Test cases, ensuring a reliable and seamless user experience.

5.2 Findings for Phase 3

Github Link: <https://github.com/karen-nke/student-gamified>

Table 5.1 presents the technology stacks employed in the gamification project. HTML5 and CSS3 were utilized for front-end implementation, while PHP, JavaScript, and SQL were employed for back-end development. XAMPP served as the hosting solution for the website in localhost, with Visual Studio Code chosen as the integrated development environment (IDE) for coding. GitHub

and Git facilitated version control, ensuring organized code management. Additionally, Figma played a crucial role in User Interface Design and Prototyping.

Tools/Language	Description
HTML5 & CSS3	The user interface was crafted using HTML and CSS , to ensure a responsive and visually engaging design. The frontend development process was streamlined with the use of PHP for server-side scripting.
PHP	PHP served as the backbone for implementing the business logic and dynamic functionalities of the website. PHP also served as server-side scripting and communication with the database.
PHPmyAdmin & MySQL	PHPmyAdmin , in conjunction with MySQL , was utilized for the database management system. This combination facilitated the organization and the retrieval of data.
XAMPP	The Apache web server was employed to host and serve PHP scripts, to ensure efficient communication between the server and the client.
GitHub & Git	GitHub was employed for version control, enabling seamless development environment, code tracking, and seamless integration of new features.
Visual Studio Code (VSCode)	Visual Studio Code (VSCode) was used as the integrated development environment (IDE) of this project.
Figma	Figma played a crucial role in the prototyping phase, allowing for the visualization of the user interface and user experience.

Table 5.1: Project Technology Stacks

5.3 System Structure

In alignment with the established three-tier architecture of the system shown in Figure 4.7, the **database tier** serves as the foundation for data management. This tier is represented by the *db_controller.php* file, responsible for establishing a secure connection to the database, managing credentials, and facilitating communication between the application and the underlying database. XAMPP includes MySQL, which manages your database locally. During development and testing, XAMPP ensures that the database tier functions seamlessly with the logic controller and presentation tier.

On the **presentation tier**, which includes various PHP files representing different pages (e.g., *account.php*, *register.php*, *login.php*), user interactions are managed. These files operate at the forefront of the user interface, handling the display and user experience. Each page in the presentation tier is responsible for distinct functionalities, providing an interactable interface for actions such as registration, login, and account management. XAMPP serves as the local server, allowing users to run and test PHP files representing different pages of the web application. This enables users to interact with the user interface and assess the functionality of various features.

Moving to the **application tier**, the *logic_controller.php* file embodies the logic controller tier. This file contains the functions that manage the core logic and functionalities of the system, including user data processing, point calculations, and gamification element handling. The functions were consolidated in a centralized manner waiting to be called and executed in the presentation tier. The utilization of the logic controller in the presentation tier forms a crucial link

in the system's functionality. PHP files for different pages interact with the logic controller, calling its modularized functions to execute specific tasks and retrieve relevant data.

5.4 Development of System

This section shows a visual representation of the gamification system's implementation through screenshots of the website. The website was implemented according to the Figma prototype design. It includes code snippets that showcase the functionality of specific functions. This section provides an overview of the user interface and system aesthetics at different development stages, along with insights into the underlying logic and coding details. The combination of visuals and code snippets provides a comprehensive view of the realized gamification platform, allowing for exploration of both design and technical aspects of the system's development journey.

5.4.1 Navigation Bar (header.php)



Figure 5.1: Navigation Bar - Before Login



Figure 5.2: Navigation Bar - After Logged in

Figure 5.1 shows the implementation of navigation bar before user login and Figure 5.2 shows the implementation of navigation bar after user has logged in into the system. Before the user log in

into the system, the buttons shown are "Login" and "Register". After the user logged in into the system, the button will be shown as "Account" and "Log Out".

```
if (isset($_SESSION['username'])) {  
    echo "  
        <button class=\"login-button\"><a href=\"account.php\">Account</a></button>  
        <button class=\"register-button\"><a href=\"Logout/logout.php\">Logout</a></button>  
    ";  
} else {  
    echo "  
        <button class=\"login-button\"><a href=\"Login/login.php\">Login</a></button>  
        <button class=\"register-button\"><a href=\"Login/register.php\">Register</a></button>  
    ";  
}
```

Figure 5.3: Code Snippet - Navigation Bar Button Implementation

Figure 5.3 provides a code snippet of the function that is used to check whether a user is currently logged in by verifying the existence of the 'username' key in the session. If a user is logged in (i.e., 'username' is set in the session), it displays buttons for account access and logout. The 'Account' button links to the 'account.php' page, and the 'Logout' button links to the 'Logout/logout.php' script for logging out. If no user is logged in, it displays buttons for login and registration. The 'Login' button links to the 'Login/login.php' page, and the 'Register' button links to the 'Login/register.php' page. This conditional display of buttons based on the user's login status enhances user experience and provides appropriate options accordingly.

5.4.2 Register and Login (register.php/login.php)

The figure displays two side-by-side web forms. Both forms share a common header featuring a logo composed of three overlapping geometric shapes: a green plus sign at the top, an orange square in the middle, and a blue triangle at the bottom. Below the logo, the word "Register" appears on the left form and "Login" appears on the right form.

Register Form Fields:

- Username (text input field)
- Email (text input field)
- Male (dropdown menu showing "Male")
- Password (text input field)
- Confirm Password (text input field)
- Register (orange rounded rectangular button)

Text below Register Form:

Already have an account?
[Login Here.](#)

Login Form Fields:

- Email (text input field)
- Password (text input field)

Text below Login Form:

Don't have an account?
[Click here to register.](#)
[Back to Homepage.](#)

Figure 5.4: Register and Login Page

Figure 5.4 shows the actual implementation of the register and login page of the website. The register and login form are created on two different files respectively. In the Register page, users are prompted to input essential information, including their unique username, email address, and gender selection. They are required to set a secure password and confirm it, ensuring accuracy. The system validates the uniqueness of both username and email address, password, displaying appropriate error messages if duplicates or errors are detected. Successful registration redirects users to the Login page. On the Login page, users are prompted to enter their registered email and password for authentication. The system verifies the credentials, granting access upon successful validation.

```

if (isset($_POST['submit'])) { //1
    $username = $_POST['username']; //2
    $email = trim($_POST['email']);
    $password = md5($_POST['password']);
    $confirmpassword = md5($_POST['confirmpassword']);
    $gender = $_POST['gender'];

    if ($password == $confirmpassword) { //3
        $sql = "SELECT * FROM users WHERE email='' . $email . """; //4
        $sql2 = "SELECT * FROM users WHERE username='' . $username . """;
        $result = mysqli_query($conn, $sql);
        $result2 = mysqli_query($conn, $sql2);

        if (mysqli_num_rows($result) > 0) { //5
            echo "<script>alert('Email Already Exists.')</script>";
        } else if (mysqli_num_rows($result2) > 0) { //5
            echo "<script>alert('Username Already Exists.')</script>";
        } else {
            $sql = "INSERT INTO users (username, email, password, gender)
                    VALUES ('$username', '$email', '$password', '$gender')";
            $result = mysqli_query($conn, $sql);
            if ($result) { //6
                echo "<script>alert('Successfully Registered'); window.location.href = 'login.php';</script>";
            }
        }
    } else { //7
        echo "<script>alert('Password Not Matched.')</script>";
    }
}

```

Figure 5.5: Code Snippet - Register Function

The Figure 5.5 shows the code snippet handles the registration process of the user when a user submits the registration form. This code snippet is in *register.php* (line 9 - line 46). This condition checks if the form is submitted.

No	Function	Description
1.	Form Submission Check	The form data is sent to the server using the POST method, and this check ensures that the registration process begins only when the form is submitted.
2.	Data Retrieval	The user's input from the form is retrieved and stored in variables. The passwords are hashed using the "md5" function for security.
3.	Password Matching	This function checks if the entered password matches the confirmed password.
4.	Database Queries	Two SQL queries are executed to check if the entered email or username already exists in the database.
5.	Validation and Insertion	Depending on the results of the database queries, appropriate alerts are shown if the email or username already exists. If not, the user is inserted into the database.
6.	Registration Result Alerts	Depending on the success or failure of the registration process, relevant alerts are displayed.
7.	Password Mismatch Alert	If the passwords do not match, an alert is displayed.

Table 5.2: Registration Code Snippet Explanation

Table 5.2 shows the explanation of the code snippet that manages the user registration process, ensuring data integrity and security through hashed password, and performs checks to avoid duplicate email or username entries in the database.

```

function validateUsername(field){
    if(field == "") return "No Username was entered.\n"
    else if (field.length <5 || field.length >10) return "Username must be at least 5 characters and maximum 10 character.\n"
    else if (/[^a-zA-Z0-9_-]/.test(field)) return "Only Alphabet & Numbers are allowed in the username.\n"
    return ""
}

function validatePassword(field){
    if(field=="") return "No Password Entered.\n"
    else if (field.length < 8) return "Password must be at least 8 characters.\n"
    else if (!/[a-z]/.test(field) || !/[A-Z]/.test(field) || !/[0-9]/.test(field)) return "Password must require at least one uppercase, one lowercase and one number\n."
    return ""
}

function validateEmail(field){
    if (field=="") return "No Email Entered.\n"
    else if (!(field.indexOf(".")>0) && (field.indexOf("@")>0) || /[^\w\.-]/.test(field)) return "The Email Address is invalid.\n"
    return ""
}

```

Figure 5.6: Code Snippet - Registration Validation

Figure 5.6 shows the JavaScript code in register.php (line 72 - 91) consists of three validation functions for form fields. The validateUsername function ensures that a username is not empty, falls within a specified length range, and contains only allowed characters. The validatePassword function checks the password for length, requiring at least eight characters, and the presence of at least one uppercase letter, one lowercase letter, and one number. Finally, the validateEmail function verifies that an email address is not empty, contains both a dot and an at symbol, and adheres to specific character restrictions.

```

<div class="input-group">
    <input type="password" placeholder="Password" name="password" id="password" value="<?php echo $_POST['password']; ?>" required>
    <i class="fa fa-eye-slash password-toggle" onclick="togglePassword('password')"></i>
</div>
<div class="input-group">
    <input type="password" placeholder="Confirm Password" id="confirmPassword" name="confirmPassword" value="<?php echo $_POST['confirmPassword'] ?>" required>
    <i class="fa fa-eye-slash password-toggle" onclick="togglePassword('confirmPassword')"></i>
</div>
<div class="input-group">
    <button name="submit" class="btn">Register</button>
</div>
<p class="login-register-text">Already have an account? <a href="login.php"><br>Login Here.</a></p>
</form>

<script>
    function togglePassword(inputId) {
        const passwordInput = document.getElementById(inputId);
        const passwordToggle = document.querySelector(`#${inputId} ~ .password-toggle`);

        if (passwordInput.type === 'password') {
            passwordInput.type = 'text';
            passwordToggle.classList.add('fa-eye');
            passwordToggle.classList.remove('fa-eye-slash');
        } else {
            passwordInput.type = 'password';
            passwordToggle.classList.add('fa-eye-slash');
            passwordToggle.classList.remove('fa-eye');
        }
    }
</script>

```

Figure 5.7: Code Snippet - Password Toggle Visibility

Figure 5.7 shows the HTML and JavaScript (line 129 - line 158) code represents a password input section in a registration form. Two password input fields, one for the password and the other for confirming the password, are provided. The togglePassword function is employed to dynamically switch between displaying and hiding the entered password. It uses Font Awesome icons to toggle the visibility of the password text in response to a user clicking on the eye icon. The eye icon changes based on whether the password is currently visible or hidden, providing a way to show or conceal password characters as needed.

```

if (isset($_POST['submit'])) {
    $email = trim($_POST['email']);
    $password = md5($_POST['password']);

Code Suggestions

$sql = "SELECT * FROM users WHERE email='$email' AND password='$password'";
$result = mysqli_query($conn, $sql);

if ($result->num_rows > 0) {
    $row = mysqli_fetch_assoc($result);
    unset($row['password']);

    $_SESSION['user_id'] = $row['id'];
    $_SESSION['username'] = $row['username'];
    $_SESSION['last_acted_on'] = time();

    if($row ['user_role_id'] === "1"){
        header("Location: ../../Private/admin_page.php");
    }else("Location:../index.php");

} else {
    echo "<script>alert('Email or Password is Wrong.')</script>";
}

Code Suggestions
}

```

Figure 5.8: Code Snippet - Login Function

Figure 5.8 shows the login validation in *login.php* (line 15 - line 45). This PHP code snippet handles the login functionality. It checks if the form with the name 'submit' has been submitted. If so, it retrieves the entered email and password from the form. The email is trimmed to remove any extra whitespace, and the password is hashed using the MD5 algorithm. The code then constructs a SQL query to check if there is a user in the database with the provided email and hashed password. If a matching user is found, their details are fetched from the database, and the user's ID, username, and a timestamp of the last activity are stored in session variables. If no matching user is found, an alert is shown indicating that the email or password is incorrect.

