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Gamification for Student Achievement in Classroom: In Search of Requirement for Student Achievement Application

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ABSTRACT

There are numerous methods available in the education arena for increasing student participation in class. The experience that students have during class is critical not just for the students, but also for the instructor. Student achievement in the classroom can be increased to the point that the student enjoys performing class tasks. Problems arise when the students are burned out because they are exhausted by learning, especially online learning during the pandemic situation. It is necessary to develop an application that may be utilized as a tool to assist teachers and students in managing student achievement through the use of gamification. The objective of this study is to ascertain which requirements and functions should be incorporated into the design of the student achievement application. User centered requirement engineering approach is used in this research to elicit the requirement from the users. Lecturers and students were employed as respondents in this study to ascertain the development phase's priorities and essential functions. The application's functions and characteristics are separated into two broad categories: technical and usability / content. The Delphi technique is used to identify the function/characteristics. Further research could be conducted to develop systems / applications based on the functional requirements identified during the study in order to develop a student achievement application.

1. Introduction

Educational institutions are one of the sectors that utilize information technology to streamline their operations; even the most basic activities involve the use of information technology [1]. Student knowledge of a subject is critical to the success of teaching and learning activities. There are a variety of strategies that can be used to impart information in the field of education, particularly in college. The primary criterion for success in teaching and learning activities is the students' comprehension of the subject being provided. There are numerous strategies that can be used in the field of education. Nowadays, instructing students necessitates an engaging experience throughout class. According to Rothman [2] the present generation, generation Z (1998-Present), is more reliant on technology and has a stronger visual sense than previous generations. Students in Generation Z prefer self-directed, self-paced learning with possibilities for cooperation when necessary [3]. The typical Generation Z individual, or digital natives according to Cilliers [4] was born into a globally linked (internet) world and thus "lives and breathes" technology. In higher education, Generation Z students rely on PC-recorded lectures rather than taking notes, are more likely to raise questions online, view lectures as "come and entertain me," and do not appreciate waiting for a response, preferring instant information and communication. The use of social media increased in Generation Z because the device to access such technology is available in the mobile phone / smartphone.

Current trends indicate that the classroom learning process necessitates the development of novel teaching and learning strategies. Game-based learning is being identified as a potential means of educating kids. Subjects centered on games and quizzes are always extremely popular in class. The experience that students have during class is critical not just for the students, but also for the instructor. Student achievement in the classroom can be increased to the point that the student enjoys performing class tasks. Problems arise when the students are burned out because they are exhausted by learning, especially online learning during the pandemic situation. Not a few teachers actually set assignments that have an effect on their students' learning load. Overwhelming tasks completed in a short period of time have an effect on student academic burnout [5], [6]. According to Sunawan, Amin, and Hafina [6] burnout is defined as the emotional state of a person who is intellectually and physically exhausted and bored as a result of increasing labor. Burnout is a state that is conceptualized as the result of unmanaged long term occupational stress. The shift in learning to online methods affects psychological well-being of students worldwide[7].

To reduce the burnout that may affect the learning process, especially the online process, one of the numerous ways teachers can make courses more enjoyable and fascinating is to incorporate games into their classroom. One of the methods that can be used is gamification, according to Furdu, Tomozei, and Kose [8] gamification reflects the integration of game mechanics, aesthetics, and game thinking with the goal of engaging people, motivating action, promoting learning, and resolving problems. According to Sanchez, Langer, and Kaur [9] gamification is the process of incorporating aspects of game design (e.g., points) and game characteristics (e.g., assessment, challenge) into non-game environments in order to accomplish desired outcomes. Previous studies suggest that gamification in the classroom can improve the teaching learning outcome [9]–[12]. Student achievement in class is obtained by completing a set of tasks that is given by the teacher to acquire the student learning outcome of the subjects. Furdu, Tomozei, and Kose [8] stated that the benefit of the gamification is to give a better learning experience and combine it with fun during the process. The other benefit is the gamification process is personalized because the achievement process is set to cope with the student pace of work, therefore the student is in control of what they do for the task given by the teacher. According to Cechella, Abad, and Wagner by using gamification in class, it can motivate individuals to act with greater engagement [13].

