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DEVELOPMENT AND EVALUATION OF AUTOMATED GATE PASS SYSTEM

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ABSTRACT

This study aimed to develop and evaluate an Automated Gate Pass System designed to keep track of the students, employees, and visitors passing the campus gate. Under the System Development Life Cycle (SDLC), the Rapid Application Development (RAD) Model was used to plan, design, create, deploy, and test the system. Also, PHP, MySQL, and XAMPP were utilized as software in system development and implementation. On the other hand, based on the ISO 9126 standard, the system was evaluated with a rate of usability (4.13) and functionality (4.30). The system helps manages in monitoring and facilitating records to anyone who passes by the school premises. Thus, the system contributes in securing and monitoring the students, employees, and visitors; thereby generating due and timely feedback to the administration.

Key words: SSCT, Gate Pass, Safety and Security, Monitoring

1. INTRODUCTION

With the rise of technology in the 21st century, new and creative gadgets and applications were developed to ease life. Still, school children's safety is the most significant component to precede research with advanced technology [1]. Surigao State College of Technology - Del Carmen Campus is the only public higher education institution in Siargao Islands, Surigao del Norte, Philippines. It has a pass slip operation/policy implemented, which aims to secure the students' safety and record information, monitor the employees going out of the gate status, and record the visitors' visit. However, using the manual system of recording, it has been noted that it could lead to losing files and documents when the administration needs information. Thus, this study aimed to develop and design an SSCT Automated Gate Pass System, centralizing the record of students and employees going out and visitors coming to the campus.

Traditionally, manual record management required vast amounts of documents to be shipped to storage facilities only to necessitate retrieval when needed and has resulted in the unnecessary expense of both time and money [2]. One the other hand, many innovations are now being developed to fasten its transaction. One of the innovations is the E-Gate pass System, which aimed to enhance and upgrade the existing system by increasing its efficiency and effectiveness by reducing the manual work [3]. Further, the software improves the working methods by replacing the current manual system with the computer-based system. As safety and security is a concern, it stressed that the consensus arising from the professional security community is that school administrators should invest in sophisticated technologies that help school staff and students to decrease violence via a multi-staged approach to safety [4].

It is evident at the cited studies that using a traditional-manual process may lead to inconsistency of information and difficulty in generating records. SSCT-Del Carmen manual gate pass slip has no available database and system to systematically and conveniently perform transactions. In so far, the institution has never had an existing system duly integrated with an electronic gate pass slip. With this, the main challenges faced by the SSCT-Del Carmen security guards are the fragmented massive of paper-based pass slip records of the students, faculty, and staff. Besides, it has been noted that the concerned personnel consumes time and difficulty in generating records for decision-making of the administration. Hence, SSCT-Del Carmen is doing its best and looks forward to optimizing its quality services.

Automated Gate Pass System aimed to modernize the manual pass slip system, which will be considered a technology to address the gap using PHP, XAMPP, and MySQL. Thus, this study is deemed to address the present situation in the Gate Pass Present System, designed to manage records, particularly in facilitating information for an employee, students, and visitors passing the school premises. Records are accessed to an informed decision making of the administration.

2. OBJECTIVES

2.1 General Objectives

To develop an Automated Gate Pass System designed to monitor and facilitate the process and information of the students, employees, and visitors passing campus gate.

2.2 Specific Objectives

SSCT Automated Gate Pass System is aimed to achieve the following specific objectives;

1. To design and develop a system with the following features and modules:
   a. Gate pass module;
   b. End-user module;
   c. Admin module;
   d. Reports module;
   e. Registration module.
2. To integrate and implement SSCT-DC Automated Gate Pass System supported with PHP, XAMPP, and MySQL;
3. To evaluate the system with the ISO 9126 standard in terms of usability and functionality.

3. CONCEPTUAL FRAMEWORK

The study was anchored in the article [4] that technologies would help security officers detect and respond to violence committed and potential violence, which have the ability to improve school safety. Further, it stipulated that there shall be an established mechanism for the students to help in crime prevention, safety, and security of the concerned Higher Education Institution (HEI) [5].

