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Knowledge Management Platform for School Botanical Gardens in Prachuab Khirikhan Province

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Abstract

The objectives of this research were: (1) to develop a knowledge management platform prototype for school botanical gardens in Prachuab Khirikhan Province, (2) to evaluate the developed knowledge management platform prototype, and (3) to demonstrate the use of the developed knowledge management platform. The researchers collected evaluation results from 35 voluntary user-participants who were school administrators, teachers, and students involved in the School Botanical Garden Project in Academic Year 2022. The research tools were a satisfaction questionnaire and an interview guide. The platform development was in four stages: (1) design and development, (2) system quality assessment by five experts, (3) students using the developed platform over a three-month period and their satisfaction assessment after use, (4) graduate students enhancing the platform efficiency based on feedback from the student users via interviews. The obtained results revealed: (1) the developed platform structure consisted of a content website, lecturer and students database, knowledge evaluation model, knowledge memorandum, web board, knowledge asset, document download and gallery; (2) the user-participants were satisfied with the developed knowledge management platform prototype for school botanical gardens in Prachuab Khirikhan Province because it was easy to access and learn; and (3) The learning process on the platform comprised five stages: (i) knowledge identification, (ii) knowledge acquisition, (iii) knowledge creation and exchange, (iv) knowledge storage and retrieval, and (v) knowledge transfer and utilization. It was expected that the developed platform prototype can help support students' learning of botanical gardens and related subjects via their digital skills.

Keywords: *Knowledge Management, platform, learning facilitation, school botanical gardens, Prachuab Khirikhan Province*

1. Introduction

The current knowledge-based economy and its operations require knowledge to create knowledge with added value in the processes involved and productivity. As generally known, knowledge management leads an experiential construct and focuses primarily on knowledge in people. Such mechanism includes the collection of scattered knowledge into one place. Creating an atmosphere for people to innovate and learn new knowledge, organizations use information communication technology systems (ICT) to gather

knowledge and a list of knowledgeable people in various fields, and most importantly, create channels and conditions for people to exchange or transfer knowledge between each other without spatial and time boundary. Knowledge enables people to develop their work as well as attain quality education at all levels (Kant et al., 2021).

Rajamangala University of Technology Rattanakosin is one of the state agencies that have actively participated in the royal project on plant genetics conservation under the patronage of Princess Maha Chakri Sirindhorn (Ratchavieng, 2020). The purposes are to conserve and develop the country's plant genetic resources for sustainability to benefit Thai people in optimizing plant genetic resources development via higher education institutions' operations and facilities. Higher education institutions are to ensure to raise awareness of plant genetic conservation in school students for the Thai society at large. The five-year project has been carried out in six phases under the Master Plan (October 2016-September 2021) in the form of plant genetics information centers and activities based on the process of conservation and restoration to achieve sustainable consciousness in Thai citizens by prompting localities to participate in the initiated projects continuously. In this regard, Rajamangala University of Technology Rattanakosin was assigned with the Plant Genetics Conservation Master Project to raise awareness in school students and individuals to understand and carry on the conservation of plant genetic resources. Campaigns and promoting activities have been arranged as training programs for the youth and individuals to conserve and maintain local plant genetic resources. As emphasized by Chen & Sun (2018), teaching and training children to be conscious of the conservation of plants should be instilled in them at the early stage in life to value and appreciate the beauty and joy of local vegetation. They should learn to understand a sense of fear that if not preserved, negligence will result in negative consequences on the environment which will be detrimental to the country in the long run.

The School Botanical Garden Master Project is one of the activities in raising consciousness of plant genetic conservation by allowing the youth to get close to the plants, appreciate the benefits and beauty to sustain their interest in conserving the rare local plants. Botanical gardens on the school grounds are used in conservation education via teaching various subjects. As of 4 July 2019, more than 3,200 member schools have participated in the Plant Genetics Master Project. Relevant school activities include analysis of plant genetics conservation integrated into in each subject group, particularly STEM subjects that incorporate teaching and learning the five elements of school botanical garden work: (1) knowledge identification, (2) knowledge acquisition, (3) knowledge creation and exchange, (4) knowledge storage and retrieval, and (5) knowledge transfer and utilization. These stages are in accordance with the policies and standards of the Bureau of Educational Standards (SOE).