The gamification in tracking student activity achievement can be supported by using an application, but problems arise when the requirement of the application is not met. According to Dwivedi [14], Unmet user expectations also contribute to the abandonment of the information system. In Indonesia, 18% of information system implementations fail, which is considered a significant failure rate [15]. Any software system's success is dependent upon its ability to suit the needs of its end users; user requirements refer to the characteristics of individuals who will use the system [16]. This research attempts to determine the requirements that are needed and also the functions to be included in the development of student achievement applications to use in the class by considering the gamification principles. The application can be used as an achievement tracker for students by giving a gamification gimmick. By establishing a more enjoyable and engaging environment than the discourse technique, games can help reduce the gap between what is learnt and what is retained. Gamification of the learning process has the potential to inspire teachers in ways that are comparable to recreational activities. In a sense, students are forced to acquire points, and the players who earn the most points automatically win the game. This encourages learners to compete in a pleasant manner and to be more proactive in responding to questions and eager to learn in order to acquire points and "win" the game.

2. Literature Review

According to Fleming et al. [17], gamification is a method to incorporate features from games into non-game scenarios. While a gamified intervention may not be a full game experience, it does incorporate gaming features such as point scoring, in-game awards, and questing. Similarly, the terms 'game-based learning' and 'gamification of learning' can be used to describe a similar concept. From a purely theoretical standpoint, these approaches might be classified as active learning, a new educational trend focused at engaging students and emphasizing knowledge application over acquisition [18]. There are benefits from implementing gamification in the class according to Furdu, Tomozei, and Kose [8] which is better learning experience, instant feedback, and better learning environment. Gamification is frequently used to enhance learning by raising participant involvement in an activity and therefore enhancing the learning outcome achievement [9].

The requirement engineering process is crucial to the information technology project because it determines whether an information technology will succeed or fail. The subset of systems engineering known as requirement engineering is concerned with the discovery, development, tracking, analysis, specification, communication, and support of specifications at different levels of abstraction [19]. The requirement engineering phase of software development is used to specify and analyze the user's requirements based on business processes; consequently. User-centered requirement engineering (UCRE) is a technique for gaining a better understanding of and insight into user expectations and demands. According to Imrona and Widowati [20], the UCRE methods are applicable to defining the requirements of any user.. The UCRE is a hybrid of the classic requirement engineering process with the user-centered design philosophy (UCD). UCD is a multidisciplinary approach that emphasizes active involvement of end users and tasks during the design and evaluation processes, as well as iterative use of design and measurement tools.

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Delphi is the MCDM method that is used in this study. The Delphi technique is used to elicit appropriate criteria from stakeholders since it is relevant when an issue necessitates collective, personal judgements or decisions and when group dynamics hinder this type of communication. Dalkey and Helmer invented the Delphi Method in 1963 for Rand Corporation. The method's purpose is to achieve outcomes by aggregating expert opinion on a certain subject. Generally, the Delphi method's decision-making process can be repeated until consensus is reached. In the first phase, data on the criteria or variables will be identified; once this information is gathered, a questionnaire will be created and distributed to specialists for assessment. The following step is to distribute questionnaires to experts for evaluation; once all questionnaires have been gathered, the findings of the questionnaires will be counted and variables will be deleted from the new set based on consensus. When a consensus is reached, the questionnaire is completed. The Delphi method is a research technique for achieving consensus through the use of surveys and feedback from respondents who possess the necessary information [21]. Delphi takes expert judgment to achieve consensus; multidimensional, multidisciplinary, and cross-disciplinary problems are more difficult to address, even more so when done collaboratively. Consensus is required in Delphi approaches to establish the boundaries that will serve as a reference point for decision-making.

3. Research Method

The objective of this research is to ascertain the requirements that are required and also the functions that will be employed in the application of student achievement. In this research, user-centered requirement engineering (UCRE) is used to better understand and articulate user expectations and wants; the methodology is adaptable to defining the demands of any user [20]. The UCRE is a hybrid of the classic requirement engineering process with the user-centered design philosophy (UCD). UCD is a multidisciplinary approach that emphasizes active involvement of end users and tasks during the design and evaluation processes, as well as iterative use of design and measurement tools. According to Pohl and Rupp [22], requirement engineering is divided into four phases: elicitation, documentation, validation, and administration. During the elicitation phase, system and user requirements are recorded. Fig 1 shows the phase of requirement engineering.

