

# Web-Based Learning Design and its Implementation on TOEIC Reading Skills to Measure the Usability and Learning Outcome A Case Study at Global Institute

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## ABSTRACT

Test of English for International Communication (TOEIC) is a compulsory subject taught to all students regardless their chosen concentration. The subject covering the consecutive two semesters at Institut Bisnis dan Teknologi Bina Sarana Global has been given for the past five years. Nevertheless, the students' achievement is still considered low, where the average scores for both mid and final semester paper-test based haven't met the expected target. TOEIC itself tests students' ability to comprehend reading texts encompassing grammar, sentence structure and vocabulary. This becomes a challenge since the majority of students have below average English competence. In contrast, their access to technology is deemed adequate, thus, its implementation towards learning can be a contributing factor to a better learning outcome by providing engagement with the technology itself. In line with the development of technology and to accommodate students' learning needs with various motivation and abilities, a scheme for developing learning materials through a web design was proposed. The researchers used SLDC for the design method, focusing on prototyping model through phases from generating users' needs, designing prototype using figma application, putting into trials and practices to conducting evaluation. As for the application, a PHP programming language with Codeigniter 4, programming MySQL as a database system, Bootstrap for website outlook, Black Box Testing with Equivalence Partitions Technique and Beta Testing through questionnaire become the framework for the proposed design. After the implementation was completed, a good result with a percentage of 71% for the usability of the application was shown and that students achieved better scores in the given practice tests.

## 1. Introduction

Digital Transformation has been integrated into a number of diverse fields, be it medicine, finance, business, fashion, social media and education. Education itself has undergone changes not only in the learning system but also in the development of the learning instructions. Automation and digitalization can be clearly notified in the design of the E-learning, a current way in education sector to support economic and social endeavors.

The information and communication technology have, undoubtedly, impacted the education sector, particularly in the learning process, thus, the innovation of the learning media was unavoidable. [1]

Up to now, the TOEIC learning and tests at the Global Institute of Technology and Business were given conventionally

where students learnt from a book and worked on paper-based practice tests. Consequently, it took much longer in terms of process and duration. In addition, lecturers should check the students' test paper so it was considered inefficient. A system enabling students to learn the materials, do the mid and final tests was deemed necessary. An innovation in the learning process was developing web-based TOEIC materials and practice tests. As a matter of fact, a number of researches had undergone similar studies, among others were The Management Information System for a web-based TOEIC and Android [2] , prototype design for an English proficiency test, and a secretary study program application. [3] Both researches highlighted listening competence. Another application was the design of web-based TOEIC focusing on Reading and Listening[4], nevertheless

the system was not supported by a set-timer and an interesting user interface.

This study implemented the Prototyping Model. Based on the comparison of Waterfall model, namely the Prototype and Rapid Application Development (RAD), it could be stated that the waterfall model suited the generic system or software, whilst the Prototype and RAD were more applicable for a customized system or software.[5] TOEIC application itself was a customized application since its design was based on the needs and that it would be used at Global institute for Business and Technology. The TOEIC web-based application was built using the codeigniter 4 framework, bootstrap for the website interface, MySQL for the database system and Black Box for the testing method. Equivalence Partitions technique and users evaluation employing Likert Scale were to measure the usability of the application. An interesting interface was such designed so that students found it easy to access, to read the module and to do the practice tests whereas lecturers would have no difficulties monitoring the web activities.

## 2. Method

### 2.1 The Prototyping Model

The prototype model approach is used if the user only defines the general objectives of the software without specifying the input, delivery and output requirements.[6] The prototyping model started from analyzing the users' needs towards the proposed software. A prototype program was made in the forms of software flow simulation so as to make it resemble the completed, ready-to-use software display. This prototype program would then be evaluated until the specification expected by users could be granted. [7] Below was the illustration of the prototyping model:

