HEALTH INFORMATION SYSTEM OF ST. PAUL UNIVERSITY PHILIPPINES

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ABSTRACT

This research and development project aimed to examine current processes and transactions made in the health services of St. Paul University Philippines in order to gather pertinent data for the development of a proposed record management system. This proposed system aimed at improving the efficiency of the services of the clinic particularly in the creation, organization, retrieval, and updating of health information of its clientele. Ten (10) experts in Information Technology and five (5) clinic staff were the study participants. The interview with the clinic staff revealed that the existing manual system performed poorly with regards to records management in the clinic. With this, they proposed for an automated system to improve the efficiency of managing clinic records to facilitate the creation, organization, retrieval, and updating of information in the clinic transactions. Based on these results, the Health Information System for St. Paul University Philippines was developed. The proposed system was pilot tested and was evaluated by the clinic staff and IT experts in terms of its functionality. Furthermore, the participants offered suggestions to enhance the system further. From the evaluation results, it can be deduced that the proposed system is effective as this improved the recording system of the clinic.

Keywords: *Health information system, health record management, clinic record management*

INTRODUCTION

No matter how information and materials are being arranged and classified, one of the biggest problems for office staff is how to create, retrieve, and organize files. An office may house too many information that it may take too much time for an office staff to locate something when done manually.

A management information system has been one of the most important tools in storing information. There are two types of information management. The first one involves filing papers using paper and pen. This kind of technology is not that reliable because of the natural elements that might cause damage, and using this type of technology consumes a lot of time when looking for information. The second one is a computer-generated management information system that is being used in the 21st century. Nowadays, people tend to rely more on technology than ever before. This makes data management easier and convenient. Also, this is a response to the rapid growth and emerging management information system issues that greatly affect different industries around the world.

Hence, the management information system is becoming more and more popular. The government could not cater to the needs of people, and banks could not process payments, supermarkets could not track transactions. In almost every field - medicine, finance, health care, manufacturing, business, and education, information system plays a prominent role.

With the aforementioned premise, the researcher would like to develop a management information system for St. Paul University Philippines Clinic. This system is intended for the clinic personnel to store the health information of their clienteles particularly the students, faculty, staff, parents, and alumni. Through the system, all information needed in the clinic can easily be stored, organized and retrieved. Through the system, the health record of every client can easily be tracked.

Conceptual Framework

The development of the system was guided by the process model of development which is the SCRUM Agile Development Methodology.

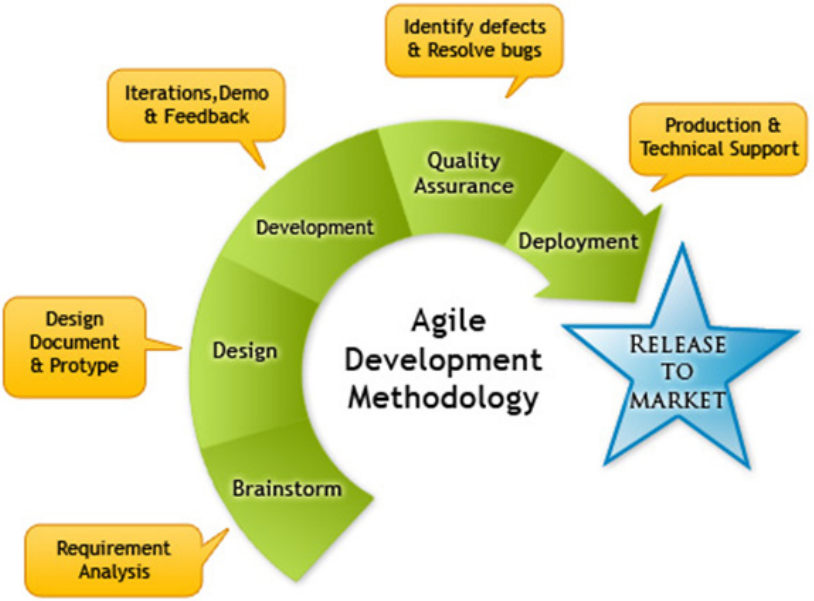

Figure 1. SCRUM Agile Methodology

The research used the AGILE methodology process to be able to produce a suitable system for the University Clinic of St. Paul University. The agile methodology as a software development follows a continuous improvement cycle, exposing flaws faster and reducing waste. The goal was achieved faster since releases arrive at the client frequently.