5.4.3 Home Page (index.php)

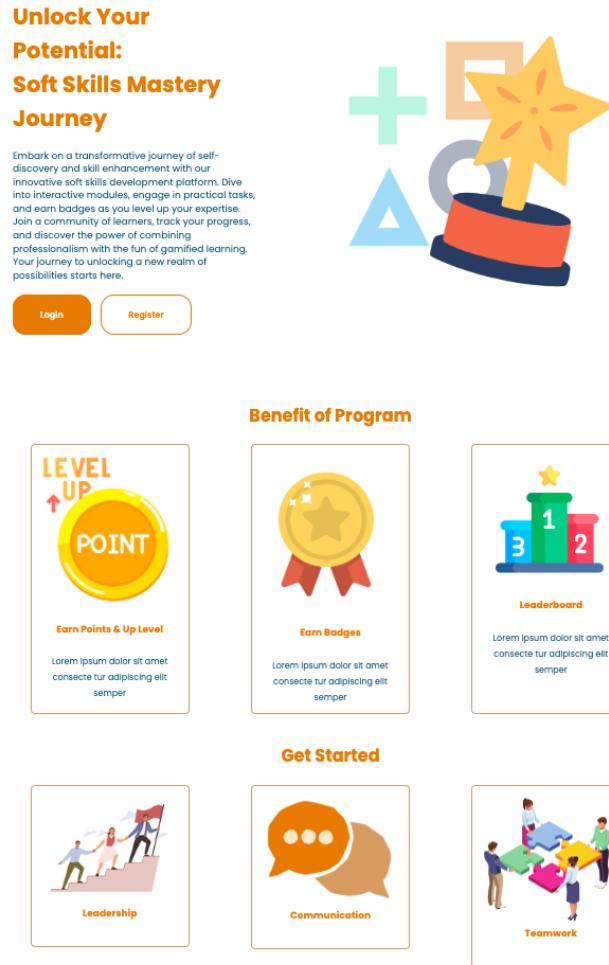


Figure 5.9: Home Page

Figure 5.9 shows the actual implementation of the home page. The "Login" and "Register" buttons have the same function as the navigation bar.

5.4.4 Event Module



Events Points Tracker

Input Event

testing

Event Name

Club

dd/mm/yyyy, --:-- --

Submit

Event History

This figure shows the 'Input Event' page of the 'Events Points Tracker'. It features a large orange header with the title. Below it is a form with four input fields: 'testing' (username), 'Event Name', 'Club', and a date/time field ('dd/mm/yyyy, --:-- --'). At the bottom are two orange buttons: 'Submit' and 'Event History'.

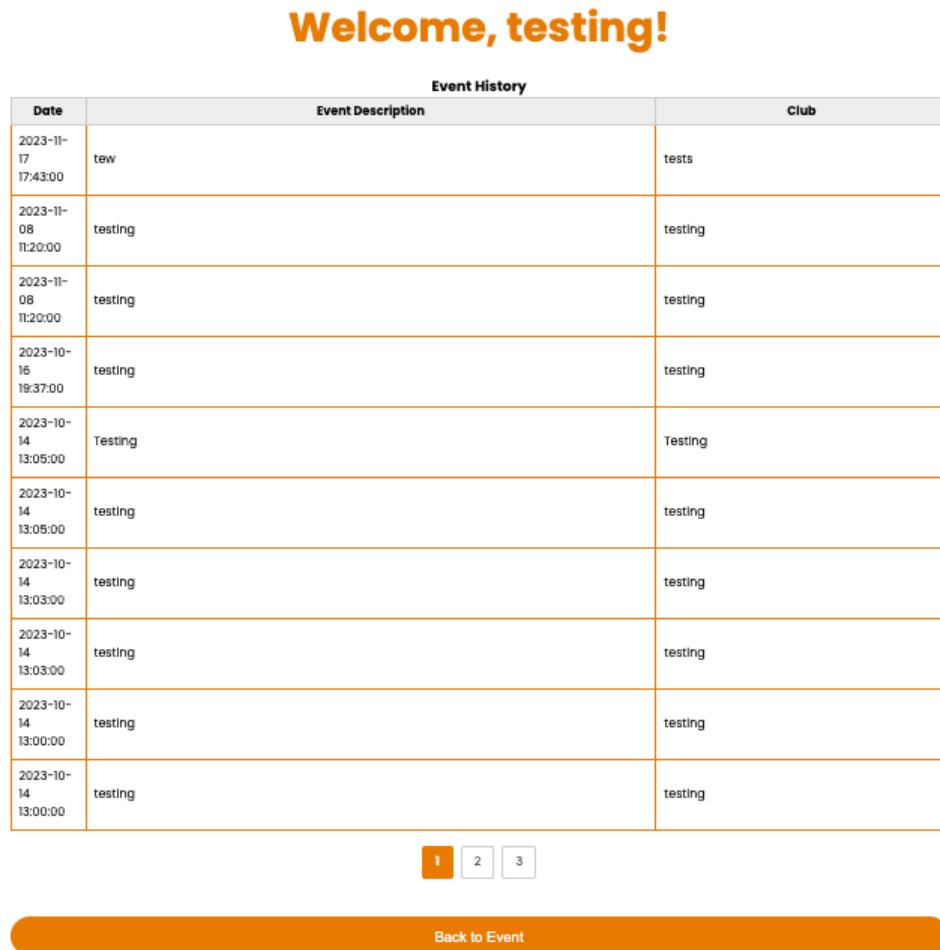
Figure 5.10: Event Module Page (event.php)

Figure 5.10 shows the actual implementation of the Event Module Page. Users are able to submit their event participation and earn 10 points by filling up the form with the required information such as username, event name, hosting club, date, and time. The form processing using the \$POST function was similar to the register.php, the function that handles event form processing was located inside *logic_controller.php*.

```
<?php
// Assuming you have a login system and the username is stored in the session
if (isset($_SESSION["username"])) {
    $username = $_SESSION["username"];
    echo "<input type='text' id='username' placeholder='Username' name='username' value='$username' readonly>";
}
?>
```

Figure 5.11: Pre-filled Username Function

In Figure 5.10, the username of the user was pre-filled automatically by the system. This function was implemented as shown in Figure 5.11. The function checks if the "username" key is set in the PHP session, indicating that a user is logged in. And will show the username automatically in the input field. The same logic was applied on the event.php page itself too, the form will only be visible if users were logged in into the system, else it will show "Please login first".



The screenshot shows a web page titled "Welcome, testing!" with an orange header. Below the header is a table titled "Event History". The table has three columns: "Date", "Event Description", and "Club". The data in the table is as follows:

Date	Event Description	Club
2023-11-17 17:43:00	tew	tests
2023-11-08 11:20:00	testing	testing
2023-11-08 11:20:00	testing	testing
2023-10-16 19:37:00	testing	testing
2023-10-14 13:05:00	Testing	Testing
2023-10-14 13:05:00	testing	testing
2023-10-14 13:03:00	testing	testing
2023-10-14 13:03:00	testing	testing
2023-10-14 13:00:00	testing	testing
2023-10-14 13:00:00	testing	testing

Below the table are three small buttons labeled 1, 2, and 3. At the bottom of the page is a blue button labeled "Back to Event".

Figure 5.12: Event History Page (event_history.php)

Figure 5.12 shows the actual implementation of the Event History Page (*event_history.php*). Users can view their submitted event participation on the Event History Page. The table displays details such as Event Date and Time, Event Description, and Hosting Club. Pagination has been implemented, with each page containing a maximum of 10 entries. The active page is highlighted with an orange box.

```
/* Event History */
function getEventHistoryDataPaginated($conn, $username, $start_index, $items_per_page) {
    $eventHistoryQuery = "SELECT * FROM events WHERE username = ? ORDER BY datetime DESC LIMIT ?, ?";
    $eventHistoryStmt = $conn->prepare($eventHistoryQuery);
    $eventHistoryStmt->bind_param("ssi", $username, $start_index, $items_per_page);
    $eventHistoryStmt->execute();
    $eventHistoryResult = $eventHistoryStmt->get_result();
    $eventHistoryData = array();

    while ($row = $eventHistoryResult->fetch_assoc()) {
        $eventHistoryData[] = array(
            'date' => $row['datetime'],
            'event_description' => $row['event'],
            'club' => $row['club']
        );
    }

    $eventHistoryStmt->close();

    return $eventHistoryData;
}
```

Figure 5.13: Code Snippet - Event History Retrieval (*logic_controller.php*)

```
<?php
foreach ($eventHistoryData as $row) {
    echo "<tr>";
    echo "<td>{$row['date']}
```

Figure 5.14: Code Snippet - Event History Retrieval (*event_history.php*)

Figure 5.13 shows the function, *getEventHistoryDataPaginated*, retrieves paginated event history data for a specific user from the database. It takes parameters such as the database connection (\$conn), the user's username, the starting index for pagination, and the number of items per page. The function then constructs and executes a SQL query to fetch events from the database based on the provided parameters. The retrieved data, including event date, description, and hosting club, is organized into an array, and returned and being called in *event_history.php* as shown in Figure 5.14.

5.4.5 Soft Skill Module (soft_skills.php)

The screenshot displays the 'Leadership' module page. On the left, there's a 'Completion Reward' section featuring a yellow 'POINT' badge and a blue 'Leadership' badge. The main content area includes a leadership illustration, a 'Leadership' definition, and two challenges: 'Challenge 1' (Theory) and 'Challenge 2' (Test). To the right, there's a 'Practical' challenge section.

Leadership

The ability to influence and inspire a group of individuals towards a common goal or purpose. Effective leadership involves making informed and strategic decisions, fostering collaboration, and motivating team members to perform at their best.

A leader serves as a role model, guiding others by demonstrating integrity and a strong work ethic. Whether in the context of an organization, government, educational institution, or any collective effort, leadership plays a pivotal role in driving positive change and achieving shared objectives.

Completion Reward

POINT

Challenge 1

Theory

In this theoretical challenge, participants delve into the foundational aspects of Leadership. The focus is on providing a comprehensive understanding and their significance in various aspects of personal and professional life.

