Developing a Grading and Monitoring System: Towards an Effective Academic Evaluation

Genesis Lalas, Dr. Dave E. Marcial

***Abstract*— Grading, monitoring, and reporting are varied activities involved in most general academic evaluation. The researcher developed the Grading and Monitoring System to address specific needs of end-users in Metro Dumaguete College (MDC) who experienced manual and inefficient grade computation, limited chance for grade and progress consultation between faculty and students, and inefficient distribution of reports across departments. It was the main objective of the study to conduct an analysis of the current grading and monitoring system at MDC with the hope that results would aid MDC's decision–making regarding the issue at hand. The project methodology involved Rapid Application Development (RAD) following the Software Development Life Cycle (SDLC) where one of the required components was prototyping. The development of the prototype used Microsoft Visual Studio 2013 C# for the code implementation and Microsoft SQL Server Management Studio 2014 for data connectivity using MySQL. The prototype boasts the following features 1) GradeBook, with Activity Planner; 2) Student workspace for grade and progress monitoring activities; and 3) Reports with applied analytics and statistics, for Business Intelligence and decision support. The Grading and Monitoring system underwent acceptance level system testing to 1) identify bugs/defects; and 2) allow the end-users to test the system and achieve the systems' expected result. Results from the usability testing yielded an average weighted mean of 6.5 interpreted as "Strongly Agree". The results in general, which implied the systems' ease of use, effectiveness, efficiency, capabilities, and functionality as delivered.**

***Keywords*— Information Science, Business Intelligence, Grading and Monitoring System, Management Information Systems**

I. THE PROBLEM AND SCOPE

A. Introduction

Assessment is an integral part of instruction in education; it determines whether or not the goals of education were being met. Assessment affects decisions about grades, placement, advancement, instructional needs, curriculum, and the like [1].

Grading in essence is an exercise of professional judgment by the instructor. It involves the collection and evaluation of evidence on students' achievement or performance over a specified period of time such as an academic semester or the entire school year. As practiced, *monitoring* has been integrated as one of the activities in assessing student performance. Though monitoring is practiced in the latter part of the grading activity, it lacks efficiency, thereby posing a dilemma to any instructor in his/her assessment activities.

B. Statement of the Problem

Ultimately, the study aimed to develop a desktop application for MDC that provided a robust, centralized management of information, monitoring with grade analytics, and reports with business intelligence for decision support system. In order to attain these, the following objectives were targeted: 1) to know the current practices of the grading and monitoring system in MDC; 2) to identify the existing difficulties experienced of the grading and monitoring system in MDC; 3) to improve the process and performance of the grading, monitoring and reporting activities in MDC; and 4) to determine the usability rating of the proposed Grading and Monitoring System as perceived by the users.

C. Scope and Delimitation

This project primarily focused on developing a Grading and Monitoring System for use in any department in MDC. Specifically, the development of the system covered only the following processes: 1) Grading module which featured GradeBook, Activity Planner and notifications; 2) Monitoring which featured the Student Grade Workspace that covered Subject, Semestral and Course progress; and 3) Reports which featured Cooperative reports to aid decision making and Statistical reports for Business Intelligence.

II. REVIEW OF RELATED LITERATURE, RELATED STUDIES, AND THEORETICAL CONSIDERATIONS

According to Tan (1957), "It is important to understand if the faculty as a whole shares a common system of grading and one consistent with their own". True, a unified and consistent grading system applied in a specific educational level can help gauge a certain progress [2]. In essence, grading is an exercise in professional judgment on the teacher's part. It involves the collection and evaluation of evidence on students' achievement or performance over a specified period of time, in an academic semester, or in entire school year. Through this process, various types of descriptive information and measures of students' performance are converted into grades or marks that summarize students' accomplishments. Although some educators distinguish between grades and marks, most consider these terms synonymous [3].

