

# Online Guidance Testing Management System

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**Abstract-** *An effective guidance and counseling service is an essential factor to equip the student with the proper foundation, attitude, skills and values to succeed in life. In this study, the researchers developed an Online Guidance Testing System for the Guidance and Counseling Department of Iloilo Science and Technology University so as the counselors may have an efficient tool in the conduct of numerous tests and prompt access to the test results when needed. The Iloilo Science and Technology University located at Burgos St. Lapaz Iloilo City is composed of five (5) branches. These include the Lapaz, Leon, Miag-ao, Barotac and Dumangas Campus. Each campus has a designated Guidance Counselors who facilitated the guidance testing. The developed system was evaluated by ten (10) Information and Communication Technology professionals using International Organization for Standardization (ISO) 9126 Six (6) Software Quality Standards. As a whole, the respondents rated the system as Very Effective. In the six general categories consisting of Functionality, Reliability, Usability, Efficiency, Maintainability and Portability, the respondents have consistently rated the system as Very Effective. The evaluation conducted by the respondents and the acceptance of the target users indicates the system's functionality and conformance to the required system features, functionality and output.*

**Keywords-** *Guidance counseling, Guidance Test, Test Management*

## INTRODUCTION

Guidance is an essential part of education to steer the student in the wide array of personal, educational, social and career concerns. With proper guidance, a student makes intelligent decisions, is self-aware, cognizant of the feelings of others and coexists in a society with values. At the forefront of these tasks are Guidance and Counseling professionals who work with students either individually or in group in order to help them identify both their strengths and weaknesses in order for them to achieve their full potentials. Besides a personal interview, one of the primordial processes of getting to know the student is through testing.

The conduct of guidance testing to college students is of great importance since valuable information about the students can be gathered. Each guidance test is designed to measure a specific facet of a person. The numerous testing services offered by the Guidance and Counseling Office evaluate almost all aspects of a person. These tests enable the University in general and the Guidance Office in particular, to identify students who are in need of immediate counseling as well as nurture students who have potentials. This activity will also help the Guidance and

Testing Office to better implement and prioritize activities that are best suited to the students' needs.

As stated by Calaguas [1], guidance and counseling programs are essential part of the educational system since it helps students develop and understand themselves fully. The use of multi-dimensional assessment is an important service offered by the Guidance and Testing Office since the result of the assessment can help provide better admission, placement and counseling to students. Moreover, the result of the assessment can help guidance counselors to plan and structure guidance and counseling programs.

However, guidance testing is still conducted through the traditional testing method. The Guidance and Testing Office each year reproduce thousands of test papers necessary for the conduct of the various examinations. Likewise, the Guidance Counselors would prepare testing schedules and is commonly done by batches since the venue could not accommodate the number of students to undergo examination. The Guidance Counselors will manually check the test instruments, encode the test results in Microsoft Excel and interpret the results. These test result are then stored on filing boxes which becomes voluminous over

a period of time and consequently are both hard to manage, maintain and retrieve.

The Guidance Testing and Counseling service can be best implemented with the aid of Information and Communication Technology (ICT). According to Rouse [2], Information and Communication Technology is a term referring to all devices and software applications that allows a user to interact with the computer system. The use of online system can help guidance counselor manage assessment, conduct online guidance and counseling, record data that can be easily retrieved and generate valuable information effectively.

However, in the study conducted by Vinluan [3], on the awareness, attitudes and extent of practice of Information and Communication Technology (ICT) in the work of guidance counselors in Metro Manila, Philippines, the study shows that most of the Guidance Counselors still conducted appraisal, counseling and testing using a paper-pencil test and face to face counseling. According to this research, guidance counselors use ICT mainly in writing letters, reports and keeping records. However, this research shows that the respondents support the use of ICT in guidance and counseling as far as the confidentiality and security of data is established.

Additionally, in the study conducted by Iacob [4], it revealed that guidance and counseling suffered from lack of ICT innovations that could help in the implementation of new instruments specifically designed for guidance and counseling. The study also shows that there is a growing demand for web-based counseling services since even in most developed counseling systems in Europe they still experience low ICT implementation in the field. However, the respondents also recognized that the use of ICT would provide quick and cost effective means in data management, sharing and accessing of information and monitoring of client's progress to support evidence-based reports. Furthermore, the researchers recognized that ICT can be used in the field of guidance and counseling without compromising quality standards and ethics.

