

## RESEARCH ARTICLE



# Smartphone-Based Evaluation of Academic Performance with QR Code Scanner Support

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## Abstract

**Objectives:** (1) To develop a smartphone-based transaction; (2) To evaluate the system using ISO 9126 software quality characteristics, in terms of functionality, usability, and reliability. **Methods:** Prototyping-based model in the software development. Visual Studio 2022 was used to develop the System's Interface and XAMPP for developing the system's web-based server to execute or show the exchange of data that is being developed within the system. The researcher used the ISO 9126 Model to check and validate the system in terms of functionality, reliability, and usability. Likert scale was used in scaling the statement of the questionnaire. Weighted mean was used in finding the average value of the rating. **Findings:** Using the Likert Scale System, the weighted mean of reliability is 4.73 interpreted as Strongly Agree, and the weighted mean of usability is 4.49 interpreted as Strongly Agree. The overall mean is 4.61 interpreted as Strongly Agree. The functionality of the software using the percentage and frequency distribution is 100% functional. The proposal is a solution for inefficient evaluation of academic performance of the student. **Novelty:** Smartphone-based transaction of academic performance of the student, with QR code scanner support The Author 's version in developing a software that will solve the inefficient of academic performance evaluation of the students.

**Keywords:** Academic Performance; Inefficient; Prototype; QR Code; SmartphoneBased Evaluation

## 1 Introduction

Smartphones are a necessity in flexible and non-flexible learning in the Philippine Educational System, especially in Secondary Education to Higher Level Institutions. In the Philippine Educational System during the most recent two years which is the extreme period of the COVID Pandemic, Smartphone was the serviceable device in learning and interaction among students, without such, you cannot participate in any form of instruction conducted.

The first objective of the study is to develop and design a smartphone-based transaction that will be a great help to Saint Mary's College of Borongan Community

in Academic Performance Monitoring. The second objective is to evaluate the system using ISO 9126 software quality characteristics, in terms of functionality, inefficiency, and reliability.

The last decade has seen rapid mobile technology development across the globe. In 2020, Statistics reported that the number of smartphone users worldwide has surpassed three billion and is forecast to grow further by several hundred million in the next few years. China, India, and the United States are the countries with the highest number of smartphone users, with each country easily exceeding the 100-million-user mark. Among them, university students are considered to be one of the most important target markets and the largest consumer group for smartphone services<sup>(1)</sup>.

The mobility of smartphones and the convenience of surfing the internet meet the needs of university students for social interaction, entertainment, and access to information, and have become an important part of university students' daily university life<sup>(1)</sup>.

The use of a smartphone is gradually becoming a compelling learning tool used to enhance teaching and learning in distance education. Its usage ensures flexible course delivery, and makes it possible for learners to access online learning platforms, access course resources, and interact digitally. The proliferation of these facilities has changed the style of learning whereby students or learners no more solely depend on paper-based materials. The introduction of the internet led to the emergence of smartphones which enable learning to take place irrespective of the geographical location or period. Globally, the explosion of smartphones and their related devices has greatly transformed teaching and learning in developed nations where developing nations are not the exception<sup>(2)</sup>.

In the Philippines, smartphone owners are rapidly growing from a young age to children of millennials, in-school youths, and out-school youths. A necessity in all aspects of their regular activity.

The pandemic of COVID-19 has affected medical education worldwide. Multiple colleges have implemented emergency remote teaching (ERT) in response to whole and/or partial lockdowns. Numerous colleges were able to begin face-to-face learning in 2021 because of the COVID-19 vaccine's approval and subsequent vaccination campaign. Universities have modified their academic activities to restore pre-COVID-19 conditions, yet social distance limitations persist in all phases of education<sup>(3)</sup>.

Saint Mary's College of Borongan (SMCB), Borongan City is the recipient of the proposed system, having five hundred forty-eight (548) students, seventeen (17) non-teaching personnel, and twenty-three (23) teaching personnel. The institution is using a paper-based in recording, storing, retrieving, and deleting student academic information and performance. The existing mechanism of student assessment and evaluation of academic performance, as well as the ratio to student and staff of employees, is a problem in updating the academic performance of a student. The ratio of the number of students to assigned personnel in student performance evaluation and assessment is a problem in any Institution in a non-computerized transaction. The accessibility of the students in monitoring their academic performance using two to five desktops is very inconvenient. Doing so is laborious for students and academic employees.