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G. L. Author is with the Graduate Programs of Silliman University, Dumaguete City 6200

D. M. Author is with the College of Computer Studies in Silliman University, Dumaguete City 6200

Business Intelligence (BI) as it is understood today is said to have evolved from the Decision Support Systems (DSS) that began in the 1960s and developed throughout the mid-1980s. DSS originated in the computer-aided models created to assist with decision making and planning [4]. In 1989, Howard Dresner (later a Gartner Group analyst) proposed "business intelligence" as an umbrella term to describe "concepts and methods to improve business decision making by using fact-based support systems" [5]. The term "Business Intelligence" was originally coined by Richard Millar Devens in the Cyclopedia of Commercial and Business Anecdotes from 1865, is the ability to collect and react accordingly based on the information retrieved, an ability that Furnese excelled in, is today still at the very heart of BI [6]. BI allows for the easy interpretation of volumes of data. Identifying new opportunities and implementing an effective strategy that can provide a competitive market advantage and long-term stability [7].

III. Methodology

A. Research Design

The study employed a descriptive and software development research design. Software development, in context, refers to the development of software using codes and programming tools. This was necessary since part of the study employed prototyping as one of the requirements during the System Development Life Cycle (SDLC). The use of such study helped the researcher employ the following: 1) actual interview and observations to note the process of the grading and monitoring activities; and 2) survey questionnaires to gather information and help determine the best possible solution to mediate the current difficulties. Hence, the use of such a descriptive and software development research design, as described herewith, was bound to apply the necessary fundamental characteristics of the entire development life cycle.

B. Research Environment

Metro Dumaguete College (MDC), a private non-stock and non-profit educational institution founded by Mr. Wilfredo and Dr. Delma P. Manila with its humble beginning way back August 13, 2002. The institution has three main educational departments, namely the Liberal Arts Department, Computer Education Department, and Business Education Department. Alongside these educational departments is the Administrative Department.

C. Respondents

To arrive at the target number of respondents, the researcher utilized Slovin's formula to arrive with data specified in Table I. Slovin's formula was only applied to students, within the age range of 17 to 32 years old, since this group had the largest population [8].

TABLE I: SUMMARY OF RESPONDENTS

Type of Respondents	Total Population	Sample Size	Percentage
Student	142	59	82%
Instructors	7	7	10%
Chairperson	2	2	3%
Administration	4	4	6%
Total Respondents	155	72	100%

As shown in Table II, 59 randomly selected student-respondents who participated helped the researcher solidify the need to implement a Grading and Monitoring System in MDC based on the reasonable accuracy of results.

TABLE II: SUMMARY OF STUDENT RESPONDENTS

Department	Course	Frequency	Percentage
Computer Education Department	ACT	3	5%
	BSIT	13	22%
	BSCS	3	5%
Business Education Department	CBA	5	9%
	BSTM	4	7%
	AMC	4	7%
	ABCOMM	2	3%
	BSBA	25	43%
Total Student Population		59	100%

D. Research Instruments

The study employed the following: 1) Informal interview – to identify the challenges during grading, monitoring and reporting; 2) Survey questionnaire – official data gathering tool to specify needed features. These data gathering tools were necessary to identify the first three objectives of this study.

The study also employed acceptance level test cases and System Usability questionnaire by Lewis, J. R. (1995). This instrument was adapted for use from IBM Computer Usability Satisfaction Questionnaires: Psychometric Evaluation and Instructions. These two additional instruments were necessary to identify the last objective of this study.

E. Block Diagram

Fig. 1 shows the block diagram of the proposed Grading and Monitoring System of MDC. The diagram basically portrays the basic functionality that represents the grading activities, from inputting to submitting of grades; the monitoring and notification activities; students' self-assessment through grade inquiry; and academic reports which covered Business Intelligence Techniques to aid top level management in their decision making activities.

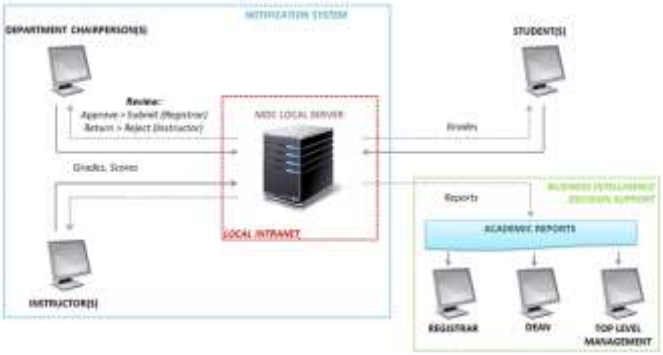

Fig. 1. Block Diagram of the study.