The Guidance counselors need to assess the students to understand themselves in order progress and develop socially. In the study of Mustapha, Abdullah and Alkali Kolo [5], the researchers assess the usage of ICT in guidance and counseling and the capability of the guidance counselor in Borno and Yobe States, Nigeria to use ICT applications. The research found out that there is a generally low use of ICT by guidance

counselors in the conduct of counselling services in Nigeria. This is due to the reason that guidance counselors was not aware of the importance of ICT in counseling services as well as they are not given opportunities to attend seminars and workshops regarding the use and applications of ICT in the conduct of guidance counseling and testing.

The study conducted by Masagca and Londerio [6] stated that counseling in some selected areas in Luzon, Philippines utilize ICT in limited number of work-related activities such as storing, preparation of documents, retrieving and using data, leisure and recreational activities. However, given the privilege to attend seminars and training related to ICT, the respondents have commendable response on the use of ICT in school counseling.

Despite the limited use of ICT in the field of Guidance and Counseling several researches prove that the use of ICT in the conduct of their activities and services are beneficial to both guidance counselors and students. The study of Carey and Harrington [7] conducted in Nebraska and Utah proves that school counseling affects the student's educational performance and engagement. Moreover, the result of the study shows that the intervention given by the Guidance and Counseling Office pertaining to career development seem to produce positive academic outcomes with students including improved attendance, lower disciplinary cases and increase academic performance.

Furthermore, the use of Information and Communication Technology is also considered meaningful, purposeful and relevant in the conduct of various counseling services as stated by Borbon [8]. The study also highlights some concerns raised by guidance counselors on the use of ICT in counseling services such as data integrity and confidentiality.

After conducting a thorough reading on the acceptability and usability of ICT in the conduct of counseling services, the researchers conducted this research to develop an online Guidance Test Management and Counseling System. The system will allow the user to manage test, conduct online guidance testing, automatically tabulate results and generate valuable reports. By automating the process, testing is expected to be more convenient and efficient for both guidance counselors and students. This will ensure prompt assessment and delivery of various guidance and counseling services.

## OBJECTIVES OF THE STUDY

The aim of this research is to find a meaningful integration of ICT in the conduct of online guidance testing. Specifically, this research is designed to allow the students to take online tests for Guidance Tests that are suited to the student's year level; provide a feedback mechanism through online survey from the students on the difficulty of the test questions; allow the Guidance counselor to control the availability of guidance tests, the test results and update the test items based on the feedback provided by the students; provide an automatic scoring system to provide the test results to the student and the counselor and generate the necessary reports; allow both the student and the counselor to view and download the test result and allow both parties to chat online; allow online communication between the student and the guidance counselor; and evaluate the conformance of the system using International Organization for Standardization (ISO) 9126 software quality standards

## METHODS

This study is a Software Development Research and uses Descriptive Research in the evaluation of the system. The descriptive research is realized with survey instruments in questionnaire form. The respondents evaluated the system performance and the gathered data is then organized and tabulated for presentation to the various stakeholders to show the extent of compliance of the system to the specified objectives.

As a Software Development Research, the study includes the development of the Online Guidance Testing System. The focal point in the design process is the tests to be included in the system. Based on initial interview with the Guidance office, the student in each year level will have to take 4 tests and one universal test. The total of Guidance Tests to be included in the system is seventeen (17).

The required Guidance tests for freshmen students include Learning Style Inventory, Esteem Scale (Inadequacy Scale), The Four Systems Anxiety Questionnaire, and Personal Behavior Inventory. The intended guidance tests for sophomores are Personality Inventory, Social Desirability Scale, Howard Gardner Multiple Intelligence Test and Beck's Depression Inventory. For Junior College students, the intended tests are The Automatic Thoughts Questionnaire, The Fear of Intimacy Scale, Emotional Quotient and Intrapersonal and Interpersonal Skills Scale. The Senior College students would have to take Conflict Orientation Inventory, The Assertiveness Schedule,

and The Expectancy for Success and The Locus Control Scale. The Student Needs Assessment Survey is for all year levels. Each of the tests may be taken by the student at most 3 times. Before graduation the following guidance test should have been taken by all students in the University.