As for the plant genetics conservation project in its implementation, school staff members need training. Review and tracked progress in operational development include work group meetings on operational standards via the school's website. Some schools have continued to operate with follow-ups on the website that displays the annual report on management. It should be noted that the period of absence of action may be result in honorary acknowledgements, awarded royal badges, and even membership suspended from

the School Botanic Garden Master Project. The suspension of members is meant to allow time for the school to catch up with delayed activities.

It is vitally important for the Master Project operators to check and review progress made by the school botanical gardens by developing a platform on knowledge management. The School Botanic Garden Master Project needs a web-based learning to manage the teaching process that connects learners to teachers and among learners. This can support self-paced learning by knowledge management to help solve problems and lower barriers for student learning in line with the main objectives of the Plant Genetics Conservation Master Project.

Based on this concept, the researchers were interested in developing a knowledge management platform to support the school botanical gardens in Prachuap Khirikhan Province. To strive for a complete learning organization, such platform development introduces educational innovations with (1) electronic learning materials, (2) knowledge management support systems, including knowledge repositories, knowledge records, and knowledge assessments, (3) database instructors and self-learning as academic services, (4) online electronic bulletin boards for the exchange of learning, and (5) links with e-schools. The researchers expected that the platform prototype will serve as a model of knowledge management systems using software and services for operators' performance evaluation to satisfaction of school executives. Teachers' and learners' performance improvements based on expert feedback can be put in good practice responsive to the needs of learners for effective knowledge management.

2. Research Objectives

The objectives of this research were: (1) to develop a knowledge management platform prototype for school botanical gardens in Prachuab Khirikhan Province, (2) to evaluate the developed knowledge management platform prototype, and (3) to demonstrate the use of the developed knowledge management platform.

3. Literature Review

The information communication technology (ICT) system reflects the way in which modern society lives. The development of various ICT systems has contributed to the significant improvement of people's quality in society (Ratchavieng et al., 2021; Wachirawongpaidan et al., 2021) in using it as a tool for life and work. As earlier asserted by Jon (2018), the world has completely entered the electronic society era and is causing limitless change. In the education system, ICT directly affects all educators concerned for data collection and communication, news and knowledge dissemination, and big data transmission at high speeds and in large volumes. It is presented and displayed with various media including information, graphics, audio and multimedia, and can be created as an interactive system or used as a learning exchange platform to facilitate learning. It makes possible digital learning with an enormous amount of knowledge (Phakamach et al., 2021). Modern learning uses world-class sources of knowledge and requires self-paced learning. Learners need to discern, search, message, and seek what they want to meet their needs for educational excellence (Sinlarat, 2020).

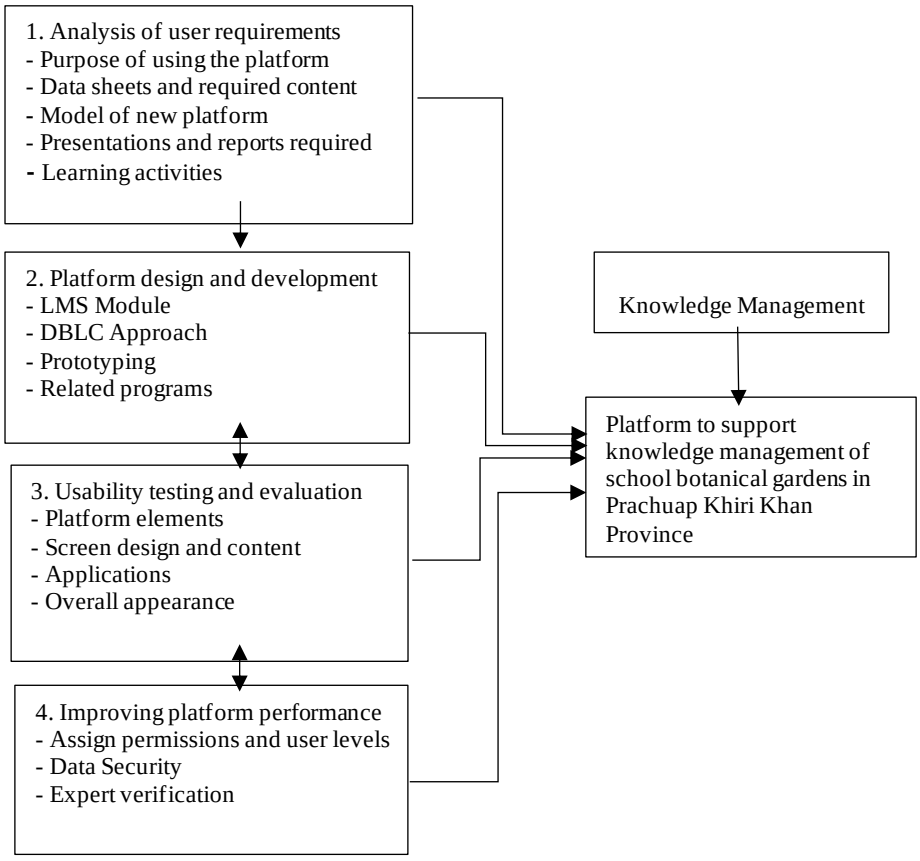
Platforms on knowledge management are to support teaching and learning by making the most of the existing knowledge for learning. They are used as tools to achieve various areas of learning, particularly knowledge development, and the creation of learning organizations. Platforms provide a sense of community for learners to gain and share mutual knowledge as needed through important processes, such as designing, creating, collecting, exchanging, and implementing knowledge (Denford & Chan, 2011; Davenport & Michelman, 2018).