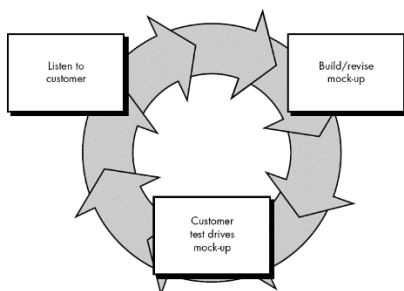


Figure 1. The illustration of Prototyping model

#### 2.1.1 The Needs Analyses

In this stage, there were significant points that had to be done in order to design a system that met the needs. This data collection methods employed in this study were as follows:

##### 2.1.1.1 Interview

An interview was conducted through a Focus Group Discussion consisting of lecturers and the

language experts as to what development in the TOEIC learning instructions were needed. As the respondents were students of Institute Technology and Business Bina Sarana Global, they were also involved in the discussions. The interview results became the grounds for the learning application to be developed. The results of the interviews showed that the implementation of the TOEIC learning and test were still carried out conventionally, a physical textbook was used by the students to learn the materials and do the practice tests whilst the mid and final tests were paper-based. This required a longer process and time particularly for the test results. Hence, it was considered necessary to have a better system that can facilitate the implementation of the TOEIC learning and testing.

#### 2.1.1.2 Observation

This phase was conducted through on site observation to gather necessary information and to investigate a number of related issues to which the needs for a development on TOEIC updated learning design can be proposed. In addition, documentation was also collected as to how the ongoing system persisted and what further steps were to be considered, such as the TOEIC test conducted by English Lecturers to determine the level of students' understanding and collect the documents used, namely TOEIC questions, answer keys and students' TOEIC test results.

#### 2.1.1.3 Literature Review

An array of books and journals were searched and used to serve as the grounds for the research. The theoretical explanations would be beneficial to support researchers in developing the design. In addition, a literature review on previous researches were observed and learned, thus the data collection could support the research to be structurally worked on, whilst at the same time the development of current technology was integrated.

#### 2.1.2 Prototype Development

Prior to the prototype development, the data collection previously conducted served as the basis for its construction. The prototype was developed by using figma application that provided views with a simulation of software flow. Figma can save time on design verification because collaboration such as giving comments, suggestions, and even changing existing designs at the same time is possible to take place. Figma is a cloud-based design application and prototyping tool for digital projects. Figma was created to help users collaborate on projects and work in teams at once anywhere.[8]. Prototype development aims to make it easier for users to know the description of the system to be built.

### 2.1.3 Prototype Evaluation

Having been developed, the prototype was evaluated. The purpose was to find specifications that met the users' needs. The iteration process was progressing until the needs were well-fulfilled.

## 2.2 System Coding

In this phase, the coding system was made. This was based on the prototype results agreed by users which then translated into a programming language. In this study, the researchers used PHP programming Language with codeignitor version 4 framework. Framework CodeIgniter (CI) is a framework for the web created in PHP format. The advantage of the Codeigniter (CI) framework is that it can be used to create complex web application systems, it can speed up the web creation process because all the classes and modules needed already exist and programmers just need to reuse the applications that are made.[9] In addition, making the application also uses MySQL for the database system and Bootstrap for website display.

## 2.3 System Testing

In this phase, a testing was conducted to ensure all features could be well-operated. The testing process used black box testing, where it served as a testing of the outside part of the software, for instance an interface design. [10] There were six ways for Black Box testing: equivalence partitioning, boundary value analysis, cause effect graphing, fuzzy testing, and model-based testing. [11] In this study, the researchers used equivalence partitioning techniques. Equivalence Partitions technique was a testing technique based on the data input in every form where each single input menu would be tested and grouped whether or not they were valid [12] and users' evaluation by distributing questionnaire with the Likert scale [13] The Likert scale is a psychometric scale commonly used in questionnaires, and is the most widely used scale in survey research. Likert scale is used to measure attitudes, opinions, and perceptions of a person or group of people about social phenomena. With a Likert Scale, the variable to be measured is translated into an indicator variable.[14]

## 2.4 Research Stages

The study started from identifying the problems based on the previous research conducted last year. The research was regarding the development of the learning instruction for the TOEIC Reading Skills . [15] To continue the research, a web-based TOEIC reading practice test was proposed and developed. A preliminary survey with students and lecturers, a literature study and data collection supported the research. Next were a research design and data collection for the process of designing

prototype method. When the prototype system was confirmed, the coding system was made. This could be seen in figure 3. Furthermore, to test the functionality of the application for the users, the proposed system was evaluated. Upon the completion of overall stages, the implementation system was started, with students as users and lecturers as admins.