Besides designing the user interface of each of the test, a separate instructions interface was designed on how the student should fill out the test items. Likewise, a survey page was created for each test to be filled out by the students after taking the test.

Besides the main campus, three other branches will access the system to take the test and so the proper management of records was diligently considered in the design process to ensure that each test record will properly identify the test by test type, branch and student.

In each of the 17 test, the user requires an output of the test results in order to conduct a reliability test of the conducted exam. The output requirement was designed and Excel was chosen as the most appropriate format because of its tabular format and the expected output are usually organized into rows and columns and requires basic computation of some of the data. Each row in the worksheet contains the student information, the answer and score in each item and the Total and Mean score of the student.

The user requires two additional reports for The Learning Style Survey. The first result is the Learning Style Category and the Test Part since the Learning Style Survey is divided into 11 parts.

Likewise, for the Inadequacy Scale, two additional reports were generated which consist of the Summarized Tabulation of Test Results containing the student information, mean score, interpretation and remarks. The second report consist of the Listing of Students with Low Self-Esteem

Each test also has a Test Results Summary in Excel, where each row contains the student information, the total score, the counselor's remarks and interpretation of the test result. Each student's test results may be downloaded both by the student and the counselors. The researchers chose Word as the format of the downloaded document of the test results.

In order to output an Excel and Word document, the researchers integrate an Excel and Word components into the system since the scripting language and the framework used do not automatically include such components.

As a web application, the user interface of the system, and incidentally the guidance tests, should be

rendered as html files. In order to speed up the development process, the researchers chose Code Igniter as a web application development framework. It uses PHP as the server-side language and the files are encoded as PHP using NotePad++.

In the design and development of the online system, the researchers used the system prototyping methodology as shown in Figure 1.

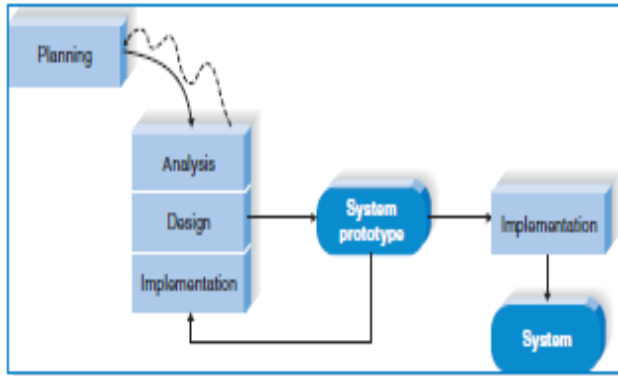


Figure 1. Prototyping Methodology

The prototyping methodology according to Dennis, Wixom and Roth [9] performs the analysis, design and implementation phases concurrently so that one can develop a functional application. The prototype is presented to the user for evaluation and feedback. Following the comments from the potential users, specifically the guidance counselors of Iloilo Science and Technology University, the researchers re-analyze, redesign and re-implement the succeeding prototypes to come up with the final working system based on the user requirements.

During the Planning stage, the researchers gathered the necessary functional and non-functional requirements of the system from the potential users. Functional requirements according to Dennis, Wixom and Roth [9] include system specification about the processes that the system needs to perform to support the user task. On the other hand, according to Pressman [10] non-functional requirements includes requirement category that states the behavioral properties of the system such as system performance, usability, aesthetics, navigation features, informational content, and user-directed functionality.

The user indicated that the Guidance Office must have control on the availability of each Guidance Test; the student may only take the tests that are appropriate to the student's year level; the system must provide a survey to the student on the difficulty of the test items; allow the user to edit the tests using the survey result as

guide, both the student and the counselor may view and download the test results; and, allow the user to generate the necessary reports. These primary requirements guided the analysis and design phase of the system.

During the analysis and design phase, the researchers design models of the system to be presented to the potential users. The researchers then designed and developed the system modules as specified in the user requirements. After each prototype or module is done, the researcher presented the system for implementation to the target users. Based on their comments and suggestions the new requirements are integrated in the system design until all the user requirements are incorporated in the system.