Challenge 2

Test

The second challenge involves a knowledge assessment through a series of Multiple-Choice Questions (MCQs). Participants test their understanding of the theoretical concepts introduced in Challenge 1, demonstrating their grasp of key Leadership principles.

Challenge 3

Practical

The practical challenge is designed for participants to translate their theoretical understanding into practical application. Participants engage in real-world scenarios, exercises, or simulations that mirror situations where Leadership are essential. This hands-on approach aims to reinforce the practical application of learned soft skills.

Figure 5.15: Soft Skill Page

Figure 5.15 shows the actual implementation of the soft skill page. The content of the soft skill page was implemented dynamically. The dynamic content of the page allows the page to adapt and present varied information based on user selection on the soft skills module.

```
<div class="dropdown-content">
    <a href="soft_skills.php?skill=leadership">Leadership</a>
    <a href="soft_skills.php?skill=communication">Communication</a>
    <a href="soft_skills.php?skill=teamwork">Teamwork</a>
</div>
```

Figure 5.16: Code Snippet - Parsing Parameter

Figure 5.16 shows the first step of the dynamic content implementation. By incorporating parameters in the link, the system can pass the information about the selected soft skills to the script that generates the page. In this case, the ‘*skill*’ parameter is used to identify the chosen soft skill.

```
function getSoftSkillData($conn, $skill) {
    $query = "SELECT * FROM soft_skills WHERE name = ?";
    $stmt = $conn->prepare($query);

    if (!$stmt) {
        die('Error in preparing statement: ' . $conn->error);
    }

    $stmt->bind_param("s", $skill);
    $stmt->execute();

    if ($stmt->error) {
        die('Error in executing statement: ' . $stmt->error);
    }

    $result = $stmt->get_result();

    if (!$result) {
        die('Error in getting result: ' . $stmt->error);
    }

    if ($result->num_rows > 0) {
        // Fetch the data as an associative array
        $data = $result->fetch_assoc();
        $stmt->close();
        return $data;
    } else {
        // No data found for the selected skill
        $stmt->close();
        return null;
    }
}
```

Figure 5.17: Code Snippet - Dynamic Soft Skill Function (*logic_controller.php*)

```
$skill = $_GET['skill'];

$data = getSoftSkillData($conn, $skill);
```

Figure 5.18: Code-Snippet - Call Soft Skill Function (*soft_skills.php*)

Figure 5.17 shows the function `getSoftSkillData` in the `logic_controller.php` which handles the retrieval of soft skill data from the database. It takes the database connection and the skill name as a parameter, executes the SQL, and returns the result as an array. And Figure 5.18 shows the function used in the `soft_skills.php`. In the soft skills page, the selected skill is obtained from the URL parameter (`$_GET['skill']`). The `getSoftSkillData` function is then called with the provided skill name, and the returned data is stored in the `$data` variable.

```
<div class="mid">
    <div class="desc">
        <h2><?php echo $data['name']; ?></h2>
        <p><?php echo $data['description']; ?></p>
    </div>
    |
    |
    
</div>
```

Figure 5.19: Code Snippet - Displaying Data (`soft_skills.php`)

Figure 5.19 shows the code snippet which is responsible for dynamically presenting the content of a selected soft skill on a web page by echoing the `$data['variable']` which retrieved from Figure 5.18. The overall purpose of this code is to dynamically generate and display the content related to the selected soft skill on the web page. The use of PHP allows for dynamic rendering, ensuring that the content adapts based on the user's selection.

```
<?php if (isset($_SESSION["username"])) { ?>
    <a href = "challenges_1.php?skill=<?php echo $skill; ?>"><button class ="challenge-button">Start Challenge</button></a>
<?php
} else { ?>
    <a href = "Login/Login.php"><button class ="challenge-button">Login First</button></a>
<?php
}
```

Figure 5.20: Code Snippet - Dynamic Challenge

Figure 5.20 shows the implementation of the soft skills challenges in Figure 5.15. The soft skill challenges adapt the same logic as Figure 5.17, Figure 5.18 and Figure 5.9 which parse the parameter to the respective challenge page dynamically based on the current selected skill. This code segment also adopts the same logic as Figure 5.10, users need to login first in order to proceed to the challenge page, else the website will show “Login First” Button instead of “Start Challenge” Button.

Teamwork

This is teamwork theory

Done

Challenge 2

For testing purposes, the answer is all 'A'

Teamwork Question 1
 A B C D

Teamwork Question 2
 A B C D

Teamwork Question 3
 A B C D

Submit Answers

Challenge 3

Submission

testing

Describe your experience in Teamwork

Submit

Figure 5.21: Challenges Page (challenges_1.php, challenges_2.php, challenges_3.php)

Figure 5.21 shows the actual implementation of the challenge 1, challenge 2 and challenge 3 of the soft skill module. All of the information of the soft skills module has been recorded in the database. The content of all the challenges will be displayed dynamically based on the parsed parameter in Figure 5.20.

```
$answers = array();

foreach ($questions as $i => $question) {
    $answer_key = 'answer_' . $i;
    if (isset($_POST[$answer_key])) {
        $answers[$i] = $_POST[$answer_key];
    } else {
        echo "<script>
            alert('Please answer all questions');
            window.location.href = 'challenges_2.php?skill=" . urlencode($skill) . "'";
        </script>";
        exit();
    }
}

} else {
    // Display a message indicating that not all answers are correct
    echo "<script>alert('Not all answers are correct. Please try again.');</script>";
}
```

Figure 5.22: Code Snippet - Reminder Script

For the Challenge 2, Users need to answer all the questions correctly, else the system will display an error message reminding them to answer all the questions correctly. Figure 5.22 shows the implementation of the respective requirement.

```

// Challenge 1 completion handling
if (isset($_POST['done'])) {
    $challenge_number = 1; // Challenge 1

    // Check if the challenge is already completed
    $check_completion_query = "SELECT completed FROM user_soft_skill_progress WHERE user_id = ? AND soft_skill_id = ? AND challenge_number = ?";
    $check_completion_stmt = $conn->prepare($check_completion_query);
    $check_completion_stmt->bind_param("iii", $user_id, $soft_skill_id, $challenge_number);
    $check_completion_stmt->execute();
    $check_completion_result = $check_completion_stmt->get_result();
    $challenge_completed = $check_completion_result->fetch_assoc()['completed'];

    if ($challenge_completed) {
        $disable_button = true;

    } else {
        // Challenge 1 completion query
        $completion_query = "INSERT INTO user_soft_skill_progress (user_id, soft_skill_id, challenge_number, completed) VALUES (?, ?, ?, 1)";
        $completion_stmt = $conn->prepare($completion_query);
        $completion_stmt->bind_param("iii", $user_id, $soft_skill_id, $challenge_number);
        $completion_stmt->execute();
        $completion_stmt->close();

        // Add 10 points to user's points and record in point_history
        $points_to_add = 20;
        $event_description = "Challenge 1 Point - " . $data['name'];

        // Update user's points
        $update_points_query = "UPDATE users SET points = points + ? WHERE id = ?";
        $update_points_stmt = $conn->prepare($update_points_query);
        $update_points_stmt->bind_param("ii", $points_to_add, $user_id);
        $update_points_stmt->execute();
        $update_points_stmt->close();

        // Record point history with added_at timestamp
        $record_history_query = "INSERT INTO point_history (username, points_added, event_description, added_at) VALUES (?, ?, ?, NOW())";
        $record_history_stmt = $conn->prepare($record_history_query);
        $record_history_stmt->bind_param("sis", $username, $points_to_add, $event_description);
        $record_history_stmt->execute();
        $record_history_stmt->close();

        echo "<script>alert('Challenge completed!');</script>";
    }
}

$check_completion_stmt->close();
}
?>

```

Figure 5.23: Code Snippet - Challenge 1 Completion Handling

Figure 5.23 shows the code snippet that handles completion of Challenge 1 for a user in the soft skills module. It first checks if the challenge has already been completed by querying the database. If the challenge is completed, it disables the completion button to prevent duplicate submissions. If the challenge is not completed, it updates the user's progress in the database, marks Challenge 1 as completed, adds 20 points to the user's total points, and records the points in the point history. It will also insert a record into the *user_soft_skill_progress* table, marking Challenge 1 as completed for a specific user and soft skill which will be used for validation in the badges module.

system. The user is then alerted about the successful completion of the challenge. This completion handling was applied to Challenge 2 and Challenge 3 as well.

5.4.6 Account Page (account.php)

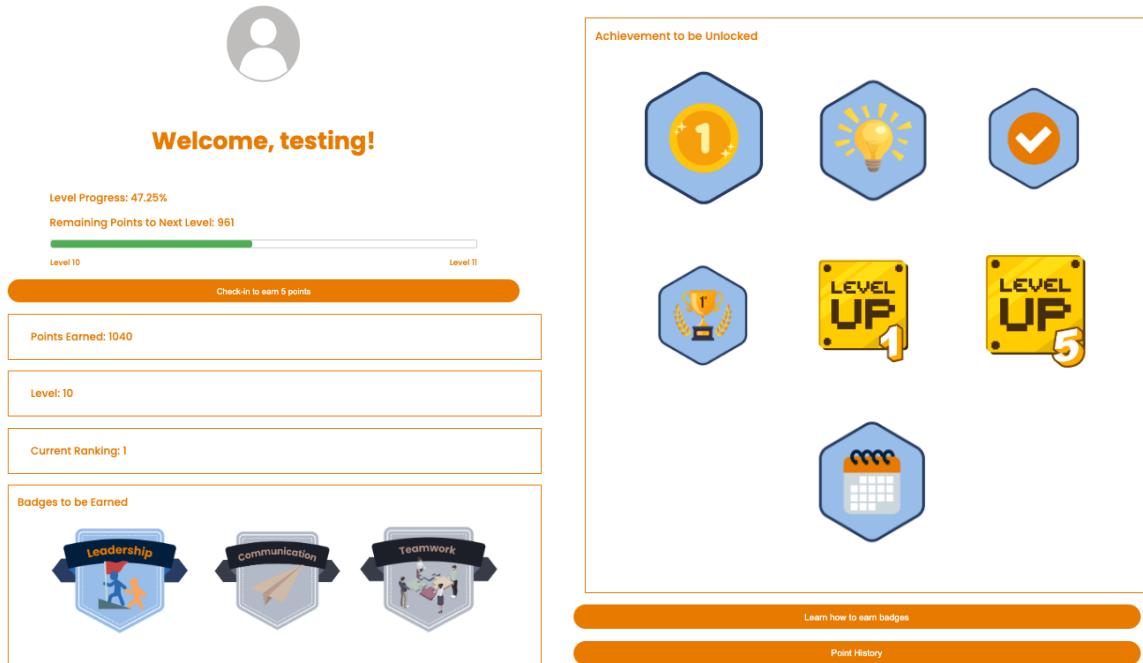


Figure 5.24: Account Page

Figure 5.24 shows the actual implementation of the account page, where users can access real-time information such as their profile picture, earned points, current level, progress, ranking, completion badges, and achievements. Furthermore, users have the option to check in daily, earning 5 points for each check-in, and review their point history. This page provides a comprehensive overview of users' progress and engagement within the gamification system. The

functions that used to control the information presentation, rewards and badges system were implemented in the logic_controller.php.

```
/* ----- Function for User Checkin----- */

if ($_SERVER["REQUEST_METHOD"] == "POST" && isset($_POST["checkin"])) {

    // Perform the check-in logic
    $checkinResult = checkin($conn, $user_id);

    // Display the check-in result
    echo "<script>alert('$checkinResult');</script>";
}
```