F. Development Methods and Approaches

System Development Life Cycle (SDLC) was the approach in the system development. For the methodology, Fig. 2 shows that Rapid Application Development, a software development methodology that involves iterative development and software prototyping techniques, was utilized.

Fig. 2. Rapid Application Development (Phases in the James Martin approach to RAD).

G. Development Models and Tools

1) Development Models

A) Client-Server Architecture - done by splitting the processing of an application between two distinct components: a "front-end" client and a "back-end" server [9]

B) Centralized System Model - computing done at a central location, using terminals that are attached to a central computer [10].

C) Unified Modeling Language (UML) - standardized general-purpose modeling language in the field of object-oriented software engineering [11].

D) Analytics - a subset of Business Intelligence that builds quantitative results to arrive at an optimal decision to perform business knowledge discovery in order to achieve business value [12].

E) Enterprise Reporting - provides business intelligence to the masses by delivering the detailed information that impacts decision-makers throughout the enterprise [13].

2) Development Tools

The following were the tools and languages used in the development of the desktop application and the centralized data repository: 1) Microsoft Visual Studio 2013 C#; 2) Microsoft Visio; 3) Microsoft SQL Server Management Studio 2014; and 3) Windows Server 2008 R2.

IV. PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

A. Analysis

The principal objective of the systems-analysis phase is the specification of what the system needs to do to meet the requirements of end users [14]. Figure 4 shows the data flow diagram which represents the current grading, monitoring, and reporting activities in MDC. Basically it involved grade and reports inquiry and submission from instructors, students, registrars and administrators.

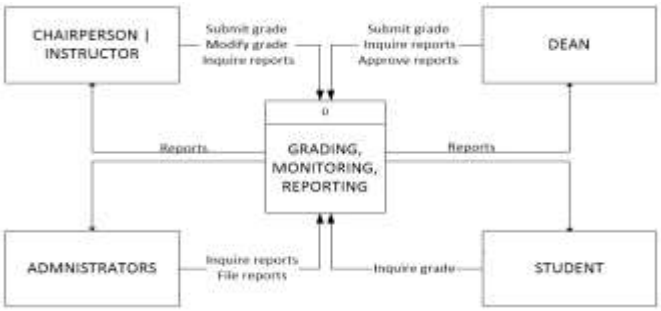

Fig. 3. Context Diagram

B. Design

"Systems design provides the technical specification and construction of the solution for the requirements identified during the systems analysis phase of the research/project [15]". It defined a systematic flow in doing things to make the system work. It was important that processes worked well for a particular process [16]. A Use Case Diagram was used in this study represented in Fig. 4 utilized Gane-Sarson's Data Flow Diagram integrated in Microsoft Visio Drawing.

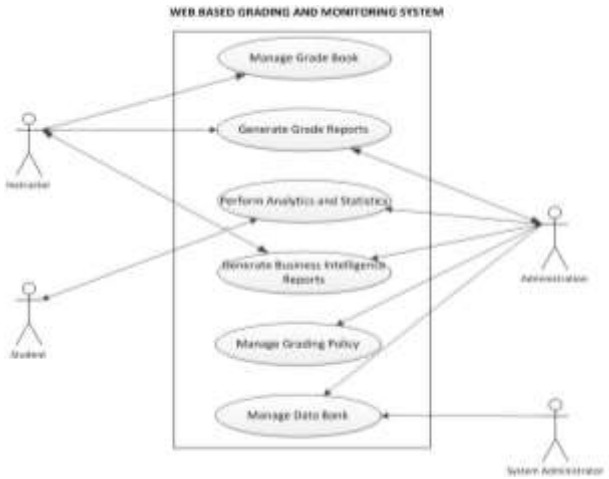

Fig. 4. Use Case Diagram - Grading and Monitoring System

C. Systems' User Interface

User-interfaces are a set of commands or menus through which users communicate with a program. It was designed in such a way that the users can navigate through the system quickly and easily. It also provided a clear recognition of the task that users need to perform. The following screenshots were actual images captured when the Grading and Monitoring System was launched.

Fig. 5 shows the instructors' module. This particular module targets grading objectives and GradeBook monitoring activities. Using the Activity Planner feature, this module included the management user profile that specify GradeBook details such as activity frequency, weighted grades, student list, status (e.g., Dropped, Withdrawn).