Brainstorming. In this phase, the researcher coordinated with the University Clinic staff particularly the director and staff to discuss the features and scope of the proposed system.

Design. Immediately after a quick brainstorming, the development of the system started. This was the stage where the researcher developed an initial prototype of the system.

Development. In this phase, the system was presented to the client group for evaluation. The objective of the demonstration was to gather feedback and suggestion from the client.

Quality Assurance. In this stage, all units were tested to check if all units coordinated with one another, and the system as a whole behaved within the specification. After successfully testing the software, it was delivered to the end user.

Deployment. This phase of the model is virtually never-ending. Generally, problems with the system which were not found during the development cycle came up after the user starts. So, issues related to the system were solved after its deployment. Problems may arise from time to time and need to be solved.

The figure below shows the paradigm of the study.

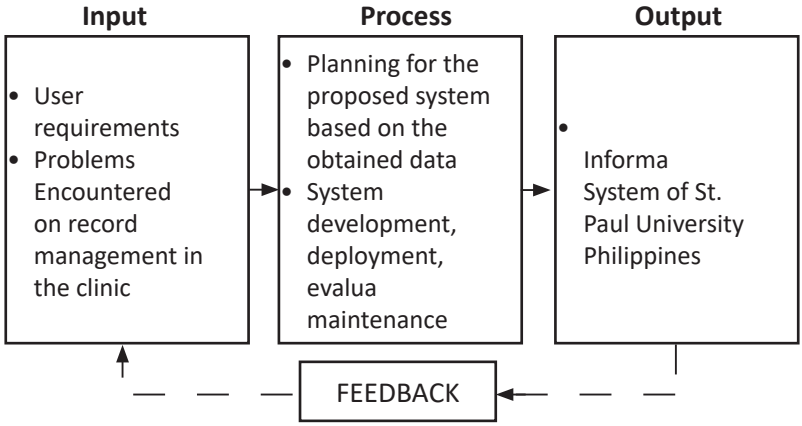

Figure 1. Paradigm of the study

This involves three aspects, namely, input, process, and output. The inputs include the user requirements and the problems encountered in the existing St. Paul University Philippines Clinic transactions. These inputs are utilized in the process where the researchers observed and analyzed the problems encountered in the existing system. Based on the results of the evaluation, the researcher designed and presented the proposed system for initial try-out. The output is the proposed

Health Information System of St. Paul University Philippines. The provision of the system on making a continual improvement is through its feedback mechanism.

Statement of the Problem

This study aimed to develop and evaluate the proposed Health Information System of St. Paul University Philippines.

Specifically, it sought answers to the following questions:

1. What is the assessment of the participants on the existing clinic processes and transactions with respect to the following:
    1.1 creating student information for medical, dental, and walk-in checkup;
    1.2 organizing student information;
    1.3 updating the check-up record of students, and
    1.4 retrieving the records of students?
2. What are the problems encountered in the existing clinic processes and transactions?
3. What intervention measures can be proposed to systematize the existing clinic processes and transactions?
4. What is the degree of effectiveness of the proposed health information system of the University Clinic in terms of the following software characteristics:
    4.1 Functionality;
    4.2 Reliability;
    4.3 Usability;
    4.4 Maintainability, and
    4.5 Portability?

Scope and Limitation

This study covered the development and implementation of a proposed Health Information System of St. Paul University Philippines.

The proposed health information system includes the following:

1. Student information database which can store and locate information of the students.
2. Prevention of data redundancy among student information.
3. Incorporation of students' medical checkup records for the whole year.
4. Printing of students' information and status.
5. Presence of admin and user (staff) profile for medical checkup per semester or school year.

METHODOLOGY

Research Design

This system development research utilized a methodology for product development. The mixed approach was used to obtain both qualitative and quantitative information that is instrumental in the development of the system. Qualitative data include the inputs on the processes and procedures on clinic transactions as well as the suggestions of experts and users for the refinement of the system. The quantitative data involved the evaluation of the users and experts on the functionality of the developed system. Specifically, the descriptive survey was used to obtain the desired information for the development and evaluation of the system.