Fig.1 - Requirement Engineering Process

The primary focus of this research is on the requirements for design applications. Before the process can begin, it is necessary to identify the system's stakeholders; once identified, the system's context is examined in order to arrive at a more optimal solution. After defining the context, the next stage is to collect specification data from the users. This data is acquired by Focus Group Discussion (FGD). The requirement can be classified as functional or non-functional. In the documentation phase the output of the previous step is standardized; this acts as a record of functional requirements, ensuring that they can be read, analyzed, written, and validated.

Following the creation of the requirement, the user persona and scenario are created. A persona is a fictitious human that embodies the characteristics of a user's role; a persona serves as the stereotypical image of a user function. The scenario is designed to elicit information about the interactions between the Personas developed in the previous step and the system. The validation process is used to check that the analyzed data from the preceding phase corresponds to the users' requirements; this might provide a more complete picture of the users' intended requirements. The validation process begins with the user being presented with the functional requirements. Lecturers and students are the subject matter experts for this research. This phase collects and analyzes requirements for developing the application. The steps of the process are divided into two parts in this study, namely data collection-related functions and application content, as well as data analysis utilizing the Delphi technique. The Delphi technique is used to elicit appropriate criteria from stakeholders since it is relevant when an issue necessitates collective, personal judgements or decisions and when group dynamics hinder this type of communication [23].

4. Result and Discussion

4.1. Elicitation of Requirements

This step collects the data necessary for analysis. This study combines the conventional method of requirement engineering with the concept of user-centered design. To determine the stakeholder of the application, table I shows the stakeholder identification.

Table 1 – Stakeholder Identification

	Stakeholder
Problem Owner	Lecturer
Problem User	Lecturer, Student
Problem Customer	Lecturer, Student
Problem Analyst	Researcher

The stakeholder identification form table I is based on the stakeholder analysis by Daellenbach and McNickle [24]. From table I it is known that the problem owner is the lecturer, it is because the purpose of this research is to identify the requirement for student achievement application to improve the student engagement in the class, therefore the owner of the problem is the teacher. The problem user and customer for this research is both lecturer and student, because the application is designed to collaborate the interaction between the lecturer and students in the form of tasks in the classroom. After the stakeholder, the next stage is to collect needs; quantitative research is critical for obtaining a greater depth of user input. Prior to conducting the interview, the interview guideline is prepared to facilitate the procedure. Focus Group Discussion (FGD) is conducted between the stakeholders to gain insight about the requirement. The interview process is done with two lecturers and three students. Although the interviews were semi-structured, respondents were able to articulate their requirements. The summary of interviewee characteristics is shown in table 2.

Table 2 – Interviewee Characteristics

User	Age	Gender	Use of Personal Computer	Use of Mobile Phone
User01	41-47	Female	Low	High
User02	27-33	Female	High	High
User03	13-19	Male	Medium	Low
User04	13-19	Male	Medium	High
User05	13-19	Female	Low	High

As shown in Table 2, each user possesses unique traits. The extent to which a user is used to his or her personal computer and website is determined, this is important aspect to considered because according to Callum and Jeffrey [25] students who have substantial familiarity with the more complex functions of technology will be both comfortable with and aware of the benefits of using it for learning.

User01 tends to use websites for searching the teaching materials, if the user is given a task to create a report in spreadsheet the user is having difficulties. User 02 tends to use PC and mobile phone occasionally, the user adapts to the use of the mobile phone because the user occasionally uses the mobile phone for online shopping. User03 tends to use personal computers for online class and for gaming purposes. User04 tends to use both personal computers and mobile phones to learn via online courses. User05 rarely uses a personal computer but often uses a web browser to surf articles on social media. The specified application must be user-friendly. As a result, it is critical to consider the fact that people rarely utilize mobile phones and are more accustomed to interacting with them, therefore the suitable platform for the application is mobile based.