Fig. 5. Instructor – GradeBook

Fig. 6 shows the monitoring of the students' module. In the study, this particular module targeted the monitoring objective. This module included the viewing of student grades and progress through graphical representation and percentage value. This module enabled students to assess their scholastic performance in a subject, semester, and course by presenting the progress and percentage trend.

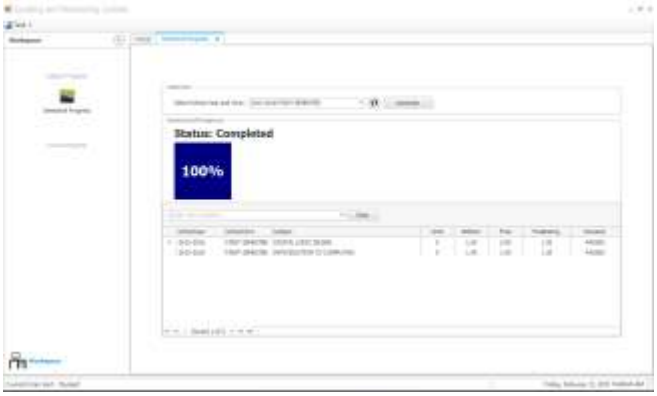

Fig. 6. Student – Monitoring

The statistical data report, shown in Fig. 7, is a report which allows users to compare the number of students enrolled per semester. In the study, it particularly presented a breakdown according to gender and year level. This module only allowed a comparison of the first and second semester, and summer term within a specific school year. The report included the actual percentage trend of the first semester against the second semester and summer term.

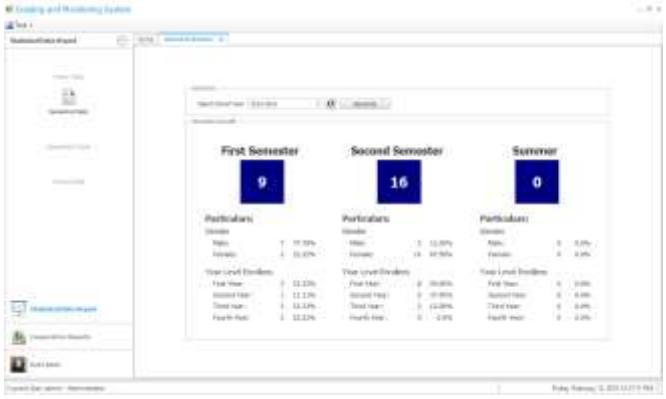

Fig. 7. Statistical Report – Semestral Stats

D. Software Testing and Evaluation

1) Test Case Results

The system underwent system testing to simulate the systems operational functionalities and to determine minor faults and bugs before the system is finally released. The testing gauged the systems' interactivity, usability, and controllability between functions, features, and processes. There was no such thing as exhaustive testing, wherein all possible testing combinations were performed. To deliver 100% bug-free software, there were always the time and resource constraints affecting the development of the proposed system. Hence, the researcher aimed to develop the system to specifically tailor its functions and features within the identified scope and limitations with high consideration to the needs of MDC.

2) Usability Rating Results

The tabulated results presented in Table 6 show that students yielded an average weighted mean of 6.2 which were interpreted as "Agree". The instructors yielded an average weighted mean of 6.7 which was interpreted as "Strongly Agree". Moreover, the chairpersons yielded an average weighted mean of 6.9 which was interpreted as "Strongly Agree". Similarly, the administration's average weighted mean of 6.4 was also interpreted as "Strongly Agree". Based on the collated results, the overall average weighted mean of the usability questionnaire yielded a value of 6.5 which was interpreted as "Strongly Agree". The results in general imply that the system was usable which provided high satisfaction. Results also show that the system was simple and easy to use, effective, efficient, informative, easy to understand, and clear. Likewise, the results also imply that majority of the respondents strongly agreed with the proposed system's capabilities and functionality as delivered. Please see APPENDIX section for the System Usability Interpretative Guide for the point matrix and the equation of each interval.