In developing a platform model to support knowledge management of the school botanical gardens in Prachuap Khiri Khan Province, its system designer put the learning management process in five steps: Step 1 Identification, Step 2 Acquisition, Step 3 Creation and Exchange, Step 4 Storage and Retrieval, and Step 5 Transfer and Utilization respectively (Phakamach, 2011). In this research, the knowledge management platform model was constructed for the school botanical gardens to provide information, keep track on progress made at different stages, evaluate the system and users' performances, and generate feedback for further improvements.

4. Research Conceptual Framework

The researchers obtained data from a panel of five IT specialists to create a conceptual framework for the study as shown in Figure 1.

Figure 1: Research Conceptual Framework



5. Research Methodology

This research was meant as research and development (R&D) in four stages as follows:

5.1 Step 1: Analysis of User Requirements

Objective: To use the data to analyze and synthesize the knowledge management process of the school botanical gardens in Prachuap Khirikhan Province. The sub-operating procedures include: Step 1: Study information from documents and formats related to knowledge management (Documentation Method); Stage 2 collects the opinions of experts in the school botanical gardens; Step 3 collects the opinions of students and stakeholders of the school botanical gardens; and Step 4 collects feedback from ICT experts and educational innovators. The data collected from stages 1 to 4 were analyzed and synthesized into an overview of the development of a desirable prototype platform.

Population and Samples: The population and samples at this stage used a purposive sampling method to obtain three groups as follows:

Group 1: Five knowledge management experts in school botanical gardens.

Group 2: The school botanical gardens or the schools that participated in the Royal Plant Genetic Conservation Program under the patronage of Princess Maka Chakri Sirindhorn. There were 35 students from 9 schools in Prachuap Khirikhan Province, consisting of: (1) Wang Klai Kangwon School, (2) Ban Fig Thong School, (3) Ban Thung Yao School, (4) Ban Tha Kham School, (5) Ban Suan Luang School, (6) Ban Khlong Loi School, (7) Ban Nong Hoi School, (8) Prachuap College School (Muang District), and (9) Ban Khao Zhao Border Patrol Police School.

Group 3: Five ICT system experts and educational innovators.

Note: Groups 1 and 2 were defined as end users of the platform to be trained.

Tools Used to Collect Information: The tools used to collect data were given to the participants as follows:

Groups 1 and 3 were given unstructured interview forms.

Group 2 was given a questionnaire consisting of a check-list and fill-in-the-blank questions.

Creating and verifying questionnaire tools were done by five experts to verify content validity as well as the appropriateness of language use and wording. The tools were tried out and tested for accuracy using Cronbach's Alpha Coefficient.

Data Analysis: The data obtained from the research at this stage were analyzed by content analysis and synthesis for the characterization design of platform models to support knowledge management of the school botanical gardens in Prachuap Khirikhan Province. Data analysis was executed by a computer program to calculate statistical values, where group 1 data were those on the educational platform and structure as a whole. Group 2 data were the number and percentage values of the user's needs regarding the use of the platform, and group 3 data summarized the methods, patterns and strategies used in implementing the ICT systems as well as the technological features suitable for platform development.

5.2 Step 2: Platform Design and Development

Objective: To create an internet network model in the form of a database and platform to support knowledge management of the school botanical gardens in Prachuap Khirikhan Province. The data obtained from Step 1 were periodic usability tests.