User access to the system is through an authenticated log in. An authenticated guidance counselor with administrative privilege and the overall system administrator may edit the test items. Part of the design process ensures that the user undergoing a test edit should take the test offline and no other admin user may edit the test while it is being edited by another authorized user.

During the testing phase, each module was tested to validate that the system is error free and is working efficiently. After testing a module, a new feature was added to the system to complete all the system's requirements.

The final system components are shown in Figure 2 using the UML Component Diagram. A UML Component Diagram according to Dennis, Wixom and Tegarden [11] depicts physical relationships among system components and modules. The necessary components of the system provide services to other components thru its port or interface using the lollipop symbol. The component retrieves its needed information thru an interface denoted by a half-circle or socket icon. An interface is the definition of a collection of one or more methods ideally one that defines a cohesive set of behaviors.

As a web application, the user's access to the system is through the HTML pages provided through the interface Request. Each web page in the UI component will respond to a particular user request and passes it to the appropriate interface provided by the Controllers component.

The IAuthenticate interface handles user log in and either invokes the StudentUser or AdminUser component based on the provided user credentials. If the user indicates that he/she is a student, the supplied information is validated by the StudentUser component

and the authentication result would either allow or deny the user to access the site. The same process is performed for Admin users. An authenticated user will then be redirected to their appropriate home page.

The Controllers component consists of controllers which invoke the appropriate component based on the UI interface that is making the request. If the examinee intends to take the test by selecting the appropriate action from his/her home page, the ITestQuestion interface is invoked by the UI component. In this case, the controller will invoke the GuidanceTest component which contains methods to access any of the included guidance tests, and the retrieval and update of the test questions. The set of test questions is passed back to the UI component for output in the Response port for the user to fill out.

When the user is done filling out the test questions, the ITestAnswer interface accepts incoming test answers for processing and invoke the TestAnswer component for the storage of test answers. The TestAnswer component provides functions for the storage and retrieval of test answers to supply the test results and test reliability features of the system. It requires the TestQuestionID from the TestQuestion

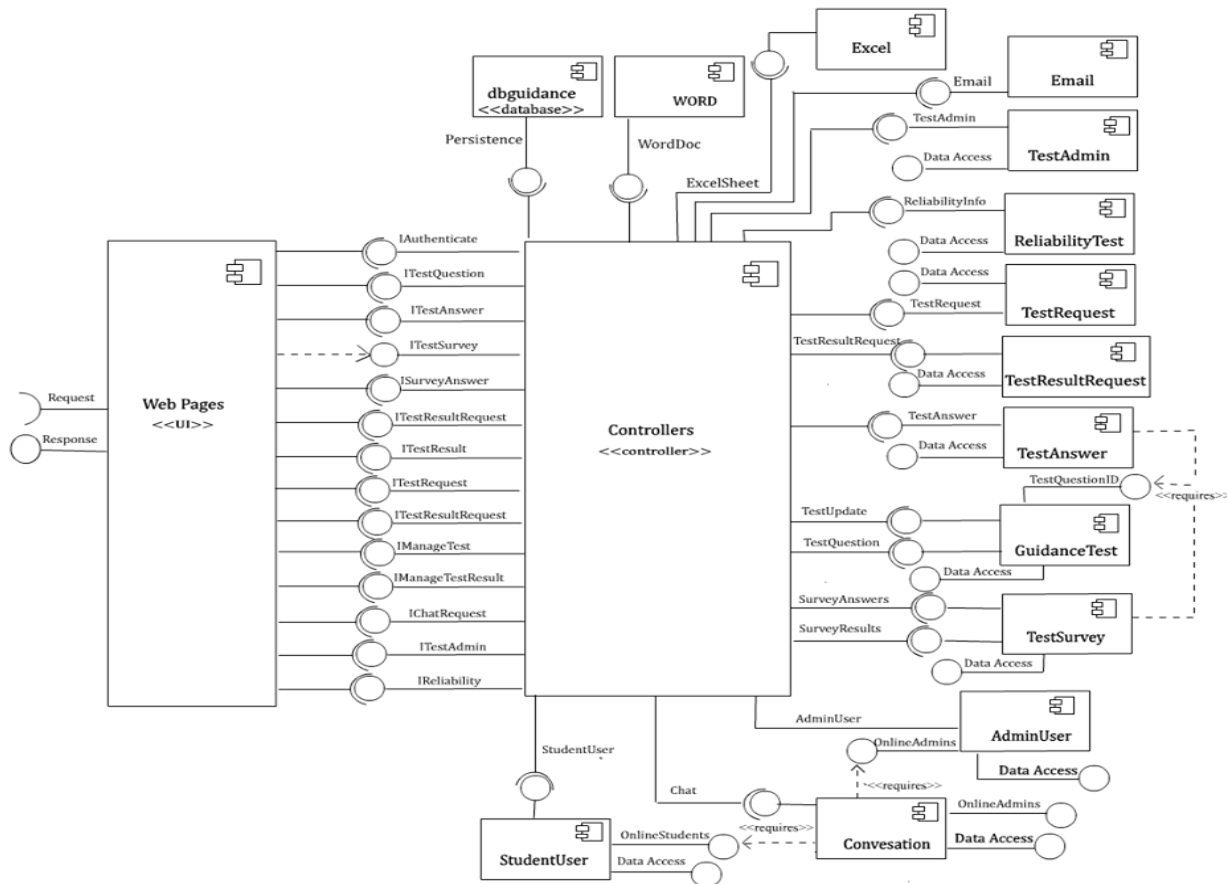
component and the StudentUser interface of the StudentUser component in order to identify the specific test answer by student and test question.