Figure 5.25: Code Snippet- Check-in (Account.php)

```
//For user checkin
function hasCheckedInToday($conn, $user_id) {
    $checkin_date_query = "SELECT checkin_date FROM checkin_history WHERE user_id = ? AND checkin_date = CURDATE()";
    $checkin_date_stmt = $conn->prepare($checkin_date_query);
    $checkin_date_stmt->bind_param("i", $user_id);
    $checkin_date_stmt->execute();
    $result = $checkin_date_stmt->get_result();
    $checkin_date_stmt->close();

    return $result->num_rows > 0;
}

function checkin($conn, $user_id) {
    // Check if the user already checked in today
    if (hasCheckedInToday($conn, $user_id)) {
        return "You have already checked in today.";
    }

    // Get the username from the session
    $username = $_SESSION["username"];

    // Reward points for check-in
    $points_to_add = 5;

    // Update user's points
    $update_points_query = "UPDATE users SET points = points + ? WHERE id = ?";
    $update_points_stmt = $conn->prepare($update_points_query);
    $update_points_stmt->bind_param("ii", $points_to_add, $user_id);
    $update_points_stmt->execute();
    $update_points_stmt->close();

    // Record point history with added_at timestamp
    $event_description = "Check-in Points";
    $record_history_query = "INSERT INTO point_history (username, points_added, event_description, added_at) VALUES (?, ?, ?, NOW())";
    $record_history_stmt = $conn->prepare($record_history_query);
    $record_history_stmt->bind_param("sis", $username, $points_to_add, $event_description);
    $record_history_stmt->execute();
    $record_history_stmt->close();

    // Record check-in in checkin_history table
    $record_checkin_query = "INSERT INTO checkin_history (user_id, checkin_date) VALUES (?, CURDATE())";
    $record_checkin_stmt = $conn->prepare($record_checkin_query);
    $record_checkin_stmt->bind_param("i", $user_id);
    $record_checkin_stmt->execute();
    $record_checkin_stmt->close();

    return "Check-in successful! You earned 5 points.";
}
```

Figure 5.26: Code Snippet - Check-in Function (logic_controller.php)

Figure 5.25 shows the "Check-in" function being implemented and called in *account.php*. Figure 5.26 shows the two functions hasCheckedInToday and checkin in the *logic_controller.php*.

The hasCheckedInToday function checks if the user has already checked in on the current date by querying the checkin_history table. The checkin function utilizes this check to determine whether the user can perform a check-in. If the user hasn't checked in, the function rewards them with 5 points and records all the necessary information. The check-in logic is triggered when the user submits the check-in form. The result is then displayed using a JavaScript alert, informing the user if the check-in was successful or if they have already checked in for the day.

```
/* ----- Function for User Progress and Badges Function----- */

//Get User Data
$userData = getUserData($conn, $username);
$gender = $userData['gender'];

//Get User Points
$points = getUserPoints($conn, $username);

//Get User Level and Progress
$levelData = getLevelData($points);
$userLevel = $levelData['level'];
$progress = $levelData['progress'];
$remainingPoints = $levelData['remainingPoints'];

//Get User Rank
$userRank = getRank($conn, $points);
```

Figure 5.27: Code Snippet - User Progress Data (*account.php*)

```

//To get user points
function getUserPoints($conn, $username) {
    $pointsQuery = "SELECT points FROM users WHERE username = ?";
    $pointsStmt = $conn->prepare($pointsQuery);
    $pointsStmt->bind_param("s", $username);
    $pointsStmt->execute();
    $pointsResult = $pointsStmt->get_result();
    $pointsRow = $pointsResult->fetch_assoc();
    $points = $pointsRow['points'];
    $pointsStmt->close();

    return $points;
}

//To get user current rank
function getRank($conn, $points) {
    $rankQuery = "SELECT rank FROM (SELECT username, points, DENSE_RANK() OVER (ORDER BY points DESC) AS rank FROM users) AS ranked_users WHERE username IN (SELECT username FROM users WHERE points = ?)" //Fixed same marks but different level using Dense_Rank()
    $rankStmt = $conn->prepare($rankQuery);
    $rankStmt->bind_param("i", $points);
    $rankStmt->execute();
    $rankResult = $rankStmt->get_result();
    $rankRow = $rankResult->fetch_assoc();
    $userRank = $rankRow['rank'];
    $rankStmt->close();

    return $userRank;
}

//To get user current level according to total points earned
function getLevelData($points) {
    $levels = array(
        0 => array('min' => 0, 'max' => 9),
        1 => array('min' => 10, 'max' => 29),
        2 => array('min' => 30, 'max' => 49),
        3 => array('min' => 50, 'max' => 69),
        4 => array('min' => 70, 'max' => 89),
        5 => array('min' => 90, 'max' => 109),
        6 => array('min' => 110, 'max' => 129),
        7 => array('min' => 130, 'max' => 149),
        8 => array('min' => 150, 'max' => 169),
        9 => array('min' => 170, 'max' => 179),
        10 => array('min' => 180, 'max' => 2000)
    );
}

//Control the progress and levelling up
foreach ($levels as $level => $range) {
    if ($points >= $range['min'] && $points <= $range['max']) {
        $nextLevelPoints = $range['max'];
        $remainingPoints = $nextLevelPoints - $points;
        $progress = ($points - $range['min']) / ($range['max'] - $range['min']) * 100;

        return array('level' => $level, 'progress' => $progress, 'remainingPoints' => $remainingPoints + 1, 'currentLevel' => $level);
    }
}

```

Figure 5.28: Code Snippet - User Progress Data Function (*logic_controller.php*)

Figure 5.27 shows the code snippet for the user progress implementation in account.php and Figure 5.28 shows the code snippet for the user progress function implemented in the logic_controller.php. These functions collectively contribute to displaying various aspects of a user's profile, such as gender, points, rank, level, progress, and remaining points on the account page. Each function serves a specific purpose in retrieving and processing the necessary data to provide a comprehensive overview of the user's gamification-related information.

In the account.php file, there are several functions related to user data and progress. The getUserData function retrieves the gender information of a user from the database. The getUserPoints function fetches the total points of a user based on their username. The getRank function determines the user's current rank by considering the points earned compared to other users. Lastly, the getLevelData function calculates the user's current level, progress percentage, and remaining points required to reach the next level based on the total points earned. The user progress will be shown in the account based on the retrieved information by using echo variable.

For example, \$userLevel = \$levelData['level']; and <?php echo \$userLevel;?>.

```
<?php
if ($points >= 1) {
    echo '';
    if (!$pointsAlertShown) {
        echo "<script>alert('Congratulations! You've earned a Points Pioneer Badge!');</script>";
        markBadgeAlertAsShown($conn, $user_id, 'points');
    }
} else {
    echo '';
}
```

Figure 5.29: Code Snippet - Progress Achievement Badges Display (account.php)

Figure 5.29 shows the implementation of displaying the badges for Points Pioneer. After retrieving user-related information such as points, level, progress, and rank, the code in account.php checks if the user has earned a Points Pioneer Badge. If the user's points are greater than or equal to 1, indicating some level of engagement or achievement, a "Points Unlocked Badge" image is displayed. Similar implementation was done to Lead Voyager, Skills Apprentice and Skills Sage.

```
$soft_skill_id = 1;
$challenge_numbers = [1, 2, 3];
$completed_leadership_challenges = hasCompletedSoftSkillChallenges($conn, $user_id, $soft_skill_id, $challenge_numbers);

//Check Communication Module Completion
$communication_id = 2;
$completed_communication_challenges = hasCompletedSoftSkillChallenges($conn, $user_id, $communication_id, $challenge_numbers);

//Check Teamwork Module Completion
$teamwork_id = 3;
$completed_teamwork_challenges = hasCompletedSoftSkillChallenges($conn, $user_id, $teamwork_id, $challenge_numbers);
```

```
<?php
if ($completed_leadership_challenges) {
    echo '';
    if (!$leadershipAlertShown) {
        echo "<script>alert('Congratulations! You've earned a Leadership Badge!');</script>";
        markBadgeAlertAsShown($conn, $user_id, 'leadership');
    }
}

} else {
    echo '';
}
```

Figure 5.30: Code Snippet - Completion Badges Display (account.php)

```
//To check if user has completed SoftSkillModule
function hasCompletedSoftSkillChallenges($conn, $user_id, $soft_skill_id, $challenge_numbers) {
    $check_completion_query = "SELECT COUNT(*) as count FROM user_soft_skill_progress WHERE user_id = ? AND soft_skill_id = ? AND challenge_number IN (?, ?, ?)";
    $check_completion_stmt = $conn->prepare($check_completion_query);
    $check_completion_stmt->bind_param("iiii", $user_id, $soft_skill_id, $challenge_numbers[0], $challenge_numbers[1], $challenge_numbers[2]);
    $check_completion_stmt->execute();
    $result = $check_completion_stmt->get_result();
    $count = $result->fetch_assoc()['count'];
    $check_completion_stmt->close();

    return $count == count($challenge_numbers);
}
```

Figure 5.31: Code Snippet - Completion Badges Function (logic_controller.php)

Figure 5.30 and Figure 5.31 shows the implementation and the underlying logic in displaying the completion badges based on user progress on the soft skill modules. Figure 5.31 shows the hasCompletedSoftSkillChallenges function takes user and challenge information as parameters, performs a database query to count the completed challenges, and returns a boolean indicating whether the user has completed all specified challenges for a particular soft skill module.

Figure 5.30 shows the section that checks the completion of challenges for different soft skills modules. The challenges for Leadership, Communication, and Teamwork modules are verified using the hasCompletedSoftSkillChallenges function from logic_controller.php. This function checks if a user has completed a specified set of challenges (identified by their challenge numbers) within a particular soft skill module. Based on the completion status, corresponding badges (either unlocked or locked) are displayed for each module. Additionally, if a Leadership badge is earned, a congratulatory alert is shown, and the user is marked to prevent repetitive alerts.

```
/* ----- Function for Achievement Badges ----- */

$soft_skill_ids = [1, 2, 3];
$completed_module_challenges = hasCompletedModuleChallenges($conn, $user_id, $soft_skill_ids);
$hasSubmittedThreeEvents = hasSubmittedThreeEvents($conn, $username);
$joined_module = hasJoinedModule($conn, $user_id);
```

Figure 5.32: Code Snippet - Achievement Badge Display (account.php)

Figure 5.32 shows the implementation on displaying some of the achievement badges related to event submission and soft skill module progress such as, \$completed_module_challenges which control the Module Master Badge, \$hasSubmittedThreeEvents which control the Socialite Elite Badge, and \$join_module which control the Module Explorer Badge. The underlying logic of these

three badges were similar to the logic implemented for the Completion Badge in Figure 5.30 and Figure 5.31.

```
/* ----- Function for Badges Alert ----- */

$leadershipAlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'leadership');
$communicationAlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'communication');
$teamworkAlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'teamwork');
$pointsAlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'points');
$challengeAlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'challenge');
$moduleAlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'module');
$eventAlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'event');
$rankAlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'rank');
$lvl1AlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'lvl1');
$lvl5AlertShown = hasBadgeAlertBeenShown($conn, $user_id, 'lvl5');
```

```
if ($joined_module) {
    echo '';
    if (!$challengeAlertShown) {
        echo "<script>alert('Congratulations! You've earned a Module Explorer Badge!');</script>";
        markBadgeAlertAsShown($conn, $user_id, 'challenge');
    }
} else {
    echo '';
}
```