4.2. Documenting Requirements

Documentation of information that has been established or worked out in a previous phase is required. The result of FGD process that is taken in this phase is shown in Table 3.

Table 3 – Requirement Gathered

No.	Requirement	Type / Property	Code
1	Centralized Database	Technical	T01
2	Real-time processing of information	Technical	T02
3	Accessible from anywhere	Technical	T03
4	Application easily seen by the user	Technical	T04
5	Accessible from various platform	Technical	T05
6	Ability of security measurement	Technical	T06
7	Achievement point can be redeemed	Usability/Content	UC01
8	Achievement List	Usability/Content	UC02
9	Badge for each achievement	Usability/Content	UC03
10	Can be post into social media	Usability/Content	UC04

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11	Achievement based on point	Usability/Content	UC05
12	Notification for each achievement completion	Usability/Content	UC06
13	Avatar for profile	Usability/Content	UC07
14	Can change avatar color and clothes	Usability/Content	UC08
15	Penalty for not doing achievement	Usability/Content	UC09
16	Achievement not only academic	Usability/Content	UC10
17	Point for member join (member get member)	Usability/Content	UC11
18	Ads popup when open the application	Usability/Content	UC12
19	Log for every achievement	Usability/Content	UC13
20	Achievement Progress	Usability/Content	UC14

From table 3 it is known that there are 20 requirements that need to be considered in developing the application. There are 6 technical requirements and 14 usability/content requirements. After identifying the requirement, the next step is to define the user persona. Earlier parts of the research incorporated the use of personas and scenarios to ascertain accessibility issues. It is necessary to emphasize that each user is unique and capable of doing duties based on their competency or experience level, particularly those who access the application via mobile phone. The traits vary according to age, gender, native tongue, birthplace, and prior mobile experience. Organizing these features into categories enables us to define and construct the personas. Fig 2 shows the use persona example. The user persona is constructed based on the characteristic of the user that is identified in the previous step.

Ayudhya, 16 years old

Ayudhya is a student in university taking a bachelor of Industrial Engineering, she likes to post her picture in social media especially her video with music background. She tends to try something new and is eager to achieve something for gaining prizes or just popularity.

Fig.2 - User Persona Example

4.3. Validation of Requirements

The requirements are audited throughout the elicitation and documentation phases to ensure they conform to the specifications established during the Validation phase. The validation step is used to confirm that the requirements identified in the preceding phase meet the user demands, which might result in a more complete understanding and picture of the requirements. The validation procedure is administered to the same respondent who participated in the elicitation phase. Individual users were interviewed about each application feature. At this point, the data collected thus far has been picked and analyzed to ascertain the functional requirements for the application that will be constructed. In broad strokes, there are two distinguishing characteristics of excellent information collection, namely technical proficiency and usability / content. Individual users were questioned about the system features. Numerous users inquired about and provided input on the new function. These users can be classified into two groups: those who believe the new feature is beneficial and those who believe it is pointless. Table 4 shows the summary of the validation process.

Table 4 – User Validation

User	Useful?	Give Opinion?
User01	Yes	Yes
User02	Yes	Yes
User03	No	Yes
User04	Yes	Yes
User05	Yes	No

The feature is useful: 4 of 5 people thinks that the feature of the application is useful, User01 think that with the application it can enhance student participation, all of four people agree that the apps is useful, User04 eager to use the system in the class when the app is finished. All four respondent in this category is accustom to use the mobile phone therefore thinks that the requirement for the application and the application itself is useful.

The feature is pointless: 1 of 5 people thinks that the feature of the application is not useful, User03 think with ads in the application, the user especially student will not open the application because it time consuming and need a lot of data quota. User03 also states that it takes a lot of effort from both of lecturer and student to use this application because the lecturer must manually input the achievement and the student must manually check to complete the task given by the lecturer. From the User03 point of view, the requirement then enhanced by adding new requirement based on the User03 point of view. To tackle the high effort from lecturer to add the task manually, new requirement of the "ability to import task from excel" is added. For the ads in the application (UC12), the feature will be included and assess in the Delphi process.