The system requires the test taker to evaluate the quality of test questions – if the test questions are well understood by the examinee. This action is realized by the ITestSurvey interface. The test questions to be evaluated are provided by the GuidanceTest component and the UI component constructs the survey questions for output through the Response port.

The test taker submits the response to survey questions through the ISurveyAnswers interface for storage by the TestSurvey component through the provided interface SurveyAnswer. TestSurvey contains methods for storage and retrieval of survey responses and requires the TestQuestionID of the TestQuestion component and StudentUser interface of the StudentUser component to identify each survey answer by student and test question.

If it is the first time the examinee had taken a particular test, the system will automatically create a request for the test result on behalf of the examinee by invoking the TestResultRequest component.

Figure 2. Component Diagram of the system



The component is responsible for the storage and retrieval of requests for test results from the examinees. The system would then inform the examinee that the test result will still be processed by the Guidance Office.

An admin user logs into the system and is validated by the AdminUser component. From the user's home page, the ITestResultRequest interface presents the user both with the newly-submitted test answers for processing and existing requests for test results. The Admin user would then view the test answers and indicate the appropriate remarks and/ or interpretation of the test result through the TestAnswer component. The TestResultRequest updates the status of the request and save the action taken for the request.

Each time the examinee accesses the site, the ITestResultRequest interface would indicate in the user's home page about the status of the request by querying the TestResultRequest status of the examinee. The component will access any saved actions for the particular examinee requests

Once the test result request has been processed, the examinee views the test result through the ITestResult interface. If the examinee intends to download the test result, the Word component is invoked to generate the test results in Microsoft Office Word format and is passed to the user as a document download.

The IManageTest interface allows the Admin user to manage the Guidance Tests. It allows the user to enable or disable examinee access to any of the guidance tests. If the user intends to update the test questions, the IManageTest interface invokes the TestSurvey component which provides the survey result based on existing survey answers through the provided interface SurveyResult. The survey result is the examinees' view of the difficulty of the test question.

The IManageTestResult interface allows the Admin user to view, delete, download, print or email any of the test results. If the user downloads the test result, the Word component is invoked while the Email component is invoked when sending the result to the examinee by Email.

The authority to control access to the guidance tests and update the test items may be delegated by the overall administrator to the other Guidance staff. This is realized by the ITestAdmin interface. The TestAdmin component is invoked to allow the overall administrator to add, update and delete users with elevated privilege.

