TABLE OF CONTENTS

[CHAPTER 5: TESTING 2](#_Toc9018681)

[1.0 INTRODUCTION 2](#_Toc9018682)

[1.1 METHODS OF TESTING 2](#_Toc9018683)

[1.1.1 Black Box Testing 2](#_Toc9018684)

[1.1.2 White Box Testing 3](#_Toc9018685)

[1.1.3 Module Testing 3](#_Toc9018686)

[1.1.4 Regression Testing 3](#_Toc9018687)

[1.1.5 Integration Testing 3](#_Toc9018688)

[1.1.6 System Testing 3](#_Toc9018689)

[1.1.7 Alpha and Beta Test 4](#_Toc9018690)

[1.1.8 Acceptance Testing 4](#_Toc9018691)

[1.1.9 Installation Testing 4](#_Toc9018692)

[1.2 VALIDATION 4](#_Toc9018693)

[1.3 VERIFICATION 4](#_Toc9018694)

[1.4 TEST RESULTS 5](#_Toc9018695)

[1.5 CONCLUSION 5](#_Toc9018696)

# CHAPTER 6: TESTING

## INTRODUCTION

After a thorough and successful completion of the design phase, the researcher moved on to the coding and testing stage.

According to Aggarwal and Yogesh (2007), Testing is the process of executing a program with the intent of finding errors. The author however viewed software testing as an expensive activity, yet launching of software without testing may lead to cost potentially much higher than that of testing, especially in systems where human safety is involved. Mohamad (2011), defined testing as an activity that aims to evaluate the attributes or capabilities of software or hardware products, and determines if the products have met their requirements. Testing, in general, is a very important phase of the software development cycle. It helps to reveal the hidden problems in the software product usually called bugs, which otherwise goes unnoticed providing a false sense of well-being. It is divided into static and dynamic. Static testing was used to review the system components and doing system walkthroughs and code inspection whilst dynamic testing is defined as the execution of the programmed code with a given set of programmed case. Testing was done with much consideration of the requirements highlighted in chapter 3.

## METHODS OF TESTING

According to Deepak (2014), testing ensures an acceptable degree of quality attributes of the software. It aims to ensure correctness, robustness, reliability, dependability and many other attributes including those highlighted at the beginning of this chapter. Great Zimbabwe University senior and managerial staff together with students joined hands in participating during this stage to confirm if the system is providing the required functionality. The system testing started early in the development stage with the intention of reducing the cost and time to re-work and to produce error-free software. Following are the main testing methods that were used in the process of testing

## Unit Testing

Unit testing is a process of testing distinct units of code to see if they are executing as expected (Hamill, 2004). The units are usually atomic meaning they are not combined with any other units and testing is done using simple input and output parameters, for example, the Student Application unit was tested on its own to see if a student can apply successfully via the application. Unit testing was carried using the following two main types:

1. Black box
2. White box

### Black Box Testing

This is sometimes referred to as system, functional, or behavioral testing as it is concerned with testing the response of the system under a given condition or input (Deepak, 2014). This was mainly done for validation purposes where the internal logic of the system was not tested. Errors were also corrected through this testing process. The main attempts of the test were to find incorrect or missing functions, interface errors initialization and termination errors as well as errors in data structures or external database access. Using this method all the data input and output paths were tested and the errors corrected.

### White Box Testing

White box testing focuses on the internal functioning of the software. White box testing tests loops of the procedure, decision points, and execution paths. This was done to get the internal functionality of a unit and facilitated handling and identifying errors.

Above all, throughout development, unit testing serves development time as the developer was only proceeding to the next unit only if the tested unit functions correctly. It also resembles the divide-and-conquer rule where all the developer’s testing effort will be applied on a small program such that testing becomes simple unlike testing the whole system at once

However, the designer realized that some of the units were not easy to test independently thus fail to apply unit testing hence need for module testing.

### Module Testing

According to Deepak (2014), a module is the integration of units and their individual independent execution states. This test was done for independent modules where each module was tested and outputs checked with the specifications of the whole module. Major errors were found on the fees statement module and the programmer attributed that to lack of accounting knowledge since they were semantic errors thus were corrected by employing the correct accounting principles. Module testing was seen to be very crucial as it makes sure that all unit modules were contributing to the same objective.