Figure 5.33: Code Snippet - Badges Alert (*account.php*)

```
// Check if the alert for a specific badge has been shown for the user
function hasBadgeAlertBeenShown($conn, $user_id, $badgeName) {
    $columnName = $badgeName . '_alert_shown';
    $query = "SELECT $columnName FROM user_alerts WHERE user_id = ?";
    $stmt = $conn->prepare($query);
    $stmt->bind_param("i", $user_id);
    $stmt->execute();
    $result = $stmt->get_result();
    $row = $result->fetch_assoc();
    $stmt->close();

    return $row[$columnName] ?? false;
}

// Mark the alert for a specific badge as shown for the user
function markBadgeAlertAsShown($conn, $user_id, $badgeName) {
    $columnName = $badgeName . '_alert_shown';
    $query = "INSERT INTO user_alerts (user_id, $columnName) VALUES (?, 1)
              ON DUPLICATE KEY UPDATE $columnName = 1";
    $stmt = $conn->prepare($query);
    $stmt->bind_param("i", $user_id);
    $stmt->execute();
    $stmt->close();
}
```

Figure 5.34: Code Snippet - Badge Alert Function (*logic_controller.php*)

In account.php, the code checks whether various badge alerts, such as leadership, communication, teamwork, points, challenges, modules, events, rank, level 1, and level 5, have been shown to the user as shown in Figure 5.33. These alerts are controlled by corresponding functions in logic_controller.php as shown in Figure 5.34. The purpose is to determine whether to display the "Unlocked" or "Locked" badge images based on completed challenges or achievements. If a badge is unlocked and its alert has not been shown before, an alert is triggered to congratulate the user on earning the badge. The functions in logic_controller.php handle the tracking of badge alerts for each user and mark them as shown to avoid repetitive alerts. This mechanism enhances user engagement by providing real-time feedback on their accomplishments within the system.

Welcome, testing!

Point History

Date	Event Description	Points Added
2023-11-20 17:39:13	Check-In Points	5
2023-11-17 14:40:50	Check-In Points	5
2023-11-16 14:19:41	Event participation	10
2023-11-15 17:43:26	Event participation	10
2023-11-15 15:59:22	Check-In Points	5
2023-11-15 08:23:22	Challenge 2 Point	20
2023-11-15 07:49:21	Challenge Point	20
2023-11-08 11:20:19	Event participation	10
2023-11-08 11:20:08	Event participation	10
2023-10-16 19:37:53	Event participation	10

1 2

[Back to Account](#)

Figure 5.35: Point History (point_history)

Figure 5.35 shows the actual implementation of the point history page. This page allows user to keep track of the points they earned by showing them the Date, Description, and the total Points they earned. The underlying logic was similar to the implementation of Event History in Figure 5.X.

5.4.7 Leaderboard



Leaderboard

Rank	Username	Points
1	testing	1040
2	testingv3	155
3	testing2	90
3	testing7	90
4	testing8	75
4	testing11	75
5	user1	60
6	testing5	55
6	testing6	55
7	testing3	50
8	testingv2	45
9	testing4	40

Figure 5.36: Leaderboard (leaderboard.php)

Figure 5.36 shows the actual implementation of the Leaderboard providing users with a comprehensive view of their ranking within the system. This implementation reflects the culmination of users' points, presenting a dynamic and competitive aspect to the platform. Users can gauge their progress, compare standings with peers, and foster a sense of accomplishment as they strive for higher ranks.

```

<div class="container">
    <?php
    if (isset($_SESSION["username"])) {
        $leaderboardData = getLeaderboardData($conn);

        if (!empty($leaderboardData)) {
            echo "<table>";
            echo "<tr><th>Rank</th><th>Username</th><th>Points</th></tr>";

            foreach ($leaderboardData as $entry) {
                echo "<tr>";
                echo "<td>{$entry['rank']}

```

Figure 5.37: Code Snippet - Leaderboard Function

5.5 System Test

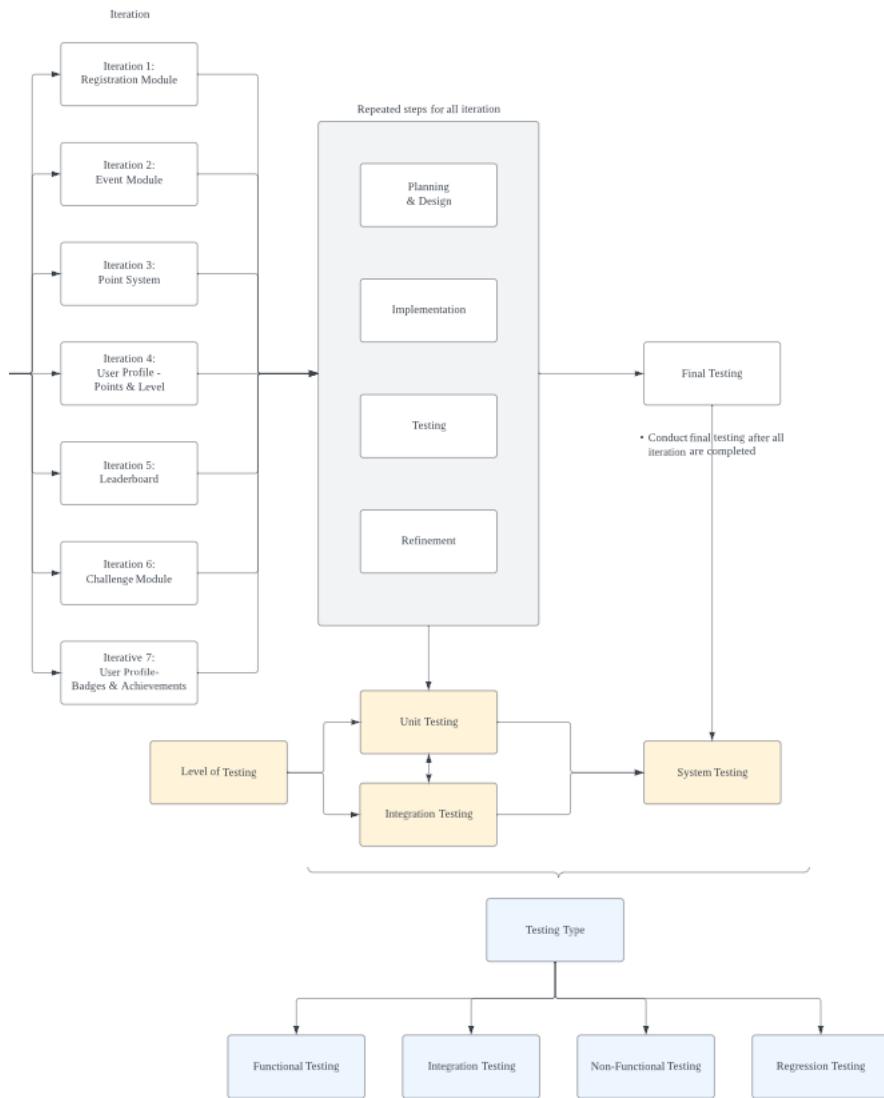


Figure 5.38: Test Level & Test Type

Figure 5.38 shows the testing phase of the development lifecycle of the gamification system. Following an iterative model, each development iteration undergoes unit and integration testing. At the unit level, individual components are assessed to validate their adherence to defined specifications. Simultaneously, integration testing focuses on the interaction and collaboration

between integrated elements, emphasizing the seamless functioning of the system's core features.

Upon the completion of all iterations, the system will undergo a comprehensive System Testing.

The testing stage will integrate functional, non-functional, integration testing, and regression testing methodologies. Functional testing examines each function to ensure they operate as intended, adhering to defined requirements. Integration testing validates the interconnectedness of system components, ensuring proper data flow and communication. Non-functional testing encompasses performance, usability, and security evaluations to guarantee the system's reliability and responsiveness. Regression Testing will be used after each integration or iteration to ensure that existing functionality remains unaffected.

5.6 Test Defect Report

Table 5.3 shows the record of identified issues during each testing iteration, including both unit and integration testing phases. The table includes columns for Issue ID, Description of the issue, Location of the problem, Status of the issue, and the Fix implementation date. Upon the identification of an issue, actions involve conducting thorough Regression and Confirmation Testing. The regression testing ensures that recent fixes do not adversely impact other system functionalities, while the confirmation testing focuses on validating the specific resolution of the reported problem. This tracking and testing process ensures the systematic identification, resolution, and verification of issues, contributing to the overall quality and reliability of the developed system. The details of each defect could be checked through project GitHub.

Issue ID	Issue Description	Location	Fixed on
During Iteration (Unit & Component Testing)			
IS-01	User with same points but different rank	leaderboard.php account.php	5 November
IS-02	Session Error	index.php	8 November
IS-03	Challenge 1 Completion Issue	challenge_1.php	10 November
IS-04	User Level Badge not reflecting	account.php	11 November
IS-05	Login Logo not showing properly	Part/login.php Part/register.php	11 November
IS-06	Challenge 2 Quiz Completion not working	challenge_2.php	15 November
IS-07	Challenge 3 form function not working	challenge_3.php	15 November
IS-08	User Rank issue in getRank()	logic_controller.php	15 November
IS-09	Challenge Box image offset	leadership.php	16 November
IS-10	Module Master not functioning	account.php	17 November
IS-11	Wrong Window Href Location (No Parameter for Dynamic Content)	All challenges files	18 November
IS-12	Fixed Module Master	account.php	18 November
IS-13	User accessibility to Challenges Page before Log In	soft_skills.php	20 November
IS-14	Leaderboard First User Badge	account.php	22 November
During Final Testing (System Testing)			
<i>"No Issue Found during Final System Test"</i>			

Table 5.3: Test Defect Reports

5.7 Test Design

Test design phase serves as a crucial step in ensuring the reliability of the gamification system. It encompasses a two-fold approach, addressing specific features in the system for testing and employing a comprehensive test coverage strategy.

5.7.1 Features to Be Tested

This section outlines the comprehensive list of features slated for testing in the gamification system.

Table 5.4 shows the feature to be tested, and each feature is assigned with a unique identifier for clear referencing and tracking throughout the testing process. The features are categorized into distinct modules, including Registration & Login, Points, Event, Badges, and Challenge Modules.

Feature ID	Description	Feature ID	Description
Registration & Login Module			
F-01	User account creation (registration)	F-03	Account session management
F-02	User account authentication (login)	F-04	Users log out
Points Module			
F-05	Event participation points	F-09	Points & Progress
F-06	Challenge completion points	F-10	Leaderboard Ranking
F-07	Check-in points	F-11	Points history
F-08	Leveling up		

Event Module			
F-12	Event submission	F-13	Events history
Badges Module			
F-14	Points Achievement	F-18	Level 1 Achievement
F-15	Challenge Achievement	F-19	Level 5 Achievement
F-16	Completion Achievement	F-20	Leaderboard Rank Achievement
F-17	Event Achievement	F-21	Module Completion Badge
Challenge Module			
F-22	Challenge 1	F-24	Challenge 3
F-23	Challenge 2		

Table 5.4: Features to Be Tested

5.7.2 Test Coverage

Test coverage is a critical aspect of the testing process, ensuring that various scenarios are considered to assess the system's functionalities. Equivalence partitioning, a recognized technique, is employed to categorize input values into classes for comprehensive coverage. The section outlines specific test conditions and corresponding test coverage IDs, focusing on critical aspects such as password and username requirements.

a. Password Requirement

The password requirement for the system is at least eight characters, with the combination of at least one uppercase letter, one lowercase letter and one number.