The collected data is subsequently processed using the Delphi technique. The Delphi method is a research technique for achieving consensus through the use of surveys and feedback from respondents who possess the necessary information [21]. Delphi takes expert judgment to achieve consensus; multidimensional, multidisciplinary, and cross-disciplinary problems are more difficult to address, even more so when done collaboratively. Consensus is required in Delphi approaches to establish the boundaries that will serve as a reference point for decision-making; in this research, the consensus is set at 60%. A critical step in the Delphi approach is prioritization; at this point, experts were asked to identify and evaluate criteria based on how they felt by selecting agree or disagree (1 = agree, 0 = disagree). The number one indicates that an expert agrees with a statement posed, whereas the number 0 indicates that an expert disagrees with a statement posed. Table 5 shows the summarized result of the Delphi process.

Table 5 – Delphi Result

No.	Requirement	Code	Percentage	Decision
1	Centralized Database	T01	100%	Pass
2	Real-time processing of information	T02	100%	Pass
3	Accessible from anywhere	T03	100%	Pass
4	Application easily seen by the user	T04	80%	Pass
5	Accessible from various platform	T05	80%	Pass
6	Ability of security measurement	T06	80%	Pass
7	Achievement point can be redeemed	UC01	80%	Pass
8	Achievement List	UC02	80%	Pass
9	Badge for each achievement	UC03	100%	Pass
10	Can be post into social media	UC04	100%	Pass
11	Achievement based on point	UC05	80%	Pass
12	Notification for each achievement completion	UC06	60%	Pass
13	Avatar for profile	UC07	60%	Pass
14	Can change avatar color and clothes	UC08	80%	Pass
15	Penalty for not doing achievement	UC09	40%	Fail
16	Achievement not only academic	UC10	100%	Pass
17	Point for member join (member get member)	UC11	60%	Pass
18	Ads popup when open the application	UC12	20%	Fail
19	Log for every achievement	UC13	100%	Pass
20	Achievement Progress	UC14	60%	Pass
21	Ability to import task from excel	UC15	100%	Pass

From table 5 it is known that from 5 respondent, there are 8 requirement that is 100% consensus (T01, T02, T03, UC03, UC04, UC10, UC13 and UC15), 7 requirement that is 80% consensus (T04, T05, T06, UC01, UC02, UC05 and UC08) and 4 requirement that is 60% consensus (UC06, UC07, UC11 and UC14). There are two requirements that are below 60% of consensus, which are the "Penalty for not doing achievement" requirement (UC09) with consensus of 40% and "Ads popup when open the application" requirement (UC12) with consensus of 20%.

The result of the Delphi, especially the requirement that below the consensus level then elaborated with the respondent. Three out of five respondents feel the UC09 requirement is not needed in the application, this is because the respondent feel that the penalty can be a reason for the user, especially the student not to use the application. According to Rahimi and Karkami [26], Penalties have a detrimental effect on their students' behavior and personalities. Due to the ineffectiveness of the penalty, students may be motivated by fear [27]. From the result the UC09 requirement will not be used as a feature in the system. Four of five respondents feel the UC12 requirement is not to be included in the application, further interviews with the respondent indicate that ads popup is annoying and can break student concentration and experience with the application. According to Nguyen et al. [28], Users typically view ads as a terrible and inescapable reality that worsens rather than enhances the overall user experience. Negative user experiences associated with advertisements can also have a significant impact on the user's perception and attitude toward the advertised product/brand. From the result the UC12 requirement will not be used as a feature in the system to prevent the negative

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user experience when using the system. The result of the Delphi method gains 19 requirements that will be used in the development of the mobile application for student achievement. Table 6 shows the final requirement.