Conduct Research: Application of various standard softwares related to the design and development of the platform using the DBLC database development process, include:

(1) System Analysis: User Requirements Analysis to identify problems and needs for problem solving and improving the existing systems. The focus was on the feasibility and scope of the new work system.

(2) System Design: The database design used the E-R (Entity-Relationship Model), also known as the Relational Model, and the Normalized Model.

(3) System Implementation: Programming as designed and program-tested for a strategy to be developed by the system owner, was carried out with documentation for using the program in two types: user documentation and program author's document to explain and teach the use of the program.

(4) System Installation: A system installation with verified programs installed for users to use in training to understand and use the operation of the system with ease.

(5) System Operation and Evaluation: The implementation and evaluation of the system.

(6) System Maintenance and Evolution: The maintenance and optimization of the system to be stable and safe.

The design and development at this stage were meant to design the platform from the data synthesized from Step 1, as well as carry preliminary testing of the implementation of the constructed model.

5.3 Step 3: Usability Testing and Evaluation

Objectives: To test the use of the platform in accordance with the platform format completed in Step 2.

Research Methodology: The researchers looked at the efficiency and satisfaction of the system users in Step 1: Three workshops for stakeholders to get to know the platform and test their use; Step 2: User testing with the teachers and students trained in the workshops; Step 3: Evaluation of the use of the system by the participants' observation; and Step 4: Summary of the format of the platform to support the proper and practical management of knowledge about the school botanical gardens in Prachuap Khirikhan Province.

Research at this stage was to modify the process as needed. Practical tests were carried out according to the prescribed patterns, in order to obtain an accurate and suitable platform for managing knowledge about the school botanical gardens in Prachuap Khirikhan Province.

Population and Sample: The population and samples at this stage were divided into two groups, derived from convenience selection: Group 1 with five knowledge management experts in school botanical gardens, and Group 2 with thirty-five students from nine schools in Prachuap Khirikhan Province from Step 1, and Group 3 had five experts in ICT systems and educational innovation.

Tools Used to Collect Information: The tools used for data collection were an unstructured interview to testing effectiveness of the platform and workshops for the participants. The arrangements were as follows:

Groups 1 and 3 were requested for workshops and interviews.

Group 2 was requested for workshops and participatory observations. The researchers used a questionnaire with five levels on the checklist on a rating scale and filling-in text space. The questionnaire contained three parts: Part 1: Information about the respondents, Part 2: Opinions on the use of the platform, which will be analyzed to determine the efficiency and satisfaction of the system users, and Part 3: Recommendations and guidelines for the development of the platform.

Strongly Agree	Score weight value at 5
Agree	Score weight value at 4
Neutral	Score weight value at 3
Disagree	Score weight value at 2
Strongly Disagree	Score weight value at 1

The researchers asked five experts to verify the content consistency, as well as the appropriateness of language use and wording, and then put it on trial. It was tested for questionnaire internal consistency using Cronbach's alpha coefficient formula, as reported in Step 1.

Data Analysis: The obtained data were analyzed by a computer statistical program to determine the users' satisfaction with the platform efficiency in support of knowledge management of the school botanical gardens in Prachuap Khirikhan Province. Group 1 data were analyzed and synthesized to find ways to improve and further develop the platform, as well as to recommend the proper implementation in accordance with the specified patterns for users. Group 2 provided data in three parts of the questionnaire. Part 1: Data on the status of respondents analyzed by frequency distribution and percentage; Part 2: Data showed the users' opinions about platform usage on the given rating scale in averages and standard deviations; and Part 3: Text-filled data on feedback and platform development guidelines concluded from content analysis to detect recommendations and development approaches.

The averages obtained from the rating scale questionnaire from Group 2 were based on the criteria for interpreting the mean value as follows:

4.21 – 5.00: Performance and satisfaction levels *Strongly Agree*

3.41 – 4.20: Performance and satisfaction levels *Agree*

2.61 – 3.40: Performance and satisfaction levels *Neutral*

1.81 – 2.60: Performance and satisfaction levels *Disagree*

1.00 – 1.80: Performance and satisfaction levels *Strongly Disagree*

where the amplitude range of the class is determined by the formula = (5-1)/5 = 0.8