Test Condition	Test Coverage ID	Test Coverage	Test Data Example
At least 8 characters. Contains at least 1 uppercase letter, 1 lowercase letter, and 1 number.	TCOV-01	Valid	User1234
Password length < 8	TCOV-02	Invalid	User123
At least 8 characters No uppercase	TCOV-03	Invalid	user1234
At least 8 characters No lowercase	TCOV-04	Invalid	USER1234
At least 8 characters No numbers	TCOV-05	Invalid	USERuser
At least 8 characters Only Number	TCOV-06	Invalid	12345678

Table 5.5: Test Coverage - Password Requirements

b. Username Requirement

The username requirement for this system is between five to ten characters.

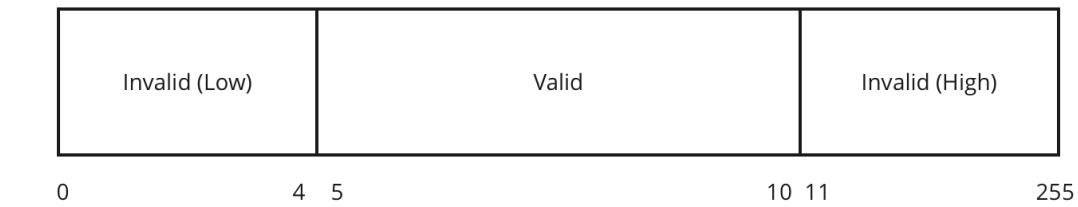


Figure 5.39: Boundary Value Analysis - Username Requirements

Test Condition	Test Coverage ID	Test Coverage	Test Data Example
Less than 5 characters	TCOV-07	Invalid	abcd
5 Characters	TCOV-08	Valid	abcde
6 Characters	TCOV-09	Valid	abcdef
9 Characters	TCOV-10	Valid	abcdefghijklm
10 Characters	TCOV-11	Valid	abcdefghijklmn
More than 10 characters	TCOV-12	Invalid	abcdefghijklmno

Table 5.6: Test Coverage - Username Requirements

5.8 Test Cases

The Test Cases section outlines a series of scenarios designed to evaluate the functionality and performance of the gamification system, focusing on each system module. Each test case is systematically structured with a unique identifier, related feature ID, and test objective for clear identification and traceability.

5.8.1 User Registration

Test Case ID	Test Case Description
TC-01-001	All correct information
TC-01-002	Mismatched Password
TC-01-003	Existing account check
TC-01-004	Invalid Email and Username
TC-01-005	Password Requirement
TC-01-006	Username Requirement

Table 5.7: Test Cases for User Registration

Test Case ID	TC-01-001
Related Feature ID	F-01
Test Coverage ID	TCOV-01
Test Objective	To verify that a user can successfully register for an account with all correct information.
Pre-Conditions	<ul style="list-style-type: none">• The username and email address were not registered before.• Users are not logged in
Test Steps	<ol style="list-style-type: none">1. Enter a valid username.2. Enter a valid email address.3. Enter a valid password (TCOV-01)4. Enter a same valid password on confirm password.5. Click on Register Button

Test Data	Username: "TestUser" Email: " testuser@gmail.com " Password: "Testing1234" Confirm Password: "Testing1234"
Expected Result	<ul style="list-style-type: none"> • The system should successfully register the user account. • The user should be redirected to the login page.
Pass/Fail Criteria	<ul style="list-style-type: none"> • Pass: The user account is successfully registered. • Fail: The system encounters an error, or the user is not redirected to the login page.
Test Status: Pass	

Table 5.8: TC-01-001-All Correct Information

Test Case ID	TC-01-002
Related Feature ID	F-01
Test Objective	
	To verify that the system displays an error message when the entered passwords do not match during registration
Test Steps	<ol style="list-style-type: none"> 1. Enter a valid username. 2. Enter a valid email address. 3. Enter a valid password. 4. Enter an invalid password on confirm password 5. Click on Register Button
Test Data	Username: "TestUser" Email: " testuser@gmail.com " Password: "Testing1234" Confirm Password: "Testing12345"
Pass/Fail Criteria	<ul style="list-style-type: none"> • The system should not register the user account. • The system should alert that the confirmed password was not matched with the password.

Test Status: Pass

Table 5.9: TC-01-002-Mismatched Password

Test Case ID	TC-01-003
Related Feature ID	F-01
Test Objective	
<ul style="list-style-type: none"> ● To verify that the system prevents registration with an email that already exists in the database. ● To verify that the system prevents registration with a username that already exists in the database. 	
Pre-Conditions	
<ul style="list-style-type: none"> ● The username or email were recorded in the database previously 	
Test Steps	<ol style="list-style-type: none"> 1. Enter an existing username 2. Enter an existing email 3. Enter Valid Password and Confirm Password 4. Click on “Register Button”
Test Data	Username: “TestUser” Email: “ testuser@gmail.com ” Password: “Testing1234” Confirm Password: “Testing1234”
Expected Result	
System displays an error message indicating an existing account.	
Pass/Fail Criteria	
Pass: System displays an error message, and the user is not registered. Fail: System register user information in the database.	
Test Status: Pass	

Table 5.10: TC-01-003-Existing Account Check

Test Case ID	TC-01-004
Related Feature ID	F-01
Test Objective	
<ul style="list-style-type: none"> Verify that the system displays an error message when the entered email does not meet the specified requirements. Verify that the system displays an error message when the entered username does not meet the specified requirements. 	
Test Steps	<ol style="list-style-type: none"> Enter an invalid username Enter an invalid email address Enter a valid password with valid confirmation password Click on “Register Button”
Test Data	Username: “Test” Email: “ test@g ” Password: “Testing1234” Confirm Password: “Testing1234”
Expected Result	
System displays an error message indicating the information is invalid.	
Pass/Fail Criteria	
Pass: System displays an error message, and the user is not registered. Fail: System register user information in the database.	
Test Status: Pass	

Table 5.11: TC-01-004-Invalid Username & Email

Test Case ID	TC-01-005										
Related Feature ID	F-01										
Test Coverage ID	TCOV-02, TCOV-03, TCOV-04, TCOV-05, TCOV-06										
Test Objective											
<ul style="list-style-type: none"> Verify that the system displays an error message when the entered password is less than 8 characters / no uppercase character / no lowercase character / no numeric character / only numeric characters. 											
Test Steps	<ol style="list-style-type: none"> Enter a valid username. Enter a valid email address. Enter an invalid password. Click on “Register” Button 										
Test Data	<p>Username: “Testing005” Email: “testing005@gmail.com” Password:</p> <table border="1"> <tr> <td>TCOV-02</td> <td>User123</td> </tr> <tr> <td>TCOV-03</td> <td>user1234</td> </tr> <tr> <td>TCOV-04</td> <td>USER1234</td> </tr> <tr> <td>TCOV-05</td> <td>USERuser</td> </tr> <tr> <td>TCOV-06</td> <td>12345678</td> </tr> </table>	TCOV-02	User123	TCOV-03	user1234	TCOV-04	USER1234	TCOV-05	USERuser	TCOV-06	12345678
TCOV-02	User123										
TCOV-03	user1234										
TCOV-04	USER1234										
TCOV-05	USERuser										
TCOV-06	12345678										
Expected Result											
System displays an error message indicating the password is invalid.											
Pass/Fail Criteria											
<p>Pass: System displays an error message, and the user is not registered. Fail: System register user information in the database.</p>											
Test Status: Pass											

Table 5.12: TC-01-005-Password Requirements

Test Case ID	TC-01-006												
Related Feature ID	F-01												
Test Coverage ID	TCOV-07, TCOV-08, TCOV-09, TCOV-10, TCOV-11, TCOV-12												
Test Objective	<ul style="list-style-type: none"> Verify that the system able to validate according to the username requirements. 												
Test Steps	<ol style="list-style-type: none"> Enter a valid email address. Enter a valid password. Enter a same password for confirm password. Enter a username accordingly. Click on “Register” Button 												
Test Data	<p>Email: “testing006@gmail.com” Password: Testing1234</p> <table border="1"> <tr> <td>TCOV-07</td> <td>abcd</td> </tr> <tr> <td>TCOV-08</td> <td>abcde</td> </tr> <tr> <td>TCOV-09</td> <td>abcdef</td> </tr> <tr> <td>TCOV-10</td> <td>abcdefghijklm</td> </tr> <tr> <td>TCOV-11</td> <td>abcdefghijklmn</td> </tr> <tr> <td>TCOV-12</td> <td>abcdefghijklmno</td> </tr> </table>	TCOV-07	abcd	TCOV-08	abcde	TCOV-09	abcdef	TCOV-10	abcdefghijklm	TCOV-11	abcdefghijklmn	TCOV-12	abcdefghijklmno
TCOV-07	abcd												
TCOV-08	abcde												
TCOV-09	abcdef												
TCOV-10	abcdefghijklm												
TCOV-11	abcdefghijklmn												
TCOV-12	abcdefghijklmno												
Expected Result	System displays an error message indicating the username is invalid or valid according to the test coverage criteria.												
Pass/Fail Criteria	<p>Pass: System able to validate the username according to the requirements, Fail: System failed to validate the username correctly according to the requirements.</p>												
Test Status:	Pass												

Table 5.13: TC-01-006-Username Requirements

5.8.2 User Authentication

Test Case ID	Test Case Description
TC-02-001	Email Not Exist
TC-02-002	Email or Password is incorrect
TC-02-003	Correct Login Credential
TC-02-004	User Log Out

Table 5.14: Test Cases for User Authentication

Test Case ID	TC-02-001
Related Feature ID	F-02
Test Objective	
To verify the system's behavior when a user attempts to authenticate with an email that does not exist in the system.	
Test Steps	<ol style="list-style-type: none"> 1. Enter email address that does not exist in the system. 2. Enter a valid password. 3. Click on “Login” Button
Test Data	Email: “ notexist@gmail.com ” Password: “Testing1234”
Pass/Fail Criteria	
<ul style="list-style-type: none"> ● Pass: The system displays the appropriate error message indicating that the provided email does not exist in the system. ● Fail: The system encounters an error, or the user is authenticated despite the non-existent email. 	
Test Status: Pass	

Table 5.15: TC-02-001-Email Not Exist

Test Case ID	TC-02-002
Related Feature ID	F-02
Test Objective	
To verify the system's behavior when a user attempts to authenticate with an existing email but provides the wrong password.	
Test Steps	<ol style="list-style-type: none"> 1. Enter valid email address. 2. Enter an incorrect password. 3. Click on “Login” Button
Test Data	Email: “ testuser@gmail.com ” Password: “Testing12345”
Pass/Fail Criteria	
<ul style="list-style-type: none"> ● Pass: The system displays the appropriate error message. ● Fail: The system encounters an error, or the user is authenticated despite providing the wrong password. 	
Test Status: Pass	

Table 5.16: TC-02-002-Email/Password Incorrect

Test Case ID	TC-02-003
Related Feature ID	F-02, F-03
Test Objective	
To verify that a registered user can successfully authenticate and log in to the system.	
Test Steps	<ol style="list-style-type: none"> 1. Enter valid email address. 2. Enter a valid password. 3. Click on “Login” Button
Test Data	Email: “ testuser@gmail.com ” Password: “Testing1234”
Pass/Fail Criteria	
<ul style="list-style-type: none"> ● Pass: The user is successfully authenticated, information was stored in session and redirected to the main dashboard. ● Fail: The system encounters an error, or the user is not redirected to the main dashboard. 	