Participants of the Study

The participants of the study were the SPUP clinic staff and IT experts within and outside the University. The IT experts were selected through purposive sampling. There were five (5) clinic staff and ten (10) IT experts who participated in the study.

The processes involved in clinic transactions and the functionality of the proposed system were obtained from the SPUP clinic staff. The IT experts provided information on the functionality of the system and their suggestions for its improvement.

Data Gathering Procedures

The researcher used the following methods in gathering the data:

Interview. The researcher interviewed the clinic staff in order to obtain information on the processes and transactions done to obtain some information beyond the researchers' knowledge.

Observation. Through this method, the researcher was able to formulate predefined problems, transactions and questions to have an idea of how the system requirements would be developed and enhanced.

Internet Surfing. The researcher browsed through the internet for the information that is not reliable within the framework of the target processes such as related literature and studies, the definition of terms and other related information necessary for the conduct of the research. The study particularly utilized the ideas expounded from the articles of Quintegra Solutions (2006), de Paula Cortes (2011) Borges de Olibeira, S., Arroyo, Borges de Oliveira, M., Ferreira (2011).

Questionnaires. The researcher floated two sets of questionnaires: pre-survey and post-survey questionnaires. There were two sets of pre-survey questionnaires.

The first set was used to assess the existing manual system while the second set was used to assess the degree of seriousness of the problems encountered in the present manual system.

The post-survey questionnaire which contains the ISO/IEC 25010 (n.d.) was used to determine the degree of effectiveness of the proposed system in terms of software features/capabilities. The ISO/IEC 25010 quality model is the cornerstone of a product quality evaluation system. The quality model determines which quality characteristics will be taken into account when evaluating the properties of a software product. The quality of a system is the degree to which the system satisfies the stated and implied needs of its various stakeholders, and thus provides value. The product quality model defined in ISO/IEC

25010 comprises the five quality characteristics such as functionality, usability, reliability, maintainability, and portability.

The following steps were undertaken in order to pursue the objectives of this study:

1. The researcher sought approval from the clinic head for the conduct of the study.
2. After securing approval from the clinic head, an observation on the clinic procedures and an interview was conducted with the clinic staff to substantiate the information obtained from the observation.
3. Based on the results of the observations and interviews on the processes in the office, the proposed system was developed.
4. The developed system was evaluated by the IT experts and the users to look into its functionality and efficiency.
5. The developed system was refined based on the evaluation results.

Data Analysis

The data was tallied and organized through the following data analysis tools:

Mean. This was utilized to determine the functionality and degree of efficiency of the proposed health information system.

Likert scale. This was used to further interpret the means on the participants' ratings on the functionality and efficiency of the proposed system. This scale was used in the study.

Scale Range	Descriptive Interpretation
4.20-5.00	Excellent/ Very High
3.40-4.19	Very Satisfactory/High
2.60-3.39	Satisfactory/Moderately High
1.80-2.59	Poor/ Low
1.00-1.79	Very Poor/Very Low

RESULTS AND DISCUSSION

Assessment of the Participants on the Existing Clinic Processes and Transactions

Table 1
Summary of the Assessment of SPUP Clinic Staff Participants' Response to the Current System

Tasks/Processes	Weighted Mean	Descriptive Interpretation
Creation of student information for the medical, dental and walk-in checkup		
• Promptness in recording student information	1.8	Poor
• Checking and verification of student information	2.0	Poor
• Completeness of information submitted	1.4	Very Poor
Organizing student information		
• Time allotment spent in categorizing submitted output by section, level and academic year	1.6	Very Poor
• Accuracy and precision in categorizing student information	1.4	Very Poor
• Security of student information	1.4	Very Poor
Retrieving the check-up record of the students		
• Promptness in locating medical and dental information of student	3.2	Satisfactory
• Time spent in updating student information	3.2	Satisfactory
• Outright dissemination of medical and dental results to the students	1.6	Very Poor

(table continues)

Table 1 *(continued)*

Updating the check-up record of the students		
• Viewing of recorded medical and dental information of students	2.0	Poor
• Checking of medical and dental information of students	2.0	Poor
• Verification of entered medical and dental information of students	1.8	Poor
Overall Mean	**2.0**	**Poor**

As shown, the current manual system is rated by the participants in almost all the indicators ranging from poor or very poor in terms of its ability to (1) create student information for medical, dental and walk-in checkup, (2) organize student information, (3) retrieve and update the check-up record of the students. However, the participants are satisfied with its promptness in locating medical and dental information of student and time spent in updating student information.