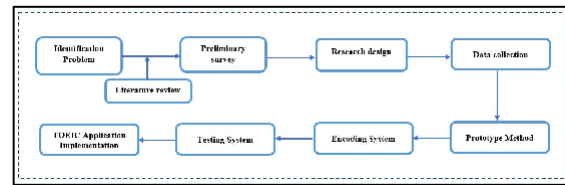


Figure 2. The research stages

Figure 3 showed the stages of the coding system were conducted until the end of July 2022. The stage commenced from collecting the needs analyses by interviewing users concerning the details of the prototype made, then continued to the development of the application stages by taking into account the MVP target to the system migration stage. Hence, having migrated to the domain address namely globaltesttoeic.com, users could access online more easily.

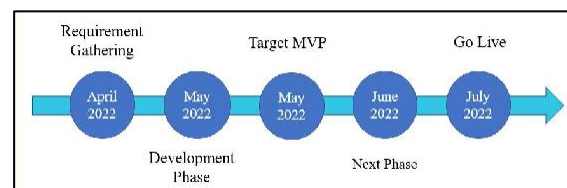


Figure 3. The stages of the coding system

## 3. Result and Discussion

Based on the research process, the following was the TOEIC web-based application view. The application design was the results of the discussion with users.

### 3.1.1 System Implementation

The stages to run the web-based TOEIC application are as follows:

1. Landing page

To get access to the TOEIC materials and practice tests online, students visited the URL <https://globaltoeicest.com/>. The system view could be seen below:

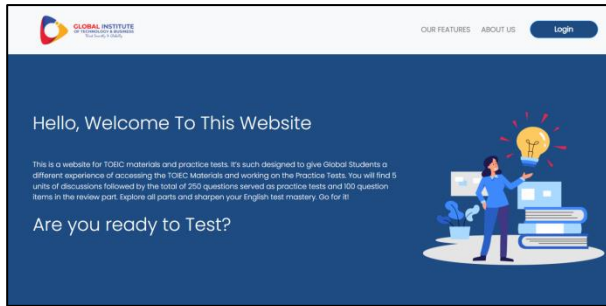


Figure 4. Landing page

## 2. Login page

In the previous view, there was a login feature. Students who had accounts could login by typing their names and passwords on the login page. The rest should click the registration account so that they could also access the web.

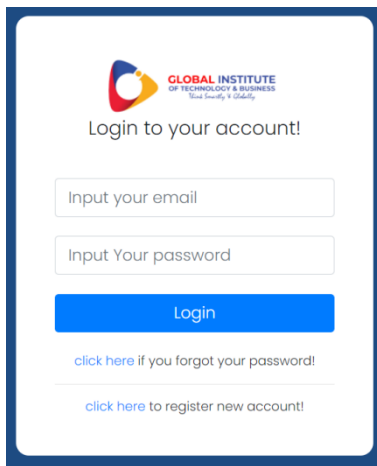


Figure 5. Login page

## 3. Registration page

Students who didn't have accounts could register first by completing the form as shown at figure 6. The data would later be used to monitor all students who have registered and completed the practice tests.

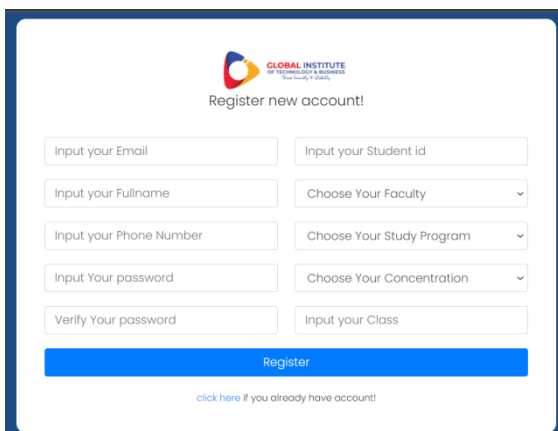


Figure 6. Registration page

## 4. Home Page

Students who have registered could login and got access to check information about TOEIC test, the modules, and doing the TOEIC reading practice test on the website.