Test Status: Pass

Table 5.17: TC-02-003-Successful Login

Test Case ID	TC-02-004
Related Feature ID	F-03, F-04
Test Objective	To verify the successful logout and session destruction for a user.
Test Steps	1. Click on the “Logout” Button
Pass/Fail Criteria	<ul style="list-style-type: none">• Pass: The system successfully logs out the user, destroys the session.• Fail: The system encounters an error, or the user is not logout.
Test Status: Pass	

Table 5.18:TC-02-004-Logout

5.8.3 System Features

Test Case ID	Test Case Description
TC-03-001	Check-In Features
TC-03-002	Event Participation
TC-03-003	Soft Skill Content
TC-03-004	Soft Skill Challenges
TC-03-005	Challenge 2 Quizzes Control
TC-03-006	Soft Skill Module Completion

Table 5.19: Test Cases for System Functionalities

Test Case ID	TC-03-001
Related Feature ID	F-07, F-09, F-11, F-14
Test Objective	
To verify the system's behaviour when user perform daily checkin	
Pre-Conditions	
<ul style="list-style-type: none"> User must log in into the system 	
Test Steps	<ol style="list-style-type: none"> 1. Navigate to “Account Page” 2. Click on the “Check-In” Button
Expected Result	
<ul style="list-style-type: none"> The system will show a pop-up box indicating user had been checked-in successfully and the number of rewarded points. The system should reward the user with the correct number of points. The system should update the points of the user to be display in user’s account page. The system should reward user with “Point Pioneer” Badge as this is first time user received points. The system should record the points obtained into point history as “Checkin Points”. 	
Pass/Fail Criteria	
<ul style="list-style-type: none"> Pass: The system working as expected results. Fail: The system encountered error or not working as expected results. 	

Test Status: Pass

Table 5.20: TC-03-001- Checkin Feature

Test Case ID	TC-03-002
Related Feature ID	F-05, F-08, F-09, F-11, F-12, F-13, F-17, F-18
Test Objective	To verify the system's behaviour when user submit the event participation form.
Pre-Conditions	<ul style="list-style-type: none"> • User must log in into the system
Test Steps	<ol style="list-style-type: none"> 1. Navigate to “Event Page” 2. Fill in the form with required information 3. Click on the “Submit” Button 4. Repeat the submission 2 more times (Total 3 Submission)
Expected Result	<ul style="list-style-type: none"> • The system will show a pop-up box indicating user form has been recorded and points has been rewarded. • The system should reward the user with the correct number of points. • The system should update the points of the user to be display in user’s account page. • The system should record the points obtained into point history as “Event Participation”. • The system should record the event submission into event. • At this stage, user should be at level 1, the system should reward user with “Skill Apprentice LVL1” Badge. • The system should reward user with “Socialite Elite” Badge.
Pass/Fail Criteria	<ul style="list-style-type: none"> • Pass: The system working as expected results. • Fail: The system encountered error or not working as expected results.
Test Status: Pass	

Table 5.21: TC-03-002-Event Participations

Test Case ID	TC-03-003
Related Feature ID	F-22, F-23, F-24
Test Objective	
To verify the system's behaviour in displaying the correct content when user select any Soft Skill module.	
Pre-Conditions	
<ul style="list-style-type: none"> • User must log in into the system 	
Test Steps	<ol style="list-style-type: none"> 1. Navigate to “Module” on Navigation Bar 2. Select each Soft Skill Module 3. Observe the content changes. 4. Click on the first challenge under one soft skill module. 5. Repeat Step 4 with other soft skill modules.
Expected Result	
<ul style="list-style-type: none"> • The system should be able to change the content dynamically of each soft skill module. • The challenge content should be different for each soft skill module. 	
Pass/Fail Criteria	
<ul style="list-style-type: none"> • Pass: The system displaying the correct content associated with the selected module. • Fail: The system encountered error or fail to display the correct content associated with the selected module. 	
Test Status: Pass	

Table 5.22: TC-03-003-Dynamic Module Content

Test Case ID	TC-03-004
Related Feature ID	F-06, F-08, F-09, F-11, F-15, F-22,
Test Objective	
To verify the system's behaviour in controlling the challenge function in Soft Skill Module	
Pre-Conditions	
<ul style="list-style-type: none"> • User must log in into the system 	
Test Steps	<ol style="list-style-type: none"> 1. Navigate to “Module” on Navigation Bar 2. Select any of the Module.

	<ol style="list-style-type: none"> 3. Click on the “Start Challenge” button of First Challenge. 4. Click on the “Done” Button. 5. Navigate back to Account Page.
Expected Result	
<ul style="list-style-type: none"> ● The system should be able notify user the challenge has been completed and marked user as completed for First Challenge. ● The system should be able to reward user with correct number of points and recorded into point history as “Challenge-1 Points”. ● The system should be able to reward user with “Module Explorer” Badge. 	
Pass/Fail Criteria	
<ul style="list-style-type: none"> ● Pass: The system working as expected results. ● Fail: The system encountered error or not working as expected results. 	
Test Status: Pass	

Table 5.23: TC-03-004-Challenge 1

Test Case ID	TC-03-005
Related Feature ID	F-23
Test Objective	
To verify the system's behaviour in validating the quiz submission	
Pre-Conditions	
<ul style="list-style-type: none"> ● User must log in into the system 	
Test Steps	<ol style="list-style-type: none"> 1. Navigate to “Module” on Navigation Bar 2. Select the same module from TC-03-004. 3. Click on the “Start Challenge” button of Second Challenge. a. Empty Question <ol style="list-style-type: none"> 4. Select “a” for Question 1 and Question 2. 5. Leave Question 3 empty. 6. Click on “Submit” Button b. One wrong answer <ol style="list-style-type: none"> 7. Select “a” for Q1 and Q2, and “b” for Q3. 8. Click on “Submit” Button.

	<p>c. All correct answer</p> <p>9. Select “a” for all questions.</p> <p>10. Click on “Submit” Button.</p>
Expected Result	
<ul style="list-style-type: none"> Condition a: the system should be able to notify user that “Please answer all questions”. Condition b: the system should be able to notify user that “not all answers are correct”. Condition c: the system should be able to notify user that the challenge has been completed. The system should be able to reward user with correct number of points and recorded into point history as “Challenge-2 Points”. 	
Pass/Fail Criteria	

- Pass: The system working as expected results.
- Fail: The system encountered error or not working as expected results.

Test Status: Pass

Table 5.24: TC-03-005-Challenge 2

Test Case ID	TC-03-006
Related Feature ID	F-06, F-08, F-09, F-11, F-16, F-19, F-21, F-24
Test Objective	
To verify the system's behaviour in controlling the challenge completion in Soft Skill Module.	
Pre-Conditions	
<ul style="list-style-type: none"> User must log in into the system 	
Test Steps	<ol style="list-style-type: none"> Select the same module from TC-03-004. Click on the “Start Challenge” Button of Third Challenge. Fill in the form. Click on “Submit” Button. Navigate back to “Account Page”
Expected Result	
<ul style="list-style-type: none"> The system should be able notify user the challenge has been completed and marked user as completed for Third Challenge. The system should be able to reward user with correct number of points and recorded 	

<p>into point history as “Challenge-2 Points”.</p> <ul style="list-style-type: none"> ● The system should be able to reward user with “Module Master” Badge. ● The system should be able to reward user with the Completion Badge. ● The system should be able to reward user with “Skill Sage” Level 5 Badge.
Pass/Fail Criteria
<ul style="list-style-type: none"> ● Pass: The system working as expected results. ● Fail: The system encountered error or not working as expected results.

Table 5.25: TC-03-006-Challenge 3

5.8.4 Test Result Summary

The test cases conducted for the gamification system's User Registration, User Authentication, and System Features modules have been completed successfully with a pass rate of 100%. In each case, the system met the expected results, including pop-up notifications, point rewards, badge awards, and accurate updates in the user's account and point history. The pass rate indicates that the system is working as intended, successfully handling user interactions and demonstrated its capability to handle various scenarios related to user registration, login, and the functionalities associated with gamification features.

5.9 Summary

Chapter 5 provides a detailed insight into the development tools, system structure, and code snippets of the gamification system. Following an iterative model, the development undergoes rigorous unit and component testing, emphasizing seamless functionality. System Testing is conducted comprehensively after all iterations. Test defect reports are generated at the end of each iteration, enabling continuous refinement. The chapter also outlines the test design, specifying features to be tested, and systematically structures test cases for user registration, authentication, and gamification functionalities. The gamification system's development has been a success, evident in the positive outcomes of multiple testing. With a 100% pass rate across various modules, including user registration and gamification features, the system showcases robustness and seamless functionality. The iterative development model, coupled with systematic testing, ensured continuous refinement, validating the system's readiness for evaluation.

Chapter 6

Evaluation

6.1 Introduction

Chapter 6 serves as the evaluation phase in accordance with the methodology outlined in Phase 4. The primary focus is on evaluating the impact of gamification on user motivations within the developed system. This assessment delves into understanding how the integration of gamified elements influences user engagement, participation, and overall motivation. The chapter aims to provide insights into whether gamification effectively enhances user experiences, encourages desired behaviors, and sustains user motivation throughout interactions with the system.

6.2 Survey Design

The survey questions were designed by adapting with the theoretical constructs of Self Determination Theory (SDT)'s Intrinsic Motivation Inventory (IMI) and User Motivation Inventory (UMI) to analyze both intrinsic and extrinsic motivations among users, providing a comprehensive understanding of user engagement.

Questions adapted from IMI delves into users' interest, perceived competence, choice, value, and effort related to engaging with the system, while UMI assesses various aspects of extrinsic motivation, including external regulation, introjected regulation, identified regulation, integrated regulation, and amotivation. The Likert scale responses are utilized to capture the subtleties of motivation, allowing for a more detailed analysis.

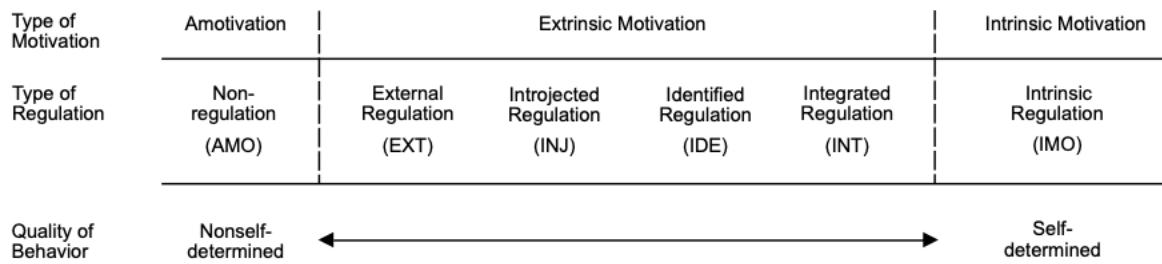


Figure 6.1: Different Regulation of Self-Determination Theory

Source: Bruhlmann et al. (2018)

Figure 6.1 shows the different regulation of Self-Determination Theory's User Motivation Inventory ranges from the least self-determined (amotivation) to the most self-determined regulation (intrinsic motivation). According to Bruhlmann et al. (2018), **Amotivation (AMO)** represents a lack of motivation from engaging in activities; **External Regulation (EXT)** involves engaging for external rewards and avoiding punishment; **Introjected Regulation (INJ)** related to maintaining self-esteem or avoiding guilt; **Identified Regulation (IDE)** reflects engagement aligned with personal goals and values; **Integrated Regulation (INT)** involves a seamless integration of activities into one's sense of self; **Intrinsic Regulation (IMO)** signifies engaging out of inherent interest and enjoyment. The adapted regulation constructs offer a comprehensive framework for evaluating the diverse motivational dynamics influenced by gamification elements which enhances our ability to identify and understand the impact of gamification on different motivational aspects.