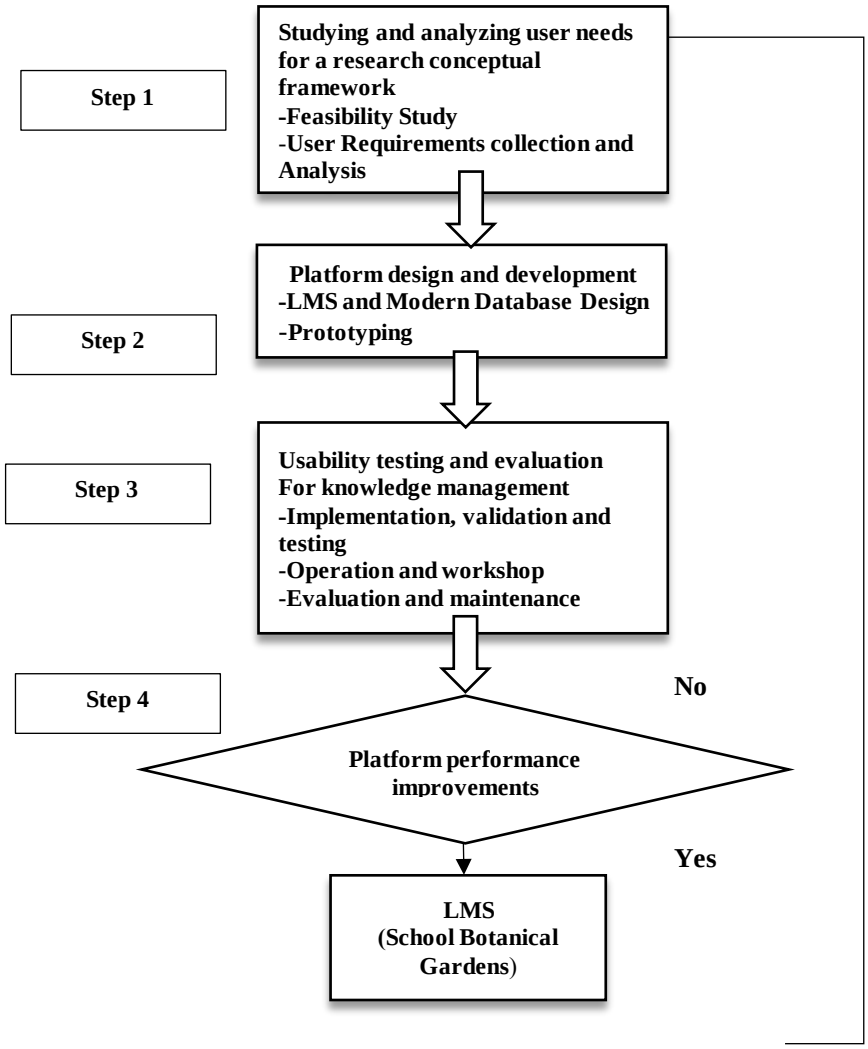
5.4 Step 4: Improving Platform Performance

Objective: To consider the actual test results and improvements obtained from Step 3, where research was carried out to improve the performance of the platform in order to achieve functions in greater efficiency of user-friendliness in mind.

Conduct Research: The researchers used unstructured interviews with specific procedure for focused interview for the participants' opinions toward the school botanical gardens. Five experts in ICT systems and educational innovation provided feedback to improve the platform for practicality and user-friendliness.

Research implementation in Steps 1-4 in a diagram on the process for the development of the platform is shown in Figure 2 below.

Figure 2: Research Implementation Process



Two examples of the knowledge management platform prototype of the school botanical gardens in Prachuap Khirikhan Province are shown in Figures 3 and 4.

Figure 3: Main Page of Platform Prototype (Ratchavieng, Phakamach & Pholsward, 2022)