### Regression Testing

As the developer was designing the system, a lot of mistakes led to the need to make some modifications at a later stage thus there was the need to undertake regression testing to make sure that the modifications did not cause any unintended effect on the system. This test helped the analyst a lot in the sense that the effects of integrating new features on the system were noted so early before further steps and stages which could have complicated debugging at a later date.

### Integration Testing

This is when all the system modules are combined to form a group and is tested to evaluate the interaction between them(IEEE,1990). The developer successfully did the testing in order to assess the communication between the modules particularly to check if there was no data loss from one module to another. The developer noted that at some instance the input data was lost as no data was retrieved via another module but through debugging all this came to an end.

### System Testing

It is sometimes referred to as system functional testing. It is carried out once all the components of the system have been successfully tested in isolation (Alsmadi, 2012). Its main focus is to determine system cohesion. Tests were carried out on more than one interacting modules to ensure collaboration according to design specifications. After integration, retests were performed on the system and results were according to the system requirements specification.

### Alpha, Beta and Acceptance Testing

These involved the release of the software to the end users. The alpha test was done to test the stress, performance, recovery, and security of the system. Successful completion of the alpha test proceeds the testing process to the beta stage. The beta test is a live application of the software in an environment that cannot be controlled by the developer. It integrates modifications imposed by the alpha phase, and the tests are carried out by an even larger audience before the absolute release is instituted for all users. At first, the system undergoes the Alpha testing and some few refinements were made then the developer gave the system to the users to test with live data (beta testing). The errors obtained from the beta testing were also corrected before the system was given for acceptance testing.

After we then move to acceptance testing as the final process towards system delivery. Here the system was tested in the presence of users, students, and all the university staff who works directly with the portal mainly with their data to verify the functionality of the system. This process enabled the revealing of errors and other inconsistencies that were hidden prior to acceptance testing, (Gambling, 2013). Acceptance testing also revealed if the system’s performance was up to or below the expected standard and it was determined that the system works as was expected.

### Installation Testing

Lastly, the system was delivered to the organization’s management and all agreed that the application should be launched and uploaded on google play store. Installation tests are the focal point for many different forms of testing, (McKay, 2008). It involves the testing of the final product to see whether it is compatible with the environment where it is operating in, present hardware and software available. This was successfully done on the application as all the hardware and the server was tested for efficiency and compatibility to receive requests from the application as and when needed.

## VALIDATION

It is concerned with the construction of the right system and assessing its conformity with the organizational objectives, (Parker, 2013). If real data is used to test the system and real working environment is simulated, the process becomes effective. The developer performed system validation and results obtained ensured that data integrity was reached and there was the conformity of the system with the organizational requirements.

## VERIFICATION

Verification is a process to check the deviation of actual results from the required ones. It observes if the primary objectives have been met as well as verifying if the data input subscribes to integrity requirements. Verification ensures that the system is built right.

Various printouts were produced to verify if entered data has the correct output.

## TEST RESULTS

Before concluding this chapter, the analyst wants to show what he observed during the process of testing. The following are the screen dumps that were taken when testing was in progress with respect to various commands.

|  |
| --- |
|  |

Login Page Loading

|  |
| --- |
|  |

Error message on the login page

|  |
| --- |
|  |

Applying instructions

|  |
| --- |
|  |

Documents uploading error

|  |
| --- |
|  |

Applicant select programs

|  |
| --- |
|  |

Paying application fee

|  |
| --- |
|  |

Application received

|  |
| --- |
|  |

Admin receives new applicant notification

|  |
| --- |
|  |

Admin applicants page

|  |
| --- |
|  |

Admin Accepting new student

|  |
| --- |
|  |

Application homepage

|  |
| --- |
|  |

Submit emergency page

|  |
| --- |
|  |

Re-Authenticate view

|  |
| --- |
|  |

Financial page

|  |
| --- |
|  |

Depositing View

## CONCLUSION

The coding and testing process was very successful as the developer managed to come up with the required system functionality. The strategies used in testing helped to correct errors made during system development. The system passed all the tests performed on it. The developer and the users revisited the design requirements and objectives and it was concluded that the objectives have been met. All the identified modules were integrated into one system. This means that the researcher had managed to meet all the mentioned objectives and has also developed a system based on user requirements. The next chapter is, therefore, going to illustrates how the system was implemented.