TABLE III: SYSTEM USABILITY RESULTS

	Overall reaction to the System	S	C	I	A	W. Mean	Remarks
1	Overall, I am satisfied with how easy it is to use this system.	6	7	7	6	6.4	Strongly Agree
2	It was simple to use this system.	6	7	7	6	6.4	Strongly Agree
3	I can effectively complete my work using this system.	6	7	7	6	6.5	Strongly Agree
4	I am able to complete my work quickly using this system.	6	7	7	6	6.5	Strongly Agree
5	I am able to efficiently complete my work using this system.	6	7	7	6	6.4	Strongly Agree
6	I feel comfortable using this system.	6	7	7	6	6.4	Strongly Agree
7	It was easy to learn to use this system.	6	7	6	7	6.5	Strongly Agree
8	I believe I became productive quickly using this system.	6	7	7	6	6.5	Strongly Agree
9	The system gives error messages that clearly tell me how to fix	6	7	7	7	6.6	Strongly Agree
10	Whenever I make a mistake using the system, I recover easily and	6	7	7	7	6.6	Strongly Agree
11	The information (such as online help, on-screen messages, and other documentation) provided with this system is clear.	6	7	7	7	6.7	Strongly Agree
12	It is easy to find the information I needed.	6	7	7	6	6.6	Strongly Agree
13	The information provided for the system is easy to understand.	6	7	7	7	6.7	Strongly Agree
14	The information is effective in helping me complete the tasks and scenarios.	6	7	7	6	6.5	Strongly Agree
15	The organization of information on the system screens is clear.	6	7	7	6	6.5	Strongly Agree
16	The interface of this system is pleasant.	6	7	7	7	6.6	Strongly Agree
17	I like using the interface of this system.	6	7	7	7	6.7	Strongly Agree
18	This system has all the functions and capabilities I expect it to have.	6	7	7	6	6.4	Strongly Agree
19	Overall, I am satisfied with this system.	6	7	7	6	6.6	Strongly Agree
	AVERAGE WEIGHTED MEAN	6	7	7	6	6.5	Strongly Agree

Legend:
S = Student | I = Instructor | C = Chairperson | A = Administration | W = Weighted (Weighted Mean)

3) Conversion Plan

The proposed system was implemented in two phases. The first phase performed actual system integration to local servers available. Source codes, database, and user credentials were provided in order to ensure the institutions' plan for successful integration. The integration will performed by the resident IT specialist, or similar, with the continuous support of the developer.

The second phase, which was planned for roll-out of the system, will be conducted as soon as the first phase was completed. The purpose of this was to assess and implement the plan and describe how the system was implemented. The plan will help ensure the timely and successful implementation of the system and to outline the schedule of dependent tasks that must occur to implement the system.

V. CONCLUSION

Based on the findings, after the system had undergone thorough analysis of the problem and design, the Grading and Monitoring System was successfully developed to help make the grading and monitoring activities of Metro Dumaguete College (MDC) robust, centralized, and more efficient and effective. The current practices of the grading and monitoring activities in MDC is manual and time- consuming. MDC experience difficulties that need to be addressed by implementing the system. The system have improved the current activities with the implementation of integrated features and corresponding functions which were highly accepted by the intended users during the study, considering that the need to improve the manual system had been drastically improved in terms of efficiency in the academic evaluation of the institution coupled with the robustness of data and information. The developed system was considered to be useful, effective in completing tasks, increased productivity and overall satisfaction with the use of the system's reporting modules that present trending data for easier analysis and better decision making.

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Genesis Lalas born in Zamboanga D.S., born on August 27, 1988. A graduate of Bachelor of Science in Information Technology in 2007 and Master in Information Systems in 2016, both degrees earned in Silliman University, Dumaguete City, Philippines. The author's interest of study is the application of information system in the academe.

The author is currently the IT department DEAN-CHAIRMAN in Rosemont Hills Montessori College, Danao, Cebu City, Philippines. He previously had a 2-year academic experience as an IT INSTRUCTOR in Metro Dumaguete College. He also had a 3-year industry experience as a SOFTWARE TEST ENGINEER in KYOCERA Document Solutions Development Philippines Inc.

Dr. Dave E. Marcial obtained his Bachelor of Science in Computer Science (Cum Laude) from The Divine Word College, Tagbilaran City, Bohol, Philippines. He was able to finish his Master of Science in Computer Science at the University of Negros Occidental Recoletos, Bacolod City, Philippines. He earned his Ph.D. in Education at Silliman University, Dumaguete City, Philippines

He is currently the OIC-DEAN in the College of Computer Studies, Silliman University, Dumaguete City, Philippines.