Both the guidance staff and the student may request an online conversation with both party and this is provided by the IChatRequest. It provides the user with the list of online users on the opposite side – student or Guidance staff. The user initiates a chat request and passed to the Conversation component. The request is passed to the opposite party for approval. Once approved, the IChatRequest and Conversation handles incoming and outgoing messages from both the student and the Guidance staff.

The Admin user may conduct a reliability test of the Guidance tests provided by the system. To obtain the data needed, the IReliability component is invoked to provide the test results needed for reliability test. When the user intends to download the test result, the Excel component is invoked which generates the test result in Excel format and is returned to the user as a document download.

### **Evaluation and Respondents of The Study**

To evaluate the system, white box testing approach was used by the researchers. White box testing according to Desikan and Ramesh [12] is a type of test in which the evaluator of the system should be knowledgeable of the program code and programming structure used in the development of the program. This is a testing technique where the external functionality of the code is tested by evaluating the program code that realizes the external functionality of the system.

To determine the respondents of the study for white box testing, the researchers used the Purposive sampling technique. Purposive sampling includes selecting respondents according to the researcher's judgment based on the availability and credibility of the respondents. According to Daniel [13] purposive sampling is best used when the researcher purposely selects the respondents of the study because they satisfy the criteria for participation in the study.

The researchers invited several Information and Communication Technology (ICT) professionals in Iloilo City to conduct the white box testing. The system was evaluated by ten (10) ICT professionals from different sectors of the academe and industry using ISO 9126 which includes six (6) software standardization criteria namely Functionality, Reliability, Usability, Efficiency, Maintainability, and Portability.

The survey instrument used in system evaluation using white box testing was adopted from Abran, Al-Qutais, Desharnais, Habra (n.d) [14] which contains some modifications to suit the study.

**Data Processing and Statistical Treatment**

Microsoft Excel 2010 was used to record and analyze the data collected from the respondents of the study. To determine the conformance of the system to the quality standard stated in ISO 9126, the weighted Mean and Standard Deviation (SD) was used by the researchers. The scoring methods used by the ICT respondents to evaluate the system during white box testing were as follows: 3.26- 4.00: Very Effective; 2.51-3.25: Effective; 1.76- 2.50: Fairly Effective; and 1.00 – 1.75: Ineffective.

**RESULTS AND DISCUSSION**

Based on the gathered data from the respondents shown in Table 1, the system was perceived as Very Effective with the mean value of 3.67 and a standard deviation of 0.10.

According to Padayachee, Kotze and van Der Merwe [15], the functionality of the system refers to the capability of the system to perform the necessary functions which meet the stated requirements of the users. The respondents rated the Functionality of the system with the Mean value of 3.76 and a Standard Deviation of 0.07 which is perceived by the respondents as “Very Effective”. This means that the system functions based on its stated purpose and functionality, the system components interoperates cohesively and smoothly such that the system display results produced by the system reached the intended users alone and provide accurate results based on specified criteria. Moreover, the result shows that the system accurately displays the necessary results, the system features and content is suitable to its intended users and there is a security mechanism that requires user log in and hierarchy to properly secure confidential information.

Table 1 Summary of Responses on the Evaluation of the System Based on ISO 9126

Statement	Mean	Description	SD
1. Functionality	3.76	Very Effective	0.07
2. Reliability	3.56	Very Effective	0.17
3. Usability	3.72	Very Effective	0.08
4. Efficiency	3.73	Very Effective	0.10
5. Maintainability	3.53	Very Effective	0.02
6. Portability	3.70	Very Effective	0.14
As a whole	3.67	Very Effective	0.10

The reliability of the system was rated by the respondents as Very Effective with the mean value of 3.56 and a standard deviation of 0.17. The reliability of the software denotes the capability of the software

product to maintain its level of performance under certain conditions and constraints [16]. This implies that the system consistently and accurately stores and retrieved relevant data. The result also shows that the system exhibit the absence of error, system failure and the system can easily recover after some degradation in its performance. Also, the result shows that the system can accurately generate valuable reports.