To create a successful Automated Gate Pass System, the researcher decided to affix the information gathered from the concerned offices, efficiently managing and monitoring the campus gate transaction. Input-Process-Output (IPO) Model was used in conceptualizing the development of the system, as shown in Figure 1.0. The IPO Framework involves the stages of Input, Process, and Output with its variables. Implementation and evaluation were also included after the said model is done.

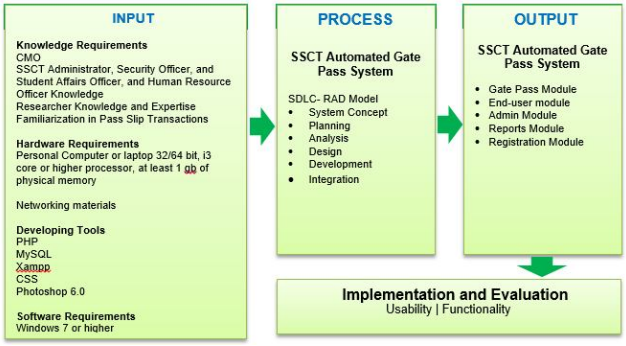

Figure 1. IPO Framework

As shown in the figure above, knowledge, hardware, developing tools, and software requirements are needed on the input stage in IPO Model. The system's development requires the knowledge of SSCT Administrator, Security Officer, Student Affairs Officer, and Human Resource Officer Knowledge, Researcher Knowledge, and Expertise, Familiarization in Pass Slip Transactions for a better understanding on the process. Secondly, the design and development of the system are being done on the process stage. The System Development Life Cycle (SDLC) includes system conceptualization, planning, analyzing, designing, development, and integration with other components are considered. The system deliverables serve as the output, as seen in the third box. The various modules are some of the outputs in the system development. Lastly, the system's evaluation is done to check the conformity to the ISO 9126 standards as to usability and functionality characteristics by the end-users.

4. METHODOLOGY

The researchers used the Rapid Application Development (RAD) methodology of the System Development Life Cycle in the study. Figure 2 shows the flow of the implementation of the system. The system ensures to increase the usability and functionality of components and encourage customer feedback as considered for evaluation.

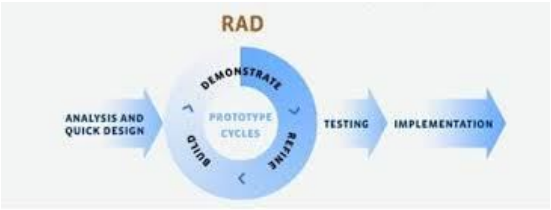

Figure 2. RAD Model

4.1 System Analysis

The researchers analyzed the legitimate information acquired from the concerned offices. In system analysis, first, the researchers studied the flow of the manual gate pass slip. They gathered data and information from the security officers and school officials to understand its process through interviews with the existing policies and guidelines on pass slip. Some needed data were collected through observations to analyze the flow of the transactions. Figure 3 shows the manual pass slip's current technical situation in the SSCT-Del Carmen Campus. It indicates that the assigned security officer provides pass slip to the students/employees who want to go out. Students and employees will ask permission from the Program Chair and Campus Director, respectively, and be signed and approved. Lastly, it is given back to the security officer and record it manually in a logbook for monitoring purposes. However, no mechanism yet to automatically generate reports and monitor data for decision-making.

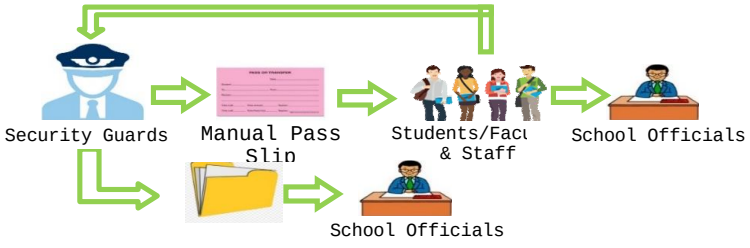

Figure 3. Current Technical Situation

4.2 System Design

The system and database design was done to estimate the effectiveness and efficiency of the application systems in addressing issues as identified in the system analysis stage phase. It created a logical data model of the business information stored in and accessed through the database.

