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Basic Education Network & Centralized Hub (BENCH): A Web-Based Information Management Bundle for Public Schools

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Abstract. The study proposed the Basic Education Network Centralized Hub (BENCH), a web-based information management system designed specifically for public schools in Cabanatuan City like HCPSMSHS. BENCH aimed to centralize educational data, streamline data management, and enhance communication among stakeholders. The system developed included features such as registrar data management, attendance monitoring using QR codes, learner profiling, clinic admission and monitoring, report generation, data analytics, and SMS/email notifications to parents and stakeholders. BENCH was developed using the Agile System Development Life Cycle (SDLC) Model and evaluated according to ISO/IEC 25010 criteria for usability, reliability, performance efficiency, functional suitability, security, portability, maintainability, and compatibility.

Data were collected using a self-made survey questionnaire and purposive sampling. The study included two sets of respondents: system users (e.g., school principal, administrative assistant, clinic personnel, discipline officer, and registrar) and IT experts, both internal and external to the school. The evaluation results indicated that BENCH conformed to ISO/IEC 25010 Software Product Quality Standards, with high ratings in system usability, performance efficiency, and functional suitability. Both IT experts and system users rated BENCH as highly functional, efficient, portable, maintainable, compatible, secure, reliable, and usable, confirming its high acceptability and alignment with international software quality standards.

Keywords: *educational data management, web-based system, public schools, ISO/IEC 25010, agile development*

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1. Introduction

In this digital age where technology has transformed various aspects of society, including the education sector. This is the era where technological advancement is rampant, educational institutions are recognizing the significance of digital adoptions to enhance the quality of teaching and learning, simplifying administrative processes, and enhancing online communication among parents and stakeholders. Schools and teachers need to achieve and comply with the mounting demands and challenges of the current education system while simultaneously performing array of administrative tasks. This scenario particularly happens in public schools which lacks resources parallel to the increasing student population.

The Honorato C. Perez, Sr. Memorial Science High School (HCPSMSHS), a secondary school in Cabanatuan City, Nueva Ecija, Philippines, exemplifies the challenges faced by its teachers in managing educational data and administrative responsibilities which requires student data and records. The school operates in an environment that requires efficient handling of data and communication. However, the lack of a reliable, functional, and well-maintained database has been one of the challenges for this public school. Teaching and non-teaching personnel often struggle to generate accurate, timely, and reliable reports due to outdated processes in data management.

The Department of Education (DepEd) has recognized these challenges and implemented different programs and initiatives to address them. A notable effort is DepEd Order No. 002, s. 2024, which mandates the removal of administrative tasks from the teachers to allow them to focus on instruction. While this policy reflects a commitment to promoting teacher welfare and enhancing the quality of education, there are still administrative tasks remain outside its scope, leaving gaps in the system. Hundani and Toquero (2021) highlight the detrimental impact of administrative workloads on teachers' occupational stress, underscoring the urgent need for targeted intervention.

In response to the abovementioned challenges, the Basic Education Network Centralized Hub (BENCH) seeks to provide an innovative solution. BENCH is a web-based information management system specifically designed for public schools like HCPSMSHS. By integrating various administrative functions into a centralized platform, BENCH aims to streamline data management processes, reduce administrative burdens on teachers and improve communication among

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teachers, parents, and stakeholders. The system takes inspiration from successful projects such as the Offline Student Information System (Romeroso et al., 2021) and the Web-based Student Monitoring System (Dela Cruz, 2019). It also leveraged international standards for software quality, usability, and security, including ISO 9126, to ensure a user-friendly and efficient system that meets the demands of the end-users.

The rationale for developing the project BENCH started in its potential to address the challenges in file management and record-keeping in the research locale. A centralized platform has the capacity to enhance the data management by enabling real-time processing, storage, and retrieval of critical information. This functionality also aims to ensure the accuracy and reliability of reports. The implementation of BENCH also addresses broader concerns about data privacy and security, which have become increasingly important in this technological age. As public schools adopt digital solutions, it is a must to ensure the protection of learners' information against unauthorised access. The system also incorporates security measures to safeguard user data.

Studies have consistently highlighted the challenges faced by public schools in managing administrative tasks. For example, Balcita and Palaoag (2020) emphasized the importance of having a centralized databases to enhance the quality of school services, while Calucin et al. (2018) demonstrated the benefits of web-based systems in reducing workloads and improving efficiency. The integration of successful features from these systems into BENCH ensures that it was built on the surface of proven methodologies to address the unique needs of public schools in the Division of Cabanatuan City.