The participants' overall rating on the existing clinic information system is poor. This implies that the current system needs to be enhanced to address the limitations encountered by the participants on the creation, organization, retrieval, and updating of records.

Problems Encountered in the Existing Clinic Processes and Transactions

Table 2
Summary of the Clinic Staff Participants' Response to the Difficulties Encountered in the Existing System

	Difficulties Encountered	Frequency	Percentage
1.	Takes time in the retrieval of existing file of student	5	100%
2.	Creation of new student information	5	100%

(table continues)

Table 2 *(continued)*

3.	Inability to easily view student medical and dental record	5	100%
4.	Returning of record is not done properly.	5	100%
5.	Files of students are not kept in good storage, and sometimes the files are damaged.	5	100%
6.	Tedious work in recording and updating of student information	3	60%
7.	There is not enough storage space for categorizing existing student information.	3	60%
8.	Sometimes files of students are lost and cannot be found.	3	60%
9.	It takes time for patients to write in the log book most especially when there are too many patients coming in.	2	40%
10.	No queuing system for patients' turn to be attended to	2	40%

Table 2 shows the difficulties encountered by the participants on the existing system. All participants pointed to the following difficulties they experienced: (1) It takes time in the retrieval of existing file of student; (2) creation of new student information; (3) inability to view student medical and dental records promptly; (4) returning of record is not done properly; and (5) files of students are not kept in a good storage and sometimes the files are damaged. Sixty percent (60%) of the participants find record keeping as very tedious. They also claimed that there is not enough storage space for categorizing existing student information, and sometimes files of students are lost and cannot be found. Moreover, forty percent (40%) of the participants asserted that in the manual system, it takes time for patients to write in the log book most especially when there are too many patients coming in, and there is no queuing system to use as prompts for patients' turn to be served.

Intervention Measures to Systematize Existing Clinic Processes and Transactions

The participants proposed a computerized system that integrates all transactions in the office, particularly the creation, organization, retrieval, and updating of clinic records. This automated system would speed up transactions in the clinic; thus, it will be able to provide prompt service to its clientele.

Description of the Proposed System

The Health Information System of St. Paul University Philippines is a standalone program that monitors and stores the basic education unit clinical records. It provides all the electronic forms that the clinic utilizes to store data in the manual system. The staff can also view and edit the entered information of the students. The system can categorize the different diseases of the patients and be able to tally the same diseases. The clinic staff will be able to evaluate pupil/student easily by providing them an electronic copy. Using this kind of system, the clinic can save paper for storage and retrieve misplaced pupil/student information. The pupils and students can just request at the university clinic their patient's record easily. Work is paperless and everything is automated because the health information system will do it for them. The development of the system was based on existing systems in the University that were developed by Tolentino (2015) and Babaran (2015).

Degree of the Effectiveness of the Proposed Health Information System of the University Clinic

Table 3

Summary of the Assessment of the SPUP Clinic Staff Participants on the Efficiency of the Proposed System