Figure 4 shows the system architecture of the study. The students/employee filed pass slip to the immediate heads/chair for approval. All of the data are saved to the file server. The authorized security officer user may allow the students to leave the premises if the student's gate pass request is approved. Furthermore, the campus director and other officials can access and generate reports to be used in decision-making and for the possible intervention program in every issue.

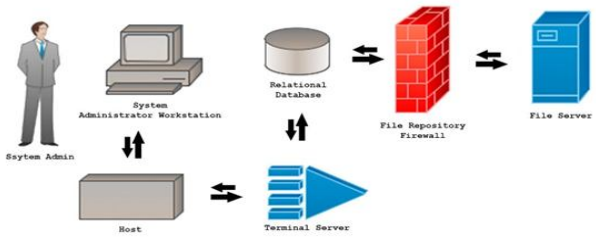

Figure 4. System Architecture

4.3 System Development

System development involves the cyclical process of building, refining, and demonstrating the said innovation. The hardware and software devices used are specified clearly. Throughout the system development, a computer unit with the specifications of at least 2GB RAM, Hard Disk Drive of 1 TB was used. Similarly, software applications used in the study were PHP programming language for the development of the system and MySQL for database file management and to ensure effective delivery of reliable, high-performance, and scalable data processes embedded in the system.

4.4 System Deployment and Implementation

The system deployment and evaluation were conducted in SSCT- Del Carmen Campus at Del Carmen, Surigao del Norte, as shown in figure 5. The college is located in one of the oldest places in the cluster islands known as Siargao of the Pacific Ocean and the eastern part of Surigao del Norte

Figure 5. System Deployment Environment

4.5 System Deployment and Implementation

The study used the developmental research design, and the survey method was utilized to evaluate the system. There are two characteristics of the system were evaluated, the usability and functionality. The usability has attributed the confirm the individual assessment of such use by a stated or implied set of users. This characteristic has the attributes of learnability, understandability, and operability. Functionality refers to the attributes that bear on the existence of a set of functions and their specified properties to which those that satisfy stated or implied needs (ISO 9126) [6].

The data needed for system evaluation were gathered through an adapted instrument. The content was adopted to System Usability Scale of John Brooke (1986) [7] and ISO 9126. The instrument consisted of two parts. Part I covered the items on the personal information of the end-users. Part II focused on the items that would determine the usability and functionality of the system. To confirm that the instrument fits the objectives of the study, the researchers underwent the processes of establishing its validity by asking assistance from experts and potential end-users.

Table 1. Distribution of Respondents

RESPONDENTS	FREQUENCY	PERCENTAGE
Campus Director	1	2.86 %
Campus Officials	8	22.86 %
Security Officers	6	17.14 %
IT Professionals	5	14.28 %
Students	15	42.86 %
Total	35	100 %

Table 1 shows the total number of respondents. Fifteen (35) persons evaluated the system; to wit, one (1) from the office of Campus Director; eight (8) from the Campus Officials (Program Chairs, Human Resource Officer, Student Affairs Officer); six (6) members of the Security and safety office; five (5) IT Professionals and fifteen (15) students. To statistically treat the obtained evaluation results, frequency counts, mean, and percentages were utilized using the MINITAB Software. Then, the data were analyzed and interpreted. The interpretations used to qualitatively interpret weighted means obtained from the user's ratings are shown in table 2 below:

Table 2. Score and Verbal Interpretation

Score	Verbal Interpretation
4.2-5.0	Strongly Agree
3.4-4.1	Agree
2.6-3.3	Fair
1.8-2.5	Disagree
1.0-1.7	Strongly Disagree

5. RESULTS AND DISCUSSION

School safety is a critical issue for school staff, policymakers, and parents. Efforts to promote safety often focus on reducing school violence and disorder, including zero-tolerance disciplinary policies, metal detectors, and police officers in schools [8]

Figure 6 shows the log-in form of the system. Once the user already has an account, the user can automatically sign in or log in to the system.