According to Losavio et.al [17], the usability of the system is the capability of the software product to be easily understood, learned, and used under specified conditions. The result of the evaluation with regards to system usability is Very Effective with the Mean of 3.72 and standard deviation of 0.08. The result implies that system provide system help or instructions for using the application. Moreover, the result shows that the system organized pages appropriately which is easily understood and manipulated by the users and the necessary navigational interfaces are adequately provided to help user move from one system components to another. Moreover, the result of the evaluation implies that the system requires less time and effort of the part of the user to learn how to use it and there is a consistency in the placement and location of user interface elements such as menu, toolbars, navigational bars, help and search bars across pages.

The Efficiency of the system is rated by the respondents as Very Effective with the Mean of 3.73 and standard deviation of 0.10. According to Fahmy, Haslinda, Roslina, Fariha [18], the Efficiency of the software product refers to the capability of the software to perform appropriately in accordance the amount of resources utilized under stated conditions. Under these criteria the system is measure in terms of Time Behavior, Resource Behavior and Efficiency Compliance. The result of the evaluation conforms with Fahmy, Haslinda, Roslina, Fariha [18], hence the system can response time to users’ request is acceptable and there is a presence of the proper tools to easily recognize symbols allowing the user to use the application efficiently. Moreover, the system provides a Search box to easily search records from the system. There is also the presence of paging to move from one record to another for better navigation and searching.

The Maintainability of the product refers to the capability of the software product to maintain its performance under specified conditions. This includes the capability of the system to be corrected and improved to adopt changes in the environment or requirements [18]. The result of the evaluation shows that the system is rated by the respondents as Very

Effective with the Mean of 3.53 and a standard deviation 0.02. This implies that the system provides mechanism for analysis of the causes of the application errors through the use of informational messages. Likewise, the system incorporates the grouping of databases queries into respective classes for code reuse, ease of error detection and modification. The system also applies normalization to the database design to promote consistency and reliability of data within the database. There is also a well-designed hierarchy of classes which is easier to follow, understand and maintain.

The portability of the system is rated as Very Efficient by the various respondents with the Mean of 3.70 and a standard deviation of 0.14. Portability is a capability of the software product to be transferred into its intended environment [19]. The result of the study implies that the system provides automated deployment system for easy installation, the deployment uses standard set up files which is easy and familiar to users and the system exhibit portability of the database used.

#### **CONCLUSION AND RECOMMENDATION**

In this paper, we present the design of an Online Guidance Testing System for conducting 17 Guidance tests on the internet. The system was evaluated by ten (10) ICT professionals using ISO 9126 Software Quality Standards. In each of the general criterion consisting of Functionality, Reliability, Usability, Maintainability and Portability, the respondents rated the system as Very Effective – it consequently rates the entire system as Very Effective. We therefore conclude that the developed system has met the stated objectives of the study and conforms to the requirements of its intended users.

The Online Guidance Testing System includes 17 Guidance tests that could substantially measure all the required information needed in making an effective guidance and counseling program. Other Institutions may install the system for their guidance and counseling requirements or the hosting institution (Iloilo Science and Technology University) may open the site not just to their branches but also to other institutions who may be interested in availing of their online guidance testing service.

Further research may also be done in order to determine if the tests included in the system may need additional tests in order to ensure full coverage of the measuring instruments needed for effective guidance and counseling.

The system allows both the student and the counselor to chat to either party so any concerns may be readily addressed by the Guidance Office making the system a must for the Guidance Office in higher education.

As a novel system, further study should be conducted on the effectiveness of the system from the student's perspectives in terms of getting access to the guidance tests online, access to the test results and being able to confer with the guidance personnel about the result of the guidance test.

A separate study should also be conducted if the system promotes efficiency to the guidance personnel in terms of guidance record management and their guidance services to the students.

By providing a chat system where students could discuss guidance matters online, the system will shift the guidance function from a face to face, personalized conversation between the counselor and the student to a distant exchange of guidance concerns. Further studies should be conducted on the impact of Guidance services to include:

- If there is an observed change in the number of students inquiring about the results of their Guidance tests compared with personal query at the Guidance office;
- If there is an observed change in the behavior of the student in discussing personal matters online as compared to face to face conversation with the counselor;
- The positive and negative effects of the system both to the students and the Guidance personnel.

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evaluate the system and assess its conformance to ISO 9126.

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