Figure 7. Home Page

## 5. The Module Page

Prior to accessing the practice test, students could learn the modules. These consisted of 5 (five) units where each unit would cover the explanation and examples. Then students accessed the practice test provided in each unit, starting from sentence completion, paragraph completion and reading comprehension. The module page could be seen from the following figure:

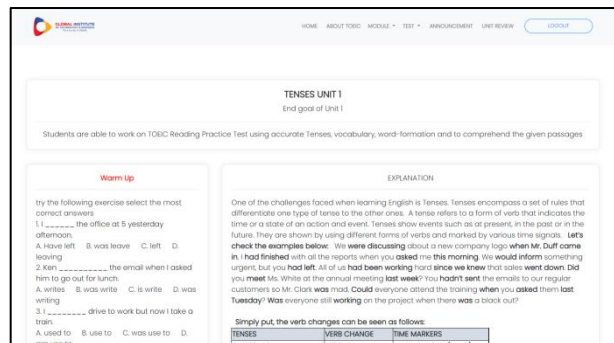


Figure 8. Module page

## 6. Testing page

Upon the completion of reading and understanding the modules, students could try the practice tests with the total of 50 (fifty) test items for each unit: 20 questions for a sentence completion part, 15 questions for a text completion section and additional 15 questions in the reading comprehension. For each unit, the time given which also became the access time, was 40 (forty) minutes. Once the students started, the timer would begin running. Below was the view:

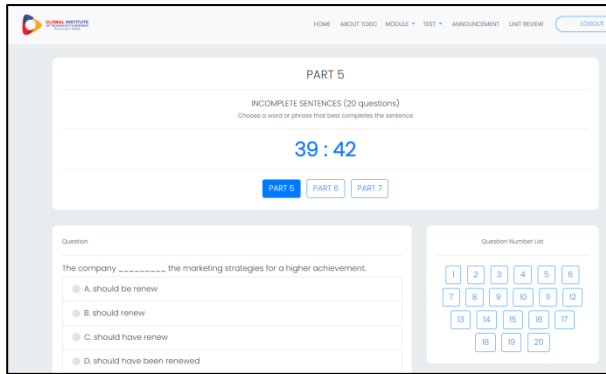


Figure 9. TOEIC Test page

### 7. Scoring Page

Students having completed the whole practice test parts could get information on the scores achieved, as seen at figure 7. There were 5 (five) scoring categories corresponding the scores gained.

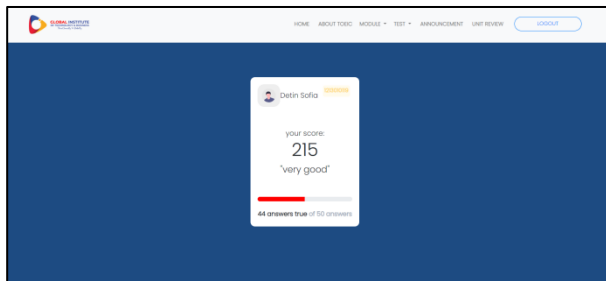


Figure 10. Score Results Page

### 8. Dashboard page

Lecturers could conduct monitoring to check how many students have registered and the ranks for scoring results were as described by figure 11:

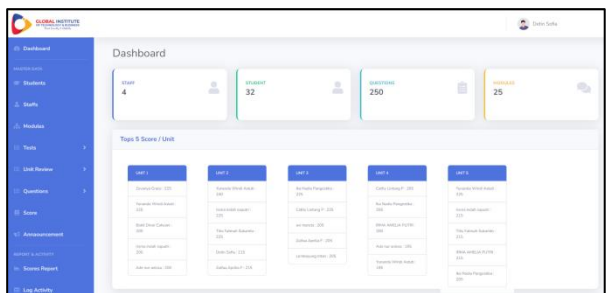


Figure 11. Dashboard Page

## 3.1.2 System Testing

Testing at this stage served to test the application and ensure the application could run as planned and all functions could be used. The tests were carried out using the Black Box method with equivalence partitioning techniques that focused on the application functionality and users testing.