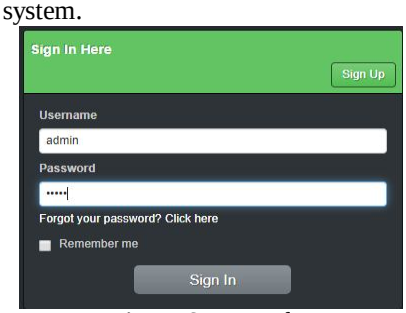

Figure 6. Log-in form

Figure 7 shows the Registration Form; this is the interface where users/students/employees register to the system subject for approval of the system administrator.

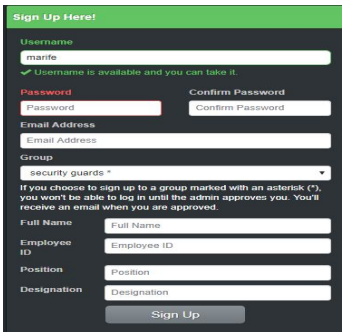

Figure 7. Sign-up form/Registration form

Figure 8 shows the Menu Navigation and System Dashboard. This interface contains menu navigation on the left side and system dashboard on the right side. The system dashboard consists of gate pass form, faculty, and staff form, individual/students form, division, visitors, calendar, approval form, pending form, and request form.

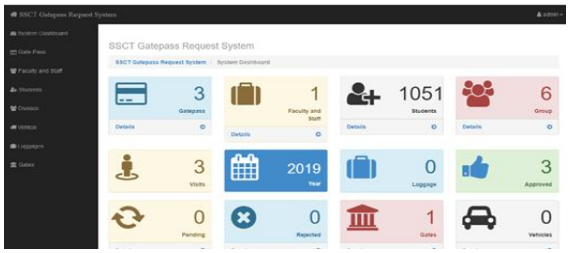

Figure 8. Menu Navigation and System Dashboard

Figure 9 shows the Gate Pass Form. The gate pass form consists of three states: student form, faculty/staff form, and visitors form.

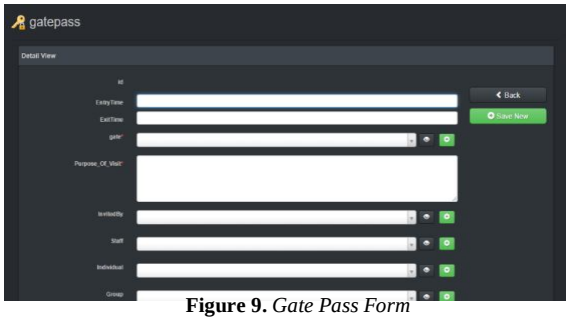

Figure 9. *Gate Pass Form*

Figure 10 shows the End-user and Members Registration and Monitoring Forms. In this interface, the admin can add and delete end-user or members to let them access the system.

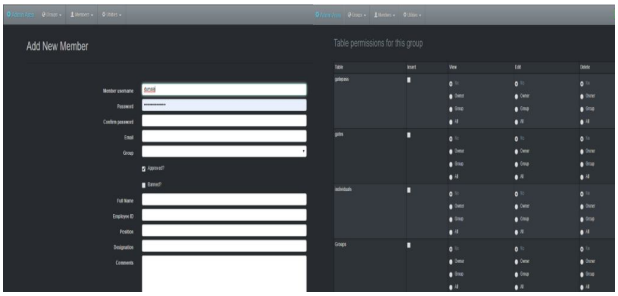

Figure 10. *End-user/Members Registration and Monitoring*

5.1 Evaluation of the System

The system evaluation was employed the ISO 9216 standards, assessing the system's usability and functionality. Further, Figure 11 presents the usability of the SSCT-DC Automated Gate Pass System. Under component 1, when asked if *the system is likely to use frequently*, users rated "Strongly Agree" with a mean score of (U1 – 4.22); when asked if *the system was easy to use*, a mean score of (U2 – 4.05) was obtained which also means "Agree". On *various functions in this system were well integrated*, a mean score of (U3 -4.20) was obtained. Most *people would learn to use this system very quickly*, a mean of (U-4 – 3.99). Respondents thought they are very confident in using the system evident from the mean (U5 - 4.19). Generally, the mean of the system's usability index is (MEAN – 4.13), which means that the respondent was "Agree" that the application is usable.