Table 6 – Final Requirement

No.	Requirement	Type / Property
1	Centralized Database	Technical
2	Real-time processing of information	Technical
3	Accessible from anywhere	Technical
4	Application easily seen by the user	Technical
5	Accessible from various platform	Technical
6	Ability of security measurement	Technical
7	Achievement point can be redeemed	Usability/Content
8	Achievement List	Usability/Content
9	Badge for each achievement	Usability/Content
10	Can be post into social media	Usability/Content
11	Achievement based on point	Usability/Content
12	Notification for each achievement completion	Usability/Content
13	Avatar for profile	Usability/Content
14	Can change avatar color and clothes	Usability/Content
15	Achievement not only academic	Usability/Content
16	Point for member join (member get member)	Usability/Content
17	Log for every achievement	Usability/Content
18	Achievement Progress	Usability/Content
19	Ability to import task from excel	Usability/Content

From table 6, if the agile is used as a development lifecycle method then the result can be used later in the system's design phase; the result can be viewed as a product backlog that must be implemented in the system. The product backlog is a list of all tasks that must be completed on the project [29]. The next step is to map and evaluate the Delphi results in order to acquire a clear understanding of the application's requirements. When an application is associated with a certain platform, it must support a number of platforms. To support a variety of platforms, two factors must be considered: the number of supported systems and the sort of application to be built. The focus of the application is in mobile phones, therefore the application must support both android and IOS platforms because both platforms are widely used by the user.

The application requirement must be accessed anywhere and information processing must be real-time, to tackle these issues the application must be connected to the internet and have a centralized database, therefore it is needed to have a server for the infrastructure in order to run the application. The minimum server specification is based on the active users of the application, Virtual Private Server (VPS) is one of the option that can be used because the server is dedicated and can reduce the traffic of gaining data from and to the server, the downside of using the VPS is in cost, because VPS provider usually bill the subscription fee monthly.

Alternative option for the server is in non-dedicated hosting server, from the perspective of cost this can save a lot of budget for the infrastructure but form the viewpoint of quick response the alternative is not suitable when the user is increasing. In the design, the focus is based on persona from each user characteristic, there are two roles for this application which is lecturer and student. Both users have different access in the application, the lecturer role mainly focuses on creating tasks and checking tasks that are completed by the student. Student roles mainly focus on completing the task given by the lecturer. Table 7 shows the summary of the technical analysis.

Table 7 – Technical Analysis Summary

Technical	Needs
Platform	Mobile Based
Support	Android, IOS
Database	MySQL
Connection	Internet via Wifi/Broadband/Quota
Host	Host Server / Virtual Private Server
User	Lecturer, Student

When considering the technology utilized, the application's interface design should be comfortable and simple to use for the user; this statement is consistent with the requirement. To tackle the "Avatar for profile" and "Can change avatar color and clothes", the application must support profile creation through avatar. Avatars are digital representations of themselves [30]. The point system for the application must be applicable not only for academic task but also non-academic task, this means that the task given by the teacher must include non-academic task like absence, student activeness, and etc., to overcome the problem the task structure in the database must support multi categories.

After the technical analysis is conducted, the next step is to categorize and group the requirement. From table 6 it is known that there are 19 requirements which consist of 6 technical requirements and 13 usability/content requirements. The usability/content requirement is then divided into three main groups, which are profile, achievement, and redeem, these three groups later used as modules in the application development phase. Table 8 shows the profile module requirement.

Table 8 – Profile Module Requirement

No.	Requirement	Category
1	Avatar for profile	Usability / Content
2	Can change avatar color and clothes	Usability / Content

From table 8, it is known that all requirements related to the profile are grouped into the profile module requirement. The profile module is regarded as essential by the respondent, therefore it is mandatory to include this requirement into the application. Table 9 shows the achievement module requirement.

Table 9 – Achievement Module Requirement

No.	Requirement	Category
1	Achievement List	Usability / Content
2	Badge for each achievement	Usability / Content
3	Can be post into social media	Usability / Content
4	Achievement based on point	Usability / Content
5	Notification for each achievement completion	Usability / Content
6	Achievement not only academic	Usability / Content
7	Log for every achievement	Usability / Content
8	Achievement Progress	Usability / Content

From table 9 it is known that there are eight requirements that are grouped into the achievement module requirement. All the requirements in this group are essential in the development phase, the requirements can be used as basic functions and can be detailed in the development stage. Table 10 shows the redeem module requirement.

Table 10 – Redeem Module Requirement

No.	Requirement	Category
1	Achievement point can be redeemed	Usability / Content
2	Point for member join (member get member)	Usability / Content

From table 10, it is known that the redeem module requirement consists of two requirements which is "Achievement point can be redeemed" and "Point for member join (member get member)", these two requirements can be used as ground rules to create the redeem function mechanism when developing the application.

