



Android-based Microsoft Excel Learning Application Design using Gamification Method

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Abstract

Microsoft Excel is software can support performance in data processing, Microsoft Excel provides formulas and function that can be used to facilitate perfomance in data processing. Utilization of Microsoft Excel can be used in every day life in business and educational activities. Microsoft Excel can perform arithmetic calculation, so can simplifying the assessment results and as an alternative that can provide maximum results. The purpose of this research is design and build a Microsoft Excel learning application with the gamification method to increase behavioral intention to use and immersion in the learning processto provide an alternative learning process in learning formulas and functions in Microsoft Excel. The method used in this study was designed and built with the gamification method using the sixsteps to gamification framework developed by Kevin Werbach in 2016. The results of this learning application have been evaluated by 32 respondents by filling out a survey based on the Hedonic Motivation System Adoption Model. From the survey, 77.5% were obtained for the behavioral intention to use aspect and 64.53% were obtained for the immersion aspect. The conclusion of this study in implementing gamification using the six steps to gamification framework states that they agree with evidence of 77.5% for the behavioral intention to use aspect and 64.53% for the immersion aspect.

A. Introduction

In the digital era, technological advances are growing so rapidly, the use of technology is increasingly being used, one of which is in processing large amounts of data, one of the software that is generally used is Microsoft Excel, by using the help of formulas and functions provided in Microsoft Excel can facilitate performance in data processing. The use of Microsoft Excel can be used in daily life, especially in business and educational activities [1]. In addition, Microsoft Excel as an alternative data processing can provide maximum results [2]. Microsoft Excel is a spreadsheet software that has the ability to perform arithmetic calculations automatically, so that simplify the assessment and calculation of the results [3].

Gamification is the use of game basic, thinking games and game mechanics for improve non-game context [4]. Gamification is the process of applying game designs and concepts to the learning or training process with the aim that more interesting and entertaining for participants so that they can increase engagement, the concept of gamification can be implemented in sectors such as marketing, training and education [5]. Gamification has potential applications broad contexts such as health care, sustainability, government, transportation, and education [6]. Gamification is used as an approach to experimenting in various strategies including task completion, learning individuals or groups, and as an assessment tool [7]. For limiting the purpose of unnecessary gamification it depends on 4 components, namely games, elements, designs, and non-game text [8].

Six steps to gamification is a framework used in this research. This framework has organized into 5 categories, namely: economics, logic, measurement, psychology, and interaction [9]. In addition, in building this framework's gamification system also equipped with 6 stages including define, delineate, describe, devise, don't forget to fun, and deploy. From these stages can help create a gamification system for the better [10].

In this research, it is focused on using at Microsoft because the Universitas Multimedia Nusantara (UMN) facilitates the use of Microsoft by creating at least the account uses student email, so it can use Microsoft products freely. The method used is the gamification method by using use the developed six Steps to gamification framework developed by Kevin Werbach and Dan Hunter in 2016.

B. Research Method

GAMIFICATION DESIGN

Gamification design using a six steps framework to gamification, and using reference material from books "Mastering Formulas and Function of Excel 2007-2019" written by Adi Kusrianto in 2019 [11].

A. Define Business Objectives

The first design is to determine the application to be made by creating a name or object, the given application name is "EXCLS". The main purpose of making this system is to provides a tool for users who want to learn about Microsoft Excel by gamification. The gamification system applied to this application is expected to help and increase motivation or user's willingness to learn about Microsoft Excel.

B. Delineate Target Behaviors

The next design is to describe the behavior of the target, the system gamification that will be made is expected that users can learn the use of functions and formulas of Microsoft Excel for a minimum of 15 minutes. Each level in learning has a maximum time of 10 minutes, if users who do not understand the material, they will use it the 10 minutes to answer questions at that level, while users who already understand the material can answer all the questions on one level for 5 minutes, so that if the user plays all levels The minimum time used is 15 minutes.