There are unreliability academic records of the students in the said Institution. The inefficient transaction, deliverables, and services in the academe to clientele are problems, resulting in unhappy clients.

In September 2021, Sultan Qaboos University (SQU) initiated face-to-face undergraduate learning. As the pandemic has affected every aspect of our daily lives, medical education must address many measures to return to a pre-COVID-19 educational environment. We have used a QR code method to record students' attendance to maintain safety and distance standards, as well as to offer an alternative to the conventional approach<sup>(3)</sup>.

QR Codes were primarily developed in 1994 by Japanese automaker Toyota to track vehicles during car manufacturing. Barcodes were used for inventory management before QR Code inventory systems. Barcodes are one-dimensional, which means they can only hold information in the horizontal dimension<sup>(4)</sup>.

The smartphone scanner is the best tool to authenticate any object with embedded QR codes anytime and anywhere. This smartphone scanner will make it easier and simpler to encode the generated code without any difficulty<sup>(5)</sup>.

QR codes can be easily created that link to websites, show a geographical location, and access a document or specific application. QR codes were developed by Denso Wave in 1994, initially to track car components during manufacturing. Since the evolution of smartphones with cameras, QR codes got more attraction and were applied to a wide range of commercial applications such as marketing, and social media, and more recently QR codes have generated interest for their use in education, presenting an opportunity to excite and engage learners in a way the teachers were unable to<sup>(6)</sup>.

The system proposal will provide an automated academic evaluated performance of the student with a QR Code Reader. The four major terms of grade computations; prelims, midterm, pre-final, and final grades can be viewed by the authorized students or officially enrolled. The availability of the grades is based on the submission of the teacher in a separate system, submitted in an online manner. The limitations are as follows: minor activities like quizzes and laboratory activity or aided with any device cannot be viewed; the proposal is just a grading management process; and exclusively for SMCB students' users.

A system conceptualization that will change the existing very poor processing of academic performance storage into an advanced and highly technical mechanism. Also, students can easily access their performance using their smartphones.

## 2 Methodology

### 2.1 Research Design

The proposal is System Prototype Development Design. Visual Studio 2022 was used to develop the System’s Interface and XAMPP for developing the system’s web-based server to execute or show the exchange of data that is being developed within the system. The researchers will use the ISO 9126 Model to check and validate the system in terms of functionality, reliability, and inefficiency. The likert scale was used in scaling the statement of the questionnaire. Weighted mean was used in finding the average value of the rating.

### 2.2 Software Development Model

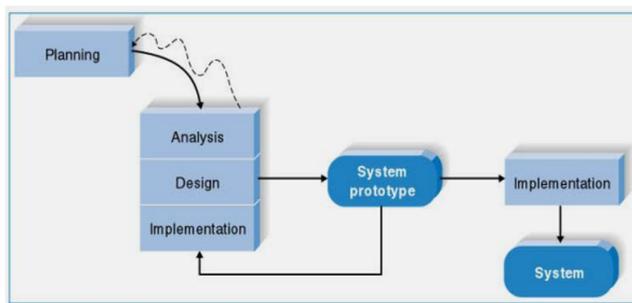


Fig 1. Software Development Model

- **Planning:** The Author will identify the proposal activities and possible outcomes.
- **Analysis:** This will identify the requirement specification, the hardware, and the software as a tool. This includes the gathering of related and existing similar studies.
- **Design:** Design the system and application interface and the database. Develop the system and enhance it with a few modifications during the second iteration.
- **Implementation:** The system is nearly complete and has been tested by the users.
- **System Prototype:** In this part, the researcher will prepare and distribute a questionnaire that evaluate the current design functions of the system.
- **Implementation:** After the system prototype, another implementation or test will be conducted, and the system/application tested with requirements.
- **System:** The result of prototyping.