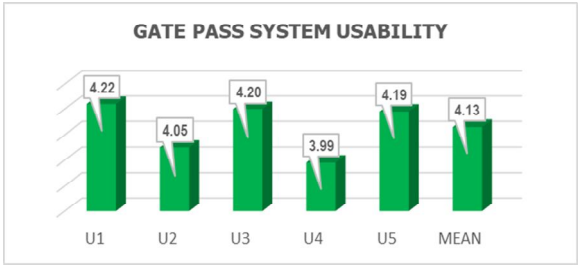

Figure 11. Usability of the system

Moreover, the results revealed that most of the respondents were satisfied with the performance on the system's usefulness, such as to its Graphical User Interface (GUI). Indeed, users have high confidence in using the system. However, on the other hand, users rated the system with the lowest rating in some items since security officers were not so good at using the computer. Most of the security officers found difficulty in utilizing the system because of computer literacy issues.

In figure 13 presents the functionality of the system. When asked if *there are appropriate essential functions of the system*, users rated "Strongly Agree" with a mean score (F1 –

4.23). *There is the correctness of the procedures and commands*, a mean score of (F2 – 4.13), which also means "Agree." The *given software component or system does not typically function in isolation*, a mean score (F3 – 4.10). The *system has met the institution's appropriate laws, and guidelines need to be complied with*, with a mean score (F4 – 4.56). The *respondent thought that the application has the security relates to unauthorized access to the software function* from the mean (F5 – 4.48) means "Strongly Agree." Generally, the mean of the application's functionality is (MEAN – 4.30), which means that the respondent was "Strongly Agree" the functionality of the system.

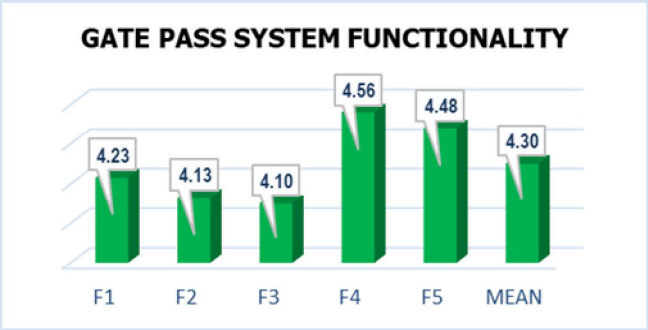

Figure 12. Functionality of the System

Additionally, the results revealed that most of the respondents were satisfied with the system's functionality in terms of security because there was an integrated security feature for unauthorized access based on the set user's view level.

Table 3. Application Evaluation Result

System Evaluation in terms of	Mean	Verbal description
Usability	4.13	Agree
Functionality	4.30	Strongly Agree
Grand Mean	**4.22**	**Strongly Agree**

The Automated Gate Pass System evaluation in terms of usability and functionality revealed is useful and functional. On usability, the mean score of 4.13, with the verbal description "Agree" and for functionality, a mean score of 4.30, with the verbal description "Strongly agree." Hence, the system provides features and meets the end-users' needs with a grand mean of 4.22 with a verbal description "Strongly Agree."

6. CONCLUSION AND RECOMMENDATIONS

Based on the record in the system analysis stage, the manual pass slip's current technical system was time-consuming for recording the file, inconsistency, and difficulty generating reports. SSCT Automated Gate Pass System is then believed as a very convenient way to store, manipulate, analyze, retrieve, and track the institution's information on gate pass. It can generate real-time data as needed and adaptable to new or modified information requirements. Thus, it is more practical and convenient for the system to be supported on its full implementation. Lastly, the system conforms to usability and functionality standards, which provides ease in decision-making among top management.

Based on the findings as mentioned above and conclusions, the following are recommended:

1. Training to end-users should be considered for the easy and manageable manipulation of the system.
2. Class schedule should be integrated to the system for efficient monitoring of class.
3. Additional Closed Circuit Television (CCTV) Cameras should be installed in the gate and other campus areas concerning the campus's safety and security.
4. The system should be integrated with a mobile application for portable access of the user.
5. Further research relating to the system are encouraged to implement and associate with other automated systems

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