C. Describe Players

Applications made targeting junior high school students and above want to learn the Microsoft Excel formulas and functions to deepen user knowledge. The target user has a user type different, this application strives to provide features that targeted for all types of users. Type killer can take advantage of leaderboard feature to compete with other users [12]. Type achievers can take advantage of the leaderboard, score, and achievement features to show the characteristics of "achievement" [12]. Explorer type can take advantage of the achievement feature to show characteristics "explorer" [12]. Socializer types can take advantage of the avatar features and achievement to show the characteristics of "socialization" [12], [13], [14].

D. Devise Activity Cycles

This application implements both activity cycles namely engagement loops and progression stairs. Existing features such as shop, leaderboard, points, and achievements are expected to help fulfill the two activity cycles. Activity cycles that will be applied to the application are as follows:

-Engagement Loops

The applied Engagement Loops is to collect coin and score, the accumulated score will be displayed on the leaderboard feature, the score is obtained by the user every time he completes level learning. While coin is obtained by the user after completing the level learning, coin can be used to buy avatar in the shop feature.

-Progression Stairs

Progression Stairs that is implemented is to open all existing achievements, the requirements to open each achievement vary according to the type of achievement, in the achievement feature there is achievement collection score 5000 and 10000, users can open achievement 10000 if they have opened achievement 5000, while coin has achievement 5000 coin and 10000 coin, users can open achievement 10000 coin if they already get achievement 5000 coin.

E. Don't Forget To Fun

The last step before starting to implement the gamification system is the "fun" factor. In bringing together the elements of a game and taking into account the complexity of players, goals, rules, and motivations, it's easy to forget the "fun" aspect. The type of "fun" in each game is different depending on what aspect is used.

-Hard fun

This type of user will try to get all the existing achievements, the available achievements can be obtained in different ways and with different requirements it is expected that the user can complete and get achievements in addition to getting score or collect coin for shopping at shop.

-Easy fun

This type of user does not have the burden or necessity to get the existing achievement or the highest score, but the user can choose the level of existing learning to play.

-Altered States

This type of user will collect all existing avatars to provide interaction with other users.

-The People Factor

This type of user interacts with other users via leaderboard, in the leaderboard feature, scores of other users can be displayed so that they can compete with other users.

F. Deploy the Appropriate Tools for the Job

To launch a system that meets the previous needs, a Microsoft Excel learning application based on Android was made. The application will be made using Android studio as the software application, and using firebase as the database application, the programming language used is kotlin in making the application.

C. Result and Discussion

This section contains the results of research and discussion, as well as the implementation of the developed system design. In addition, in this section the author should interpret the results of his findings, and confirm his findings with other existing findings or theories. The application model that is designed when user is using the application, the device used will respond to the user according to the activity of user while using the application. There is an application process and the database will be connected to each other to perform the get and post process, the post process when user registers and the data is stored in firebase and the get process when user logs in and the data will be retrieved via firebase.

On the login user page, you must fill in the email and password fields, after user presses the login button, a check will be carried out in the form of account validation. This is done to find out the email column is empty or not, if email is not empty, it will continue to check that email is used is a valid email or not, if email if the password matches the entered email it will be redirected to the home page, if it does not match the application will display error message is "Password does not match". Figure 1 is the home screen application display. Home page on the application contains a logout button if the user wants to change the account, avatar profile currently in use, the welcome text contains the username, play button, leaderboard button, shop button, achievement button. Profile avatars are used to redirect to profile page. The play button is used to select levels. The shop button is used to go to the shop page. Leaderboard button used to go to the leaderboard page. The achievement button is used to go to the achievements page.