Software Features/ Capabilities	Attributes of the software that bears the following:	Clinic Staff		IT Experts	
		Mean	DI	Mean	DI
Functionality					
Suitability	shows presence and appropriateness of a set of functions for a special task	4.50	Very High	4.60	Very High
Accurateness	has provision of right or agreed result of effect	4.67	Very High	4.30	Very High
Interoperability	has the ability to interact with a specified system	4.50	Very High	4.30	Very High
Compliance	adheres to application-related standards of conventions or regulations in law and similar prescriptions	5.00	Very High	4.70	Very High
Security	prevents unauthorized access whether accidental or deliberate, to programs or data	4.67	Very High	4.60	Very High
Reliability					
Maturity	shows frequency of failure by faults in the software	4.67	Very High	4.60	Very High
Fault Tolerance	maintains a specified level of performance in case of software faults or infringement of its specific interface	4.50	Very High	4.20	Very High
Recoverability	re-establishes its level of performance and recover the data directly affected in case of a failure and on the time and effort needed for it	4.83	Very High	4.50	Very High
Usability					
Understandability	shows user's effort for recognizing the logical concept and its applicability	4.83	Very High	4.70	Very High

(table continues)

Table 3 *(continued)*

Learnability	shows user's effort for the learning of its application	4.67	Very High	4.60	Very High
Operability	shows user's effort for operation and operation control	5.00	Very High	4.60	Very High
Maintainability					
Analyzability	shows effort needed for diagnosis of deficiencies or causes of failure, or for identification of parts to be modified	4.67	Very High	4.70	Very High
Changeability	shows effort needed for modification, fault removal or environmental change	4.50	Very High	4.50	Very High
Stability	shows risk of an unexpected effect of modifications	4.67	Very High	4.80	Very High
Testability	shows effort needed for validating the modified software	4.67	Very High	4.60	Very High
Portability					
Adaptability	provides opportunity for its adaptation on the different specified environment without applying other actions or means than those provided for this purpose for the software considered	5.00	Very High	4.70	Very High
Instability	installation of the software in a specified environment.	4.67	Very High	4.50	Very High
Conformance	adheres to standards of conventions relating to portability	4.50	Very High	4.70	Very High
Replaceability	opportunity of using the software in place of other softwares in the environment of that software	4.67	Very High	4.80	Very High
Overall Weighted Mean	**4.70**	**Very High**	**4.58**	**Very High**	

The clinic staff and clinic experts assessed the proposed system as "Very High" in all aspects of functionality, reliability, usability,

maintainability, and portability. This finding implies that both groups of participants from the University who evaluated the proposed system have seen the desired features and very satisfied with the processes shown during the demonstration and testing of the said system.

The very high degree of functionality of the system implies that the software has the attributes that recognize the appropriateness of a set of functions for special task, that determine the accuracy of the result, that can interact with other systems, that make the software adhere to application-related standards of conventions or regulations in law and similar prescriptions, and have the ability to prevent unauthorized access whether accidental or deliberate, to programs or data.

The very high reliability rating of the system indicates that the system is very effective in determining the frequency of failure by faults in the software, maintaining a specified level of performance in case of software faults or infringement of its specific interface, and re-establishing its level of performance and recovering the data directly affected in case of a failure and on the time and effort needed for it.

The system's very high maintainability level is an indicator that the system can diagnose deficiencies or causes of failure or can identify parts which can be modified; identify the needed modifications, fault removal or for environmental change; identify the risk of an unexpected effect of modifications; and identify actions needed for validating the modified software.

The very high performance of the system with regards to its portability features is indicative of its ability to identify opportunity for its adaptation on different specified environment without applying other actions or means than those provided for the purpose of the software,ability to function when installed in other software in a specified environment, its ability to adhere to standards of conventions relating to portability, its ability to be utilized in place of specified other software in the environment of that software.

In general, the very high functionality rating of the system implies

that it has met the desired features that could better facilitate the managing and tracking of students' records.

CONCLUSION

Based on the aforementioned findings, the researcher concludes that the proposed Health Information System of St. Paul University Philippines, as compared to the existing system, is more efficient in facilitating transactions and processes for managing clinic records.

RECOMMENDATIONS

Based on the findings and conclusions, the following are presented:

The researcher may present the proposed system to the administration of St. Paul University Philippines for approval and implementation of the system.

The system developer may conduct an orientation on the use of the proposed health information system of St. Paul University Philippines.

The users of the system may utilize the proposed system and note some of its limitations which could be significant inputs for the enhancement of the existing system.

The IT administrator may request the support of the administration for a standalone server to sustain the utilization of the proposed system.

Future researchers may look into the system and do survey studies and benchmarking activities that could improve the efficiency of the system.

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