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5. Conclusion

The purpose of this study is to identify both the needs and the functions that will be used in the application of student achievement. When creating requirements, this research frequently use user-centered requirement engineering (UCRE). The UCRE is divided into three phases: elicitation, documentation, and validation. The elicitation phase identifies all stakeholders and conducts an in-depth interview to ascertain the demand. The application's functions and qualities are classified into two broad categories: technical and usability / content. Experts use the Delphi approach to determine the priority functions / features. A user persona is constructed to represent the qualities of the user. The persona is then used to guide the documentation phase. From the result there are two requirements from focus group discussion that is not met the minimum consensus of 60%, therefore these requirements will not be included as the requirement in the development phase. This research outcome demonstrates simply the general requirement in terms of the users' requirements identified through user-centered requirement engineering.

Disclaimer

This paper has no conflict of interest.

References

[1] R. P. Soesanto, A. F. Rizana, and L. Andrawina, "Design of Reporting, Evaluation, and Monitoring Application for Student Organization in University," *Int. J. Innov. Enterp. Syst.*, vol. 3, no. 01, pp. 53–57, 2019, doi: 10.25124/ijies.v3i01.34.

[2] D. Rothman, "A Tsunami of Learners Called Generation Z," *PEOPLE Int. J. Soc. Sci.*, 2017.

[3] K. Moore, C. Jones, and R. S. Frazier, "Engineering Education For Generation Z," *Am. J. Eng. Educ.*, vol. 8, no. 2, pp. 111–126, 2017, doi: 10.19030/ajee.v8i2.10067.

[4] E. J. Cilliers, "the Challenge of Teaching Generation Z," *PEOPLE Int. J. Soc. Sci.*, vol. 3, no. 1, pp. 188–198, 2017, doi: 10.20319/pijss.2017.31.188198.

[5] Z. Rahmati, "The Study of Academic Burnout in Students with High and Low Level of Self-efficacy," *Procedia - Soc. Behav. Sci.*, vol. 171, no. 1996, pp. 49–55, 2015, doi: 10.1016/j.sbspro.2015.01.087.

[6] S. Sunawan, Z. N. Amin, and A. Hafina, "The Differences of Students ' Burnout from Level of Education and Duration Daily Online Learning During COVID-19 Pandemics," 2021.

[7] N. Mheidly, M. Y. Fares, and J. Fares, "Coping With Stress and Burnout Associated With Telecommunication and Online Learning," *Front. Public Heal.*, vol. 8, no. November, 2020, doi: 10.3389/fpubh.2020.574969.

[8] I. Furdu, C. Tomozei, and U. Kose, "Pros and cons gamification and gaming in classroom," pp. 56–62, 2017, [Online]. Available: http://arxiv.org/abs/1708.09337.

[9] D. R. Sanchez, M. Langer, and R. Kaur, "Gamification in the classroom: Examining the impact of gamified quizzes on student learning," *Comput. Educ.*, vol. 144, no. October 2018, p. 103666, 2020, doi: 10.1016/j.compedu.2019.103666.

[10] F. Oprescu, C. Jones, and M. Katsikitis, "I PLAY AT WORK-ten principles for transforming work processes through gamification," *Front. Psychol.*, vol. 5, no. JAN, 2014, doi: 10.3389/fpsyg.2014.00014.

[11] C. A. Rowland, "The effect of testing versus restudy on retention: a meta-analytic review of the testing effect," *Psychol. Bull.*, vol. 140, no. 6, pp. 1432–1463, 2014, doi: 10.1037/a0037559.

[12] N. Z. Legaki, K. Karpouzis, V. Assimakopoulos, and J. Hamari, "Gamification to avoid cognitive biases: An experiment of gamifying a forecasting course," *Technol. Forecast. Soc. Change*, vol. 167, p. 120725, 2021, doi: 10.1016/j.techfore.2021.120725.

[13] F. Cechella, G. Abbad, and R. Wagner, "Leveraging learning with gamification: An experimental case study with bank managers," *Comput. Hum. Behav. Reports*, vol. 3, no. January, p. 100044, 2021, doi: 10.1016/j.chbr.2020.100044.