### 2.3 System Conceptualization

Figure 2, the system conceptualization that will change the existing very poor processing of academic performance storage into an advanced and highly technical mechanism. Also, students can easily access their performance using their smartphones.

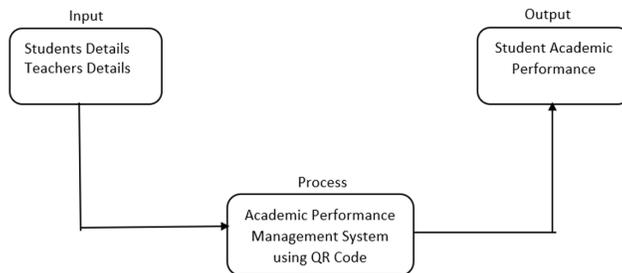


Fig 2. Conceptual Framework

### 2.4 Hardware and Software Requirements

Table 1. Technical Requirement

	System Minimum Requirements	Organization/Clients Specification	Technical	Compatibility Yes or No
<b>Hardware</b>				
<b>Computer/Laptop</b>				
Processor	Intel® Core	Intel Core		Yes
Memory	4GB	4GB		Yes
Hard Drive	500 GB	1 TB		Yes
Display	1366x768 resolution	1024x600 resolution		Yes
Video Card	Intel® HD graphic 4400	NVIDIA Geforce mx130		Yes
<b>Mobile/Android Device</b>				
Model number		Infinix X660C		Yes
Android version		10		Yes
Baseband		1.5		Yes
Build number		X660C-H653CF-Q-OP210315V406		Yes
<b>Software</b>				
<b>Operating System</b>				
	Windows 10	Windows 10		Yes
		Android OS		Yes
<b>Application Software</b>				
	Visual Basic	Visual Studio		Yes
	C++	XAMPP		Yes

Figure 3 the Registrar’s Office system flowchart which will enter the course and the section which are stored on their respective data storage. Next is Subject list Storing. Teacher information is inputted also in the system to create a teacher’s account and then stored in the teachers’ list. And the registrar will input the student information and store the data then generate their Quick Response (QR) Code for the students to be able to view their grades online using their mobile phones.

Figure 4 shows the flow of how students can view their grades using the application scanner developed. The student scanned their QR Code using the application provided. Wait if the QR code is valid or not, if it is valid the student can proceed in checking their grades. After scanning the valid QR Code, the system fetches the data from the table then it will generate a grade report.

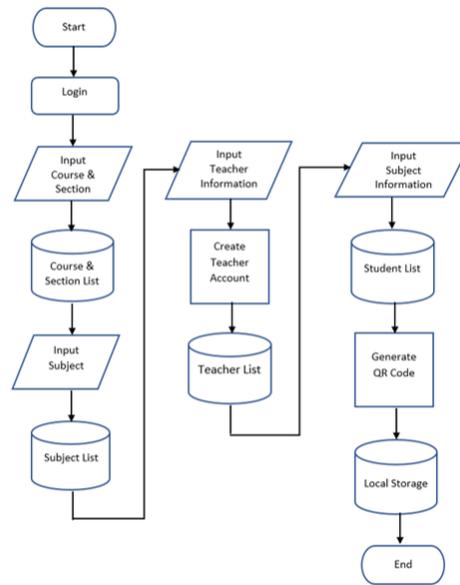


Fig 3. Registrar System Flowchart

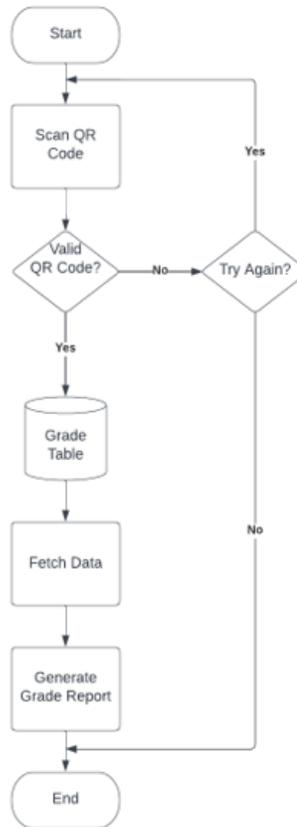


Fig 4. Student System Flowchart

## 2.5 Location

The study was conducted in SMC, Borongan City, in the Province of Eastern Samar, Philippines.