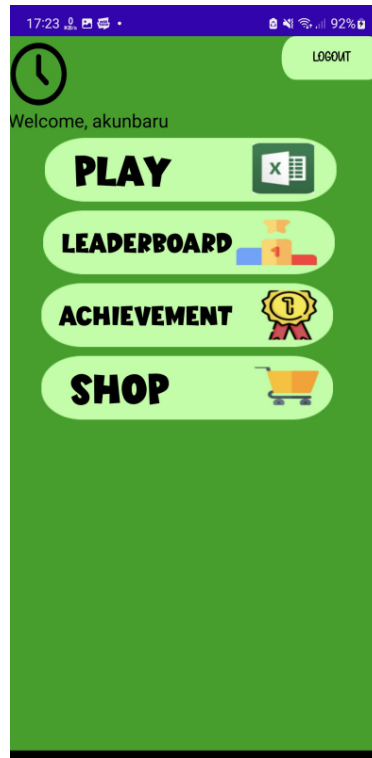


Figure 1. Homeplay Screen

The register page is used to create a new account, user enters data such as: username, email, password and confirm password. After user presses the register button, validation will be carried out to database in the form of checking email, if email is not empty and valid, it will continue to check password, if password is not empty it will check confirm password, if confirm password matches, the application will redirect to the login page. On the register page there is "Have an Account? Login Here" which can be used by user if you already have an account. Figure 2 is the application display gameplay screen. The gameplay page is used for learning from the material Microsoft Excel, each level has 15 questions and has time 10 minutes. If the answer is correct then score is added 100 and coin is added 100, if the answer is wrong there is no subtraction.

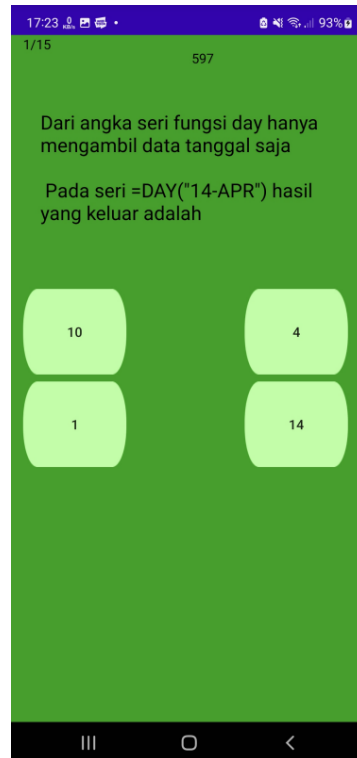


Figure 2. Gameplay Screen

The shop page used to buy avatar, avatar already owned by user will not be displayed again on the shop page. If user presses the "Buy" button, a message box is displayed to confirm the purchase. If user presses the "Buy" button, a check is carried out on the coin owned, if coin is insufficient then avatar fails to purchase, if coin is sufficient then avatar successfully purchased. If user presses the "Cancel" button, the avatar is cancelled. The achievement page contains the achievement list contained in the application, if user meets the requirements to open the achievement, then the color of text and background achievement will change, from black and background contains icon lock will change to white text and icon lock is missing. Figure 3 is the application display leaderboard screen. The leaderboard page contains data from all accounts stored in firebase, the data is taken by column score and sorted by biggest number.



Figure 3. Leaderboard Screen

Evaluation

The evaluation for this Microsoft Excel learning application is carried out by using questionnaires and links to download surveys application. This is done by spreading it to class groups and friends. There are 32 respondents with junior high school (SMP) status who have filled out the survey based on the link provided, and the survey results are calculated based on the Hedonic Motivation System Adoption Model question using the likert scale. With the survey results obtained the following values:

- Perceived Ease Of Use (75.26%)
- Curiosity (72.25%)
- Control (71.35%)
- Perceived Usefulness (77.25%)
- Behavioral Intention to use (77.5%)
- Joy (71.66%)
- Immersion (64.53%)

From all the calculations above, it can be seen that the highest aspect is the Perceived Ease Of Use aspect (75.26%) and the lowest aspect is the immersion aspect (64.53%). Of these seven aspects, the average percentage value is 72.82%

D. Conclusion

The Microsoft Excel learning application based on Android which was designed and built using the gamification method using the six steps to gamification framework has been successfully designed and built. Examples of gamification

aspects that have been implemented include achievement, leaderboard, avatar, and shop. The results of the research from this application have been evaluated by 32 respondents and get 77.5% results for the behavioral intention to use aspect and for the immersion aspect, the results are 64.53%. This figure shows that the respondents agree that learning using the gamification method can make users want to return to using this learning application. Respondents also agree that users were easily carried away when using this learning application.

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