6.3 Results

Motivation	Subscale	Questions	Mean	SD
Extrinsic Motivation	Amotivation	I don't see the point in using the system. (R)	2.9	2.64
	External Regulation	I will engage with the system because I will receive rewards or recognition.	6.1	0.99
	Introjected Regulation	I will engage in the system to avoid feeling guilty about not participating.	4.5	2.01
	Identified Regulation	Using the system is important to me because it helps me achieve my personal goals.	6.2	0.63
	Integrated Regulation	Engaging with the system will potentially shape the fundamental part of who I am.	6.3	0.82
Intrinsic Motivation	Interest /Enjoyment	I think using the gamified system for soft skill development was fun and I will enjoy using it.	6	0.94
	Perceived Competence	I would feel competent if I engaged with the system.	5.8	0.63
	Perceived Choice	I would like to engage in this activity (using the system) because I wanted to.	6.4	0.7
		I believe using the system for soft skill development could be of some value to me.	6.1	0.74
		I think using the system is important for my improvement.	6.1	0.88
	Value/Usefulness	I believe that engaging with the gamification elements in this system is useful for enhancing motivation in soft skill development.	6.6	0.70
		I think it's important to incorporate gamification elements because it can make learning more enjoyable.	6.4	0.97
	Effort/Importance	It was important to me to do well in the soft skill development activities.	5.8	1.23

Table 6.1: User Evaluation Questionnaire Results

Table 6.1 shows the User Evaluation Questionnaire Results. The result was separate into two different motivation 6.3.1 Extrinsic Motivation and 6.3.2 Intrinsic Motivation.

6.3.1 Extrinsic Motivation Result

Under Extrinsic Motivation, External Regulation ($M=6.1$, $SD=0.99$), Integrated Regulation ($M=6.3$, $SD=0.82$) and Identified Regulation ($M=6.2$, $SD=0.63$) display high mean scores above 6, coupled with relatively low standard deviations. These results suggest a strong motivation among participants to engage with the system. External Regulation indicates a drive for external rewards or recognition, while Integrated Regulation signifies a clear intent to shape fundamental

knowledges. Identified Regulation highlights participants' belief that the system is instrumental in achieving personal goals. The findings reveal a considerable level of agreement among participants regarding their motivation to interact with the system.

Introjected Regulation ($M=4.5$, $SD=2.01$) suggests a moderate level of engagement driven by the desire to avoid feelings of guilt about non-participation. On the other hand, in the case of Amotivation (**R**) ($M=2.9$, $SD=2.64$) indicates that participants find the purpose of using the gamified system in average. However, the high SD indicates considerable variability in the perception of the system's purpose.

6.3.2 Intrinsic Motivation Result

In the Intrinsic Motivation results, participants demonstrate consistently positive feedback across various dimensions. Interest/Enjoyment ($M=6.0$, $SD=0.94$) suggests that, on average, participants found the gamified system enjoyable, with some variability in individual experiences. Perceived Competence ($M=5.8$, $SD=0.63$) reflects a moderate level of confidence in participants' competence when engaged with the system, with a high level of agreement among participants regarding perceived competence. Participants generally experienced a strong sense of choice and autonomy in engaging with the system, as indicated by a relatively consistent agreement in Perceived Choice ($M=6.4$, $SD=0.7$). Regarding Effort/Importance ($M=5.8$, $SD=1.23$), there is an indication that participants perceive a moderate level of importance in excelling in soft skill development activities, but there is a diverse perspective on the significance of this aspect.

Under Value/Usefulness, the four results, with an average mean score of 6.3 and a standard deviation of 0.83, indicate that participants, on average, highly value the system for soft skill

development. There is a high level of agreement among them regarding the importance of the system for improvement, the usefulness of gamification elements in enhancing motivation, and the significance of incorporating gamification elements for a more enjoyable learning experience.

6.4 Discussion

For Extrinsic Motivation, the results shown that participants score a higher mean and low standard deviation on External Regulation, Identified Regulation and Integrated Regulation. By means, on average, participants were motivated by external factors, personal goals, and the integration of the system into their identity. The result shows the gamification elements incorporate in the developed gamified system will motivate students in using the system in Soft Skills Development. However, there is more variability in responses when it comes to introjected regulation. This diversity in opinions emphasizes the individual attitudes towards perceived lack of motivation and the influence of internal pressures, offering valuable insights for further refining gamification strategies to accommodate these varying motivational dynamics.

Additionally, the high standard deviation of Amotivation indicates significant variability in students' perceptions of the system's purpose, suggesting the possibility that some students still lack concern about the importance of soft skills development in employability. It emphasizes the need for university to enhance awareness and underscore the value of soft skills in the context of employability.

The intrinsic motivation results suggest an overall positive result, with participants finding enjoyment, competence, choice, and value in the gamified system for soft skill development. The standard deviations provide insights into the varying degrees of individual experiences and

opinions within these motivational dimensions. The responses under the category of Value/Usefulness underscore a positive validation of the gamified system's efficacy for soft skill development. Participants, on average, recognize the significance of incorporating gamification elements in enhancing motivation and making learning process more enjoyable.

However, under Effort/Importance, participants provided a moderate mean score but with a higher standard deviation, indicating moderate agreement regarding the importance of soft skill development. The higher variability in responses suggests diverse perspectives among participants. This further underscores the existence of a skills articulation gap, where individuals may vary in their articulation of the importance of putting effort into soft skill development.

6.5 Summary

Chapter 6 evaluates the impact of gamification on user motivations, drawing on Self Determination Theory constructs. While Extrinsic Motivation shows strong engagement, Intrinsic Motivation indicates positive feedback. With the questions for each regulation consistently achieving above-average satisfaction from the findings, the survey concludes positively which validate the gamification system. The high satisfaction levels across regulation constructs suggest that users perceive the gamification elements positively, indicating a successful implementation of the proof-of-concept. The findings align with previous studies exploring the impact of gamification on student motivation and engagement in educational settings in Section 2.9. However, the Varying perceptions in Introjected Regulation and Amotivation emphasize the need for awareness and highlight a skills articulation gap. The chapter provides valuable insights into the effectiveness of gamification in enhancing user experiences and motivation.

Chapter 7

Conclusion

7.1 Project Summary

In the beginning of the project, the challenges in the soft skills of recent graduates within the Malaysian job market were identified. The initial chapters shaped the project, defining the problem statement, scope, and objectives. The main issue highlighted the evolving demands of the job market, where a deficiency in essential soft skills among recent graduates in Malaysia was observed. To address this, the project strategically focused on extracurricular activities, soft skills development, and innovative gamification. The key problem was a lack of motivation among higher education students to actively participate in extracurriculars, contributing to the shortage of crucial soft skills required for the contemporary workplace and three objectives has been identified to solve the key problem

First, to understand the elements of gamification and their correlation with motivational factors and soft skills development, particularly in the context of career readiness. A thorough literature review emphasized the importance of soft skills, explored motivational drivers in extracurricular activities, and showcased the potential of gamification in educational platforms. Further, a focused effort identified and evaluated gamification elements, such as Acknowledgment, Badges, Leaderboard, and Points, ensuring a tailored and impactful gamified experience for users in an

educational setting. In short, the first objective lays the foundation of the implementation of the second and third objective leading to the success of the project.

The second objective is to design and develop a gamified personal development system tailored for higher education students. Based on the findings of objective 1, the identified gamification elements lay a foundation in the system requirements especially functional requirement and system design such as the User Interface Design and Prototype. The project adapted iterative enhancement model to systematically design and implement the gamification system. Each iteration followed a modular and incremental development approach and evolving requirements. To develop the system, the main tools were collaborative tools like Figma, Canva, and Lucidchart for planning and designing. In the implementation phase, a comprehensive set of web development technologies including HTML, CSS, JavaScript, PHP, SQL, PHPmyAdmin, XAMPP, VSC, and GitHub ensured effective planning, designing, and implementation. After developing the system, the system undergoes testing to ensure the system functions as intended. Phase 2 and Phase 3 under the second objective required the most time and effort, as it involves intensive Planning, Designing, Implementing and Testing to present the working user interface and backbone of the system.

The third and last objective is to evaluate the impact of gamification strategies on mitigating the lack of motivation among these students. After the system has been developed and tested, a total of 10 higher education students have participated in the evaluation of the system. Intrinsic Motivation Inventory (IMI) and User Motivation Inventory (UMI) from Self-Determination Theory were adapted to construct the survey questionnaire to evaluate the impact of gamified system in user intrinsic and extrinsic motivation on soft skill development. While Extrinsic

Motivation shows strong engagement, Intrinsic Motivation indicates positive feedback. A varying perception in Introjected Regulation and Amotivation highlight the need for awareness and emphasize a skills articulation gap. However, the overall high satisfaction levels across regulation constructs suggest successful implementation of the proof-of-concept gamified system.

7.2 Project Contribution

This project makes substantial contributions to higher education by effectively addressing the identified challenges. Recognizing the market gap in essential soft skills among recent graduates, the project strategically integrates gamification elements, aligning itself with established studies that highlight the benefits of gamification in educational settings. It serves as a practical guideline for higher education institutions, offering a roadmap to implement gamification concepts and enhance motivation and soft skill development among students. The concept of gamification learning could apply in higher education current e-learning system in both academic and non-academic development in the future.

The development of a gamified personal development system stands as a primary achievement, providing a gamified solution to the identified market gap. Additionally, the project identifies and evaluates specific gamification elements, serving as a valuable reference for future projects and research usage. The documentation and open-source sharing of the system's source code on GitHub contribute to transparency and accessibility, fostering a potential improvements and accessibility for the future development of similar project. As a comprehensive reference point, this project's methodologies, findings, and outcomes offer a foundation for future research and development in the field of gamified educational systems, contributing to innovation and improvement in the education sector.

7.3 Future Works

While this project has achieved significant milestones, it is essential to acknowledge its limitations and propose avenues for future work. The primary constraint are the project's time limitations, preventing the system from reaching a fully market-ready state, as it remains a proof of concept in gamified learning. The first limitation of the system is the manual recording of event participation. Hence, the first recommendation is to incorporation of an event booking system. This would serve as a centralized platform for higher education institutions to efficiently explore and participate in campus events. However, the implementation of such a system required proactive involvement and initiative from higher education entities. Another limitation is the system only focus on professional soft skills in career readiness, suggesting the potential for future work to broaden the system's scope. The second suggestion is to include self-development aspects such as hobbies and habit development, providing users with a more personal development experience. Lastly, the absence of user behavior analysis within the system. To address this, a recommendation is made to implement a system analysis module, enabling the examination of user activities, completion progress, time spent on the system, and other relevant behavioral metrics. These proposed future enhancements can elevate the system's functionality and impact, making it more comprehensive and responsive to the dynamic needs of higher education and students.

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Appendix

Project Timeline

The project timeline provides an overview of phases and corresponding tasks over a 12-week duration. The project timeline serves as a guide to ensure the systematic development and implementation of the proposed gamified system. Throughout this timeline, ongoing documentation will be maintained to ensure that each development phase aligns with the project's goals. Figure 1.1 shows the overall project timeline.