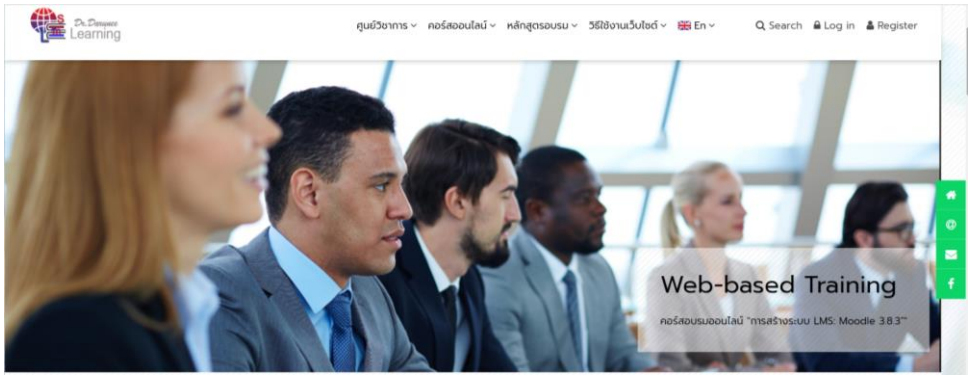
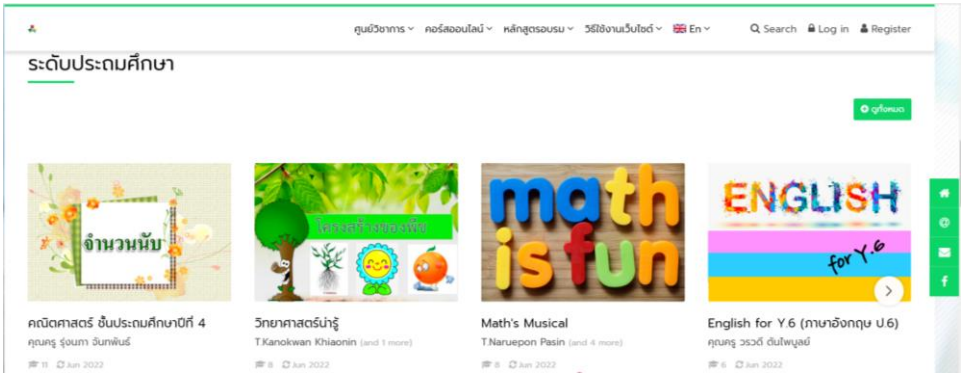


Figure 4: Elementary Learning Management Platform (Ratchavieng, Phakamach & Pholsward, 2022)



6. Results

The researchers considered the obtained findings according to the research objectives and reported in four dimensions: (1) the study and analysis, (2) system design and development, (3) usability and evaluation, and (4) system performance improvement.

6.1 Study and Analysis

The results indicated that all participating users would need this platform with the management system and operational procedures for knowledge management about the school botanical gardens in Prachuap Khirikhan Province. The platform components were in accordance with the requirements and regulations related to the management of education at the basic education level in Thailand. The platform provided content in the framework of course management for a specific period of time. The procedures were logically sequenced, ranging from course opening to teacher arrangement for writing instructional requirements on course studies, practical evaluation, and notification of educational results and reports to the school.

To the participants, the guidelines for the development of ICT systems on the platform clearly defined the functional structure related to knowledge management tasks at the required educational levels in line with the School Botanical Garden Master Project. The knowledge management models and methods that are in line with the requirements and regulations of the Teachers' Council on appropriate ICT systems and educational

innovations. The basic platform development provided the guidelines accordingly as follows:

(1) There should be clear and continuous policies, plans, and actual operations with an emphasis on the operating model in accordance with the ICT general standards.

(2) Equipment should be supplied. Tools, including effective programs to support and support the effective management of knowledge about the school botanical gardens in Prachuap Khirikhan Province.

(3) Prepare and plan budget work in accordance with and appropriate to the preparation of the student service system.

(4) Promote and campaign for all personnel to see the importance and understanding of the benefits of using platforms and ICT systems for education in the school botanical garden projects.

(5) Provide training for personnel to understand and use the platform for the benefit of teaching and learning for academic enhancement.

(6) There should be a central agency to coordinate, advise/recommend effective use on an ongoing basis.

(7) There should be a usability assessment conducted to identify problems and find plausible solutions.

6.2 System Design and Development

The researchers designed and developed the knowledge management platform using the Database Life Cycle (DBLC) standard system development process: (1) System Analysis, which is the process of user requirements analysis, (2) System Design Database design using the E-R (Entity-Relationship Model), also known as the Relational Model and Normalized Model, (3) System Implementation, (4) System Installation, (5) System Operation and Evaluation, and (6) System Maintenance and Evaluation. Clear procedures and practices to achieve a good system fully respond to knowledge management at the basic education level.

The appropriate program for use in the design and development of the platform should need: (1) flexible programs, (2) programs that can define functions to support knowledge management as much as possible, (3) programs that can support future functionality, and (4) the choice of programs compatible with normal operating patterns and methods without creating complications for users.

6.3 Usability and Evaluation

Part 1: The quality assessment of platform prototype based on the opinions of five experts in three areas: platform composition, screen design and content and usability indicated the overall quality results at a high level *(Agree)* ($\bar{x}$=3.82, S.D.=0.38), as shown in Table 1.