## 2.6 Respondents

The respondents are ten Information Technology (IT) Education Faculty Members, five Non-teaching personnel, and fifty students in Computing or ICT field. A Total of sixty -five. Using slovin’s formula in 95% confidence level, and 5% margin of error; a total of fifty-six (56) respondents were required.

## 2.7 Coding Scheme

The proposed system will be evaluated with the following scale:

5- Strongly Agree

4- Agree

3- Slightly Agree

2- Disagree

1- Strongly Disagree

The obtained mean will be interpreted with the following scale:

4.50 – 5.00 Strongly Agree

3.50 – 4.49 Agree

2.50 – 3.49 Slightly Agree

1.50 – 2.49 Disagree

1.00 – 1.49 Strongly Disagree

## 3 Result and Discussion

The proliferation and increasing user of smartphones in the academe was noted based on acceptance of the functionality of the proposed system, hence the features are functional. 100 percent of the respondents strongly agree the system is functional. The authenticity of the QR code scanned by the smartphone is favorably accepted in terms of reliability. Barcodes using QR code is highly acceptable. With these results, the efficiency of services was achieved.

The following table and figures will suffice for the overall acceptance.

### Acceptance Test

Table 2. Acceptance Table

Software Quality Criteria	Weighted Mean	Interpretation
Functionality		Strongly Agree with 100 % of the frequency
Reliability	4.73	Strongly Agree
Inefficiency	4.49	Strongly Agree

Alpha and beta test was applied in testing. The prototype proposed system is appreciated by the respondents.

### 3.2 Program Environment

The main interface is in Figure 5, which is the parent layout of the system. This includes the course and section list, teacher’s list. Figure 6 is the form that will display whenever the user clicks a button in the panel menu. The same figure is the subject entry listing, the subject offered by semester.

Figures 7 and 8 are student’s main information entry and QR code assignment. Figure 9 is the academic rating entry of the four major exams in a particular subject, and will calculate the average grade of students.