2. Methodology

This study used developmental research design that develops a solution to address a specific problem. This is also defined as the "systematic study of designing, implementing, and assessing instructional programs, procedures, and products that must satisfy the requirement of internal consistency and effectiveness, as compared to basic instructional development (Ritchey et. al, 2004).

The Figure 1 below shows the research design of this study. The researchers used Agile Development Life Cycle (SDLC). This method consists of

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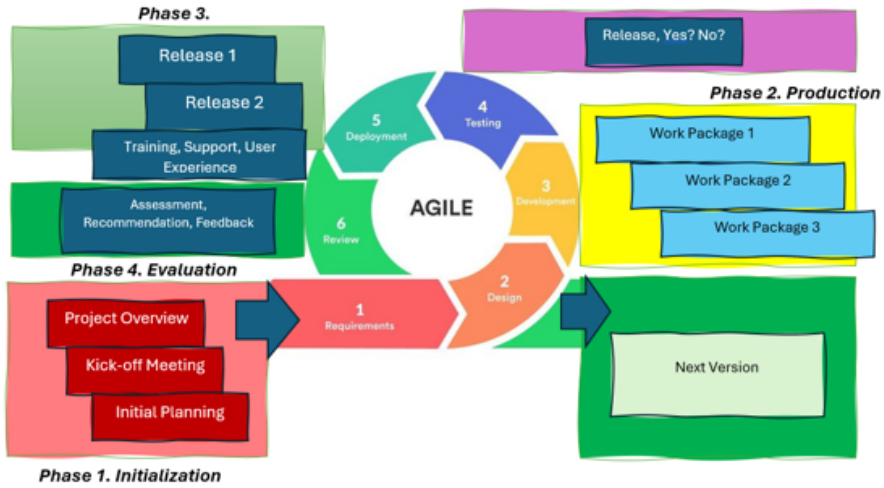
three major stages such as: The Developmental Stage, based on SDLC with five-sub-phases namely, conception, inception, iteration, testing, and release; Assessment Stage, and the Implementation Stage.

Figure 1. Research Design



2.1 Respondents

The respondents of the study were divided into two groups: (1) IT Distinguished Expert-respondents and (2) System User-respondents. The system user-respondents were the school principal, registrar, clinic staff, guidance coordinator, non-teaching personnel, advisers and parents. The IT expert-respondents were those individuals from different institutions whose line of ability involves software and application development, IT project management, database management, and system administration and maintenance.

The developer experts were those individuals who focus on developing systems. The system administrator IT expert-respondents, those are individuals who keep implemented systems. The IT project manager takes part in project management and supervises application development. On the other hand, the System Analyst is also an expert in system analysis and design.

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Table 1. Distribution of Respondents

Respondents	Number of Respondents (n)	Percentage
IT Experts		
Programmers/ Developers	3	20.00%
System Analyst	2	13.33%
From HCPSMSHS	1	6.67%
From ICT Faculty	1	6.67%
Subtotal	**7**	**46.67%**
System User		
School Principal	1	6.67%
ADAS	2	13.33%
Clinic Personnel	2	13.33%
Guidance Coordinator	1	6.67%
Discipline Officer	1	6.67%
Registrar	1	6.67%
Subtotal	**8**	**53.33%**
Total	**15**	**100%**

2.2 Research Site

This study was conducted at the HCPSMSHS and the developed system is utilized by the school principal's office, school clinic, registrars' office, guidance and counselling office, and discipline office.

The Cabanatuan City Science High School was founded through the leadership of the late Cabanatuan City Mayor Honorato C. Perez, Sr. on April 19, 1985, by the virtue of MECSRO Permit 06, s. 1085. To honor the prime advocate on founding this school, Cabanatuan City Science High School was renamed Honorato C. Perez, Sr. Memorial Science High School by virtue of Sangguniang Panlungsod Ordinance No. 96-002, s. 1996 dated February 2, 1996. Currently, the school is categorized as a large school with a population of 1,416, the combined total of Junior High School and Senior High School learners, and a faculty composed of 61 teachers, three head teachers, and four utility workers (hcpsmshs-official.com, n.d.).

True to being a center for excellence, HCPSMSHS offers the Science and Technology Curriculum. One of the schools to teach the Spanish Program as a Foreign language. In addition, it also offers a Special program in Journalism for Junior High School and in Senior High School department offers Science, Technology, Engineering, and Mathematics (STEM), and Accountancy, Business, and Management (ABM) academic tracks.

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Figure 1. Research Locale

3. Results and Discussion

3.1. Evaluation of IT Experts

The researchers presented individually the Basic Education Network Centralized Hub (BENCH) to IT Experts that has experience in various system applications. Right after the system presentation, IT Experts assessed the BENCH using ISO 25010 evaluation form.