Table 1: The Quality Assessment of Knowledge Management Platform Prototype for the School Botanic Gardens in Prachuap Khirikhan Province

List of Aspects	$\bar{x}$	S.D.	percent	Level of Efficiency
Recording/editing information	3.92	.12	78.40	Agree
Search terms	3.80	.20	76.00	Agree
Reporting aspects	3.72	.52	74.40	Agree
The contact side of the user, including the administrator	3.90	.19	78.00	Agree
Information Security	3.86	.86	77.20	Agree
Platform User's Guide	3.65	.28	73.00	Agree
Aspects of the overall appearance of the platform	3.95	.51	79.00	Agree
Total	**3.82**	**0.38**	**76.40**	**Agree**

As seen in Table 1, the overall platform performance was at a high level. When considering the individual aspects, the experts were positive about data recording/editing as well as the contact with users and administrators.

Table 2 reports the results on users' satisfaction with the use of the platform by students and stakeholders who showed their high overall satisfaction with the platform ($\bar{x}$ =3.77, S.D.=0.59). Details are given in Table 2.

Table 2: The Users' Satisfaction with the Knowledge Management Platform for the School Botanic Gardens in Prachuap Khirikhan Province

List	$\bar{x}$	S.D.	Percent	Level of Satisfaction
Responding to teaching and learning arrangements	3.80	.44	76.00	Agree
Providing convenient and fast information services	4.00	.70	80.00	Agree
Data accuracy	3.40	.54	68.00	Neutral
Sufficiency of information	3.40	.54	68.00	Neutral
Accessibility of information	3.80	.83	76.00	Agree
The information meets the requirements	3.80	.44	76.00	Agree
A hub of information	3.80	.83	76.00	Agree
Ease of coordination/command	3.60	.54	72.00	Agree
Convenient to search for information	4.20	.83	84.00	Agree

List	$\bar{x}$	S.D.	Percent	Level of Satisfaction
Convenient access to the system	4.00	.70	80.00	Agree
The procedure for use is clear, easy to understand	4.00	.70	80.00	Agree
Ease of changing data	3.80	.44	76.00	Agree
Meeting support	3.40	.54	68.00	Neutral
Clear manuals and procedures	3.80	.44	76.00	Agree
Issuance of appropriate reports	3.20	.44	64.00	Neutral
Proper data security	4.40	.54	88.00	Agree
Total	**3.77**	**0.59**	**75.40**	**Agree**

Part 2 reports the results of interviews with the students and stakeholders regarding their opinions on the model of knowledge management platform of the school botanical gardens in Prachuap Khirikhan Province. The researchers classified their filled-in text responses and summarized their main issues of concern as follows:

(1) *Knowledge and implementation*: The school has a platform suitable for the teaching style in relation to the school botanical gardens. The students used the platform in the subjects related to the school botanical gardens guided by their teachers and were able to use apply their knowledge to the areas of science and social science.

(2) *Behavior and response*: It was found that the teachers used platforms to teach, search, record knowledge, practice in exchanging boards, self-learning and knowledge assessments. It was a good learning experience not only for the students, but also for the teachers to a certain extent.

(3) *Learning atmosphere*: The participating teachers and school administrators were involved in the use of online media. The platform therefore motivated all users to create a learning atmosphere of exchanging and sharing knowledge on social media.

(4) *Competency-based learning skills*: All users were satisfied with the use of the platform in enhancing competency-based learning skills.

(5) *Problems and suggestions*: The students would prefer a system of self-tuning screens that look beautiful and attractive when accessing the system, just like on other social networks.

6.4 System Performance Improvement

From data analysis on platform improvements for knowledge management of the school botanical gardens in Prachuap Khirikhan Province, five experts in ICT systems and educational innovation asserted that the platform was useful for users--students and teachers all alike—in managing knowledge about the school botanical gardens at the basic education level. The experts provided useful feedback on further development of the platform's quality. They emphasized a one-stop service that can deliver quality assessment

results and report to the public for the benefit of all stakeholders in the basic education circle in Thailand.

7. Conclusion and Discussion of the Results

The researchers concluded the obtained findings in four key areas: (1) study and analysis of user needs, (2) platform design and development, (3) usability testing and evaluation, and (4) platform performance improvements. The findings were discussed according to the research objectives.