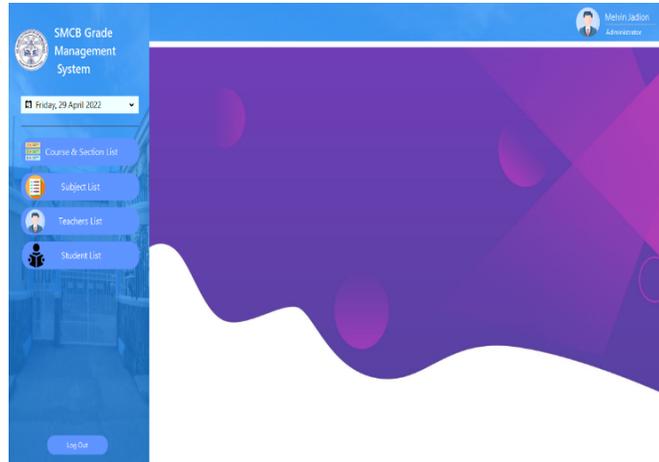


Fig 5. Main Interface

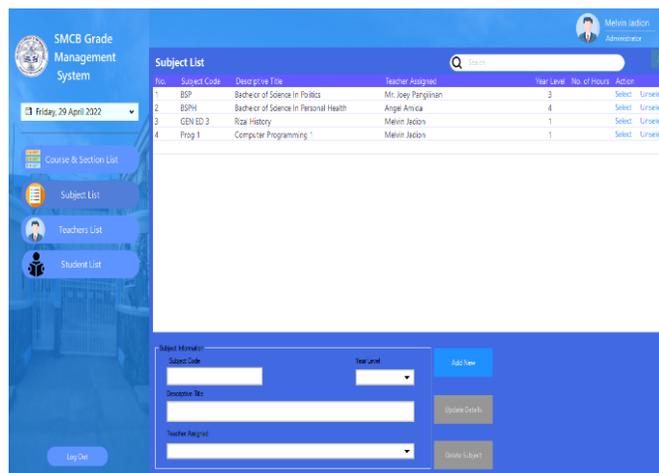


Fig 6. Subject Entry

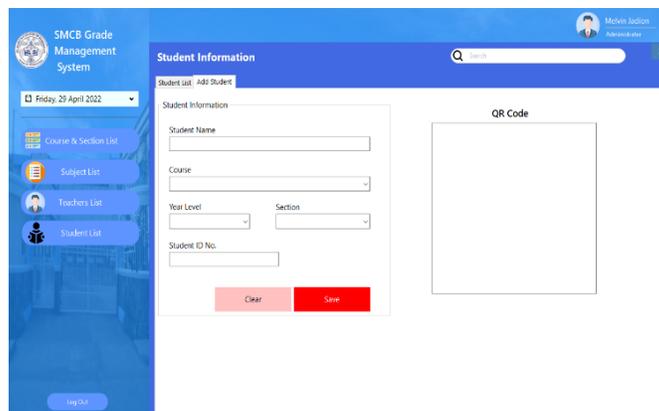


Fig 7. Student Information

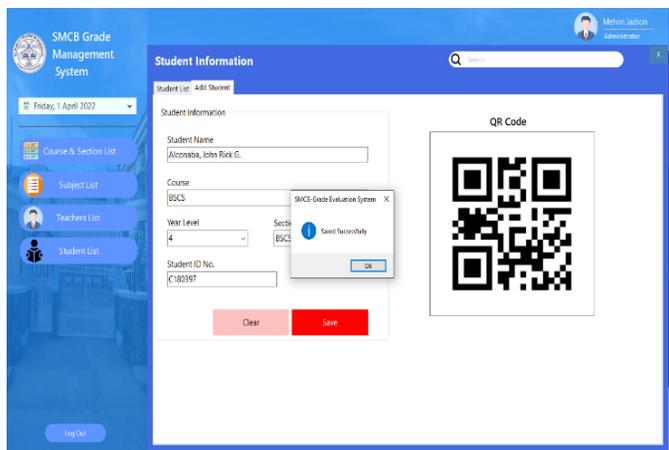


Fig 8. QR Code Assignment

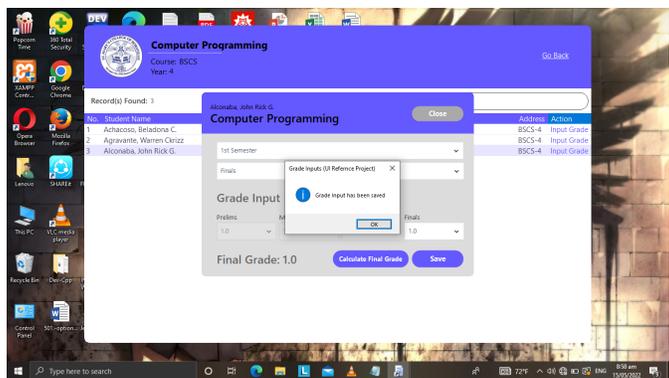


Fig 9. Grade-entry

#### 4 Conclusion

It is concluded that the proposal is considered an initial wireless system in the grade management process in SMC, the smartphone-based transaction. Friendly user to all SMC community. A solution in crowded applicants in grade evaluation and assessment. Encourages the teachers to submit grades on time, hence the students always updating their academic performance. Very accessible and convenient to students and registrar employees. Functional, reliable, and efficient. Highly acceptable to all users. The best solution to an inefficient evaluation of the academic performance of the students in SMC.

Smartphone-based transaction of the academic performance of students is a reliable source of data, gaining a 4.73 weighted mean, interpreted as strongly agreeing with its reliability. The QR code generates reliable information about clients scanned by a smartphone, inasmuch the efficiency was 4.49 weighted mean, interpreted as strongly agree. These numerical results will further support enhancing the limited functions features in the system, like the inclusion of computation of minor academic activities or quizzes.

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