Table 2. IT Experts Evaluation Summary Results based on the ISO 25010 Software

PRODUCT QUALITY STANDARDS	Weighted Mean	Verbal Interpretation
1. Functional Suitability	3.76	Highly Functional
2. Performance Efficiency	3.71	Highly Efficient
3. Compatibility	3.64	Highly Compatible
4. Usability	3.67	Highly Usable
5. Reliability	3.61	Highly Reliable
6. Security	3.86	Highly Secured
7. Maintainability	3.79	Highly Maintainable
8. Portability	3.67	Highly Portable
Overall Weighted Mean	**3.71**	**Highly Recommended for Use**

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The results show the result of the evaluation summary of the assessment of the IT experts based on the ISO/IEC 25010 Software Product Quality Standard. As shown, item "Security" obtained the highest weighted mean of 3.86 verbally described as Excellent It can be realized from the data above that the evaluation summary has an average weighted mean of 3.71 with a verbal interpretation of highly secured while the item 5 "Reliability" obtained the lowest weighted mean of 3.61 verbally described as highly reliable. Overall, the IT experts' evaluation of the Basic Education Network and Centralized Hub (BENCH): A Web-based Information Management Bundle for Public Schools obtained an overall weighted mean of 3.71 verbally described as highly recommended for use.

This data implies that the BENCH-WBMBPS passed the evaluation with no evidence of weaknesses based on the conducted assessment of the IT experts. The BENCH-WBMBPS satisfactorily met the ISO 25010 Software Product Quality Standards with no pieces of evidence of weaknesses. Hitting a result of "Highly Recommended for Use" which has a qualitative interpretation of "Highly Functional", "Highly Efficient", "Highly Compatible", "Highly Usable", "Highly Reliable", "Highly Secured", "Highly Maintainable", "Highly Portable."

3.2 Evaluation of End-Users

After the system has been completed and developed, the BENCH was subjected to assessment system end-users (teaching, non-teaching, and stakeholders).

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Table 3. Summary of Evaluation of End-Users

End-Users' Evaluation of the Basic Education Network and Centralized Hub (BENCH): A Web-based Information Management Bundle for Public Schools	Weighted Mean	Verbal Interpretation
1. Functional Suitability	3.83	Highly Functional
2. Performance Efficiency	3.75	Highly Efficient
3. Usability	3.75	Highly Usable
Overall Weighted Mean	**3.78**	Highly Recommended for Use

The above Table 3 shows the result of the Summary of Evaluation made by the system users. As shown, item 1 "Functional Suitability" obtained the highest weighted mean of 3.83 verbally described as highly functional while item 2 "Performance Efficiency" and item 3 "Usability" obtained the lowest weighted mean of 3.75 verbally described as highly efficient and highly usable.

The result revealed that the BENCH-WBMBPS has an overall weighted mean of 3.78 with the verbal interpretation of Excellent based on the ISO/IEC 25010 Software Product Quality Standards.

Further, the data implies that the system implemented BENCH-WBMBPS has excellently met all the requirements with the qualitative interpretation of Highly Functional, Highly Efficient, and Highly Usable. From the point of view of the system user, the BENCH-WBMBPS has met its goals and objectives. In addition, the system provides significantly efficient response time, and can be used by any type of user with different characteristics and abilities.

In the end, the qualitative result highly recommended for you from the system user clearly implies that the system BENCH-WBMBPS becomes helpful, useful, and improves the process of the office which becomes the game changer

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for the research locale. The aim of the BENCH-WBMBPS as well as the government to provide quality service was attained.

Conclusions

Based on the findings, the following conclusions were listed:

1. The Basic Education Network Centralized Hub: A Web-based Management Bundle for Public Schools was successfully developed based on the Agile Software Development Life Cycle (SDLC). The system was developed based on the different stages and phases of the Agile SDLC.

2. The presentation of the implemented system helped the IT Experts in the assessment of the system. The respondents concluded that the BENCH-WBMBPS can really help the offices to minimize their administrative tasks or duties especially in reporting, monitoring, and communication with the stakeholders.

3. The BENCH-WBMBPS is of great help to the school principal, registrar, clinic personnel, guidance coordinator, discipline officer, and stakeholders.

4. The different functionalities and features were helpful to the end-users. It can save and manage learners' data and records, send automatic and manual SMS/email notification to the parents/guardians, generate, and print reports, provide accurate and up-to-date records, and provide data analytics which are of great help with the users.

5. The BENCH-WBMBPS was highly acceptable in the school offices, the system application, record management, generate reports, message notification, and data analysis sub-parameters were assessed as Highly Acceptable by the system users and IT Experts. It can be concluded that the system excellently met all the requirements.

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