[14] Y. K. Dwivedi *et al.*, "Research on information systems failures and successes: Status update and future directions," *Inf. Syst. Front.*, vol. 17, no. 1, pp. 143–157, 2015, doi: 10.1007/s10796-014-9500-y.

[15] R. D. Apriyanto and H. P. Putro, "Tingkat Kegagalan Dan Keberhasilan Proyek Sistem Informasi Di Indonesia," *Semin. Nas. Teknol. Inf. dan Komun. 2018*, vol. 2018, no. Sentika, pp. 23–24, 2018.

[16] L. Teixeira, C. Ferreira, and B. S. Santos, "User-centered requirements engineering in health information systems: A study in the hemophilia field," *Comput. Methods Programs Biomed.*, vol. 106, no. 3, pp. 160–174, 2012, doi: 10.1016/j.cmpb.2010.10.007.

[17] T. M. Fleming *et al.*, "Serious games and gamification for mental health: Current status and promising directions," *Front. Psychiatry*, vol. 7, no. JAN, 2017, doi: 10.3389/fpsyt.2016.00215.

[18] S. Sandrone and C. Carlson, "Gamification and game-based education in neurology and neuroscience: Applications, challenges, and opportunities," *Brain Disord.*, vol. 1, no. November 2020, p. 100008, 2021, doi: 10.1016/j.dscb.2021.100008.

[19] J. Dick, E. Hull, and K. Jackson, *Requirements engineering*. 2017.
[20] I. M. Nurrifqhi Arian , Widowati Sri, "Implementasi User Centered Requirements Engineering pada Perancangan Aplikasi," vol. 4, no. August, pp. 9–20, 2019, doi: 10.21108/indojc.2019.4.2.256.
[21] A. Habibi, A. Sarafrazi, and S. Izadyar, "Delphi Technique Theoretical Framework in Qualitative Research," *Int. J. Eng. Sci.* ||, no. December, 2015, [Online]. Available: www.theijes.com.
[22] K. Pohl and C. Rupp, *Requirements Engineering Fundamentals*. rockynook, 2015.
[23] B. M. M. Grime and G. Wright, "Delphi Method," *Wiley StatsRef Stat. Ref. Online*, no. August, pp. 1–6, 2016, doi: 10.1002/9781118445112.stat07879.
[24] H. G. Daellenbach and D. C. McNickle, *Management science : decision making through systems thinking*. New York: Palgrave Macmillan, 2005.
[25] K. Mac Callum and L. Jeffrey, "The influence of students' ICT skills and their adoption of mobile learning," *Australas. J. Educ. Technol.*, vol. 29, no. 3, pp. 303–314, 2013, doi: 10.14742/ajet.298.
[26] M. Rahimi and F. H. Karkami, "The role of teachers' classroom discipline in their teaching effectiveness and students' language learning motivation and achievement: A path method," *Iran. J. Lang. Teach. Res.*, vol. 3, no. 1, pp. 57–82, 2015.
[27] M. Fuad, E. Suyanto, and U. A. Muhammad, "Can 'reward and punishment' improve student motivation ?," *Eur. Online J. Nat. Soc. Sci.*, vol. 10, no. 1, pp. 165–171, 2021.
[28] N. T. Nguyen, A. Zuniga, H. Lee, P. Hui, H. Flores, and P. Nurmi, "(M)ad to See Me? Intelligent Advertisement Placement: Balancing User Annoyance and Advertising Effectiveness," *Proc. ACM Interactive, Mobile, Wearable Ubiquitous Technol.*, vol. 4, no. 2, 2020, doi: 10.1145/3397324.
[29] M. C. Layton, "Scrum for Dummies - A Wiley Brand," p. 403, 2015.
[30] P. R. Messinger, X. Ge, E. Stroulia, K. Lyons, K. Smirnov, and M. Bone, "On the Relationship between My Avatar and Myself," *J. Virtual Worlds Res.*, vol. 1, no. 2, pp. 1–17, 1970, doi: 10.4101/jvwr.v1i2.352.

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