### 3.1.2.1 Functionality Testing

The black box testing process was a test that was carried out by trying out application programs through

data entry into the forms that have been provided. This test allowed the software engineer to obtain a set of input conditions that fully met all the functional requirements for a program.[16]

Table 1. Black Box Testing Results

The Testing names	The Testing Formats	The expected results	The final results
Users login testing	Clicking the login button	Showing Login Form option	Successful
Users registration Testing	Tapping <i>click here to register</i> account	Showing a field for user registration	Successful
The registration field testing was successful	Completing all users' registration fields correctly	Showing a display to login	Successful
The registration field testing was unsuccessful	Completing registration field but there was still a blank field and the the input data were not suitable	Showing a notification that a registration was unsuccessful	Successful
Login field testing	Did not fill in the login field	Showing a notification that a field should be completed	Successful
Login testing was successful	Completing username field and registered password	Login to the users page as a user	Successful
Login testing was unsuccessful	Completing username field and unregistered	Displaying the notification that username not found	Successful
Logout testing	Clicking logout button	Displaying the public page of the application	Successful
Admin login field testing	Not completing login field	Displaying a notification that field should be completed	Successful
Login testing was successful	Completing user name field and	Login to users' page as an admin	Successful

	registered password		
Admin login test failed	Completing username field and failed password	Displaying a notification <i>username not found</i>	Successful
Logout Testing	Clicking logout button	Displaying the public page of the application	Successful

### 3.1.2.2 User Testing

Beta testing was a typical testing used by end-user of a software, as a respondent of a questionnaire in which it included questions on the usability of the application [17]. The testing was conducted by distributing the questionnaire link on google form, as illustrated at figure 12. A design of ten questions requested the respondents to select one of five options based on Likert scale of Strongly disagree, disagree, doubtful, agree and strongly agree. The score 1 was given for strongly disagree and 5 for strongly agree.

Figure 12. Users' questionnaire for TOEIC application

Based on the questionnaire results, the percentage for each response can be calculated using the formula below [13]:

$$Y = \frac{x}{i} \times 100\%$$

Notes:

Y = Percentage value

i = The ideal score (Likert highest score was multiplied by the number of respondents)

X = Score total

The score interpretation criteria for Likert scale can be seen as follows:

0% < Y < 20% = Very weak

21% < Y < 40% = Weak

46% < Y < 60% = Average

61% < Y < 80% = Strong

81% < Y < Very strong

The accumulated result from 20 respondents was 71%, indicating that the web-based TOEIC applications was considered strong in terms of its usability.

## 4. Conclusion

Based on the process carried out through the designing of a web-based TOEIC application using a prototyping model which went through a series of processes, some conclusions were highlighted. From the data collection, the prototype creation up to the evaluation, the final prototype results were achieved in accordance with the agreement the users had set. Furthermore, the coding was made for a web-based TOEIC application with the PHP programming language using the PHP programming language. In addition, codeigniter 4 framework, as well as bootstrapping for views and MySQL for database systems were also utilized. Then the test was carried out in two stages, namely functional testing and user testing. Functional testing was satisfactory because the majority of tests were successful, whilst users tests got 71% results, meaning they were in a strong area. This clearly indicated that the web-based TOEIC reading application was users-friendly, particularly for students, where they could also immediately see the results obtained after completing the TOEIC practice tests.

Nevertheless, the web-based TOEIC Reading application in this study still needs some improvements that can be suggestions for further researches. The need for adding the number of TOEIC test questions up to 100 items to comply with the standardized one, the value criteria with the conversion table and the camera features to monitor students when conducting online TOEIC tests are significant points to consider for future studies.

## 5. Acknowledgement

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