7.1 Conclusion

Study and Analysis of User Needs

The needs of users of the knowledge management platform in support of the school botanical gardens in Prachuap Khirikhan Province were taken care of. All participating users were positive toward this platform regarding its management system and operational procedures about the school botanical gardens in Prachuap Khirikhan Province in accordance with the requirements and regulations at the basic education level. The subject courses also integrated the school botanical gardens in the framework of course management for a specified period of time.

Designing and developing appropriate knowledge management platforms were guided by the standard platform system development processes. Clear procedures and practices fully responded to knowledge management at the basic education level.

As for the guidelines for developing an ICT system for a platform, the work structure involved knowledge management tasks clearly defined and in accordance with the master project on school botanical gardens. The knowledge management models and methods were in line with the requirements and regulations of the Teachers' Council in using appropriate ICT systems and educational innovations.

Platform Design and Development

DBLC was used to develop the platform to meet the needs of users on the basis of the results on the test and evaluation implementation in Step 3.

Usability Testing and Evaluation

According to the results of the study, the users' performance and satisfaction with the platform were as follows:

(1) The overall use of the platform appeared effective ($\bar{x}$=3.82, S.D.=0.38), indicating that the developed platform served as a tool for teaching and learning via the knowledge management platform of the school botanical gardens in Prachuap Khirikhan Province.

(2) The participating users' overall satisfaction with the platform was high (*Agree*) ($\bar{x}$ =3.77, S.D.=0.59) indicating that the platform responded well to the knowledge management requirements of the school botanical gardens. The platform used an appropriate format to provide information services for self-learning and teaching. This included the functions of the future education management section. With ease in use, the system presented clear data to make possible expansion of knowledge management information through the use of standard software for now and in the future.

Platform Performance Improvements

Based on the interview data, the platform required following features:

(1) An electronic document system platform that can store data and can contact users conveniently, quickly and intuitively.

(2) A platform that can perform additional recording, editing, processing, creating reports and deleting user data manually.

(3) A platform that can query educational data. Documents and information arrangements are carried out in accordance with the specified conditions in order to efficiently implement the master project.

(4) A platform that can issue both screen and printer reports conveniently.

(5) A platform with a newly developed data security system must have a password-based security system.

(6) The platform is constantly moving new information and knowledge to keep up with changes in science and technology.

In light of the platform performance improvements listed above, the platform should require five key steps:

Step 1: *Identification* to provide an accurate overview of the knowledge associated with the subjects presented. Selected materials need to be relevant to the school botanical gardens.

Step 2: *Acquisition* to use useful information and knowledge on related subjects to create valuable documents. At this stage, information about the school botanical gardens must be in a prototype system, to appear on a website. Learning materials and database are to connect teachers with learners.

Step 3: *Creation and Exchange* to draw on deep-seated new knowledge generated from experience and work in the form of media for target communities. At this stage, the course content with prescribed activities and relevant tests are by electronic media.

Step 4: *Storage and Retrieval* to create an educational database for learners. Teachers and general interested parties can take advantage of storage and retrieval as needed. The database system can be stored, searched and shared by creating a membership system for interested parties.

Step 5: *Transfer and Utilization* to distribute knowledge via the platform for exchanging and sharing. Going through Steps 1-4, learners can review their knowledge about the school botanic gardens for further dissemination.

7.2 Discussion of the Results

The researchers discussed the obtained findings in four key areas as done in the conclusion section: (1) study and analysis of user needs, (2) platform design and development, (3) usability testing and evaluation, and (4) platform performance improvements.

Study and Analysis of User Needs

It is without doubt that users of educational platforms need ICT systems for data storage and retrieval. They need to take into account the usage patterns in knowledge management in a convenient, fast and accurate manner. These points were highlighted by earlier researchers, particularly Kaewsomthong et al. (2017), Altinay et al. (2019), and

Wachirawongpaisan et al. (2021). They showed how to integrate ICT systems with management and quality assessments would improve the learning atmosphere with practical performance evaluation. efficiency. Supermane & Tahir (2018) mentioned the process of designing and developing a good platform with the technical characteristics of computer systems and networking systems to solve system problems. It is vitally important to find the right system to enable the organization to achieve its objectives, as emphasized by Ukhov et al. (2021) on the design and development of modern platforms for user needs of functionality that suits real-world work conditions. This is to enable the acquired platform to respond to applications by supporting all functions pertinent to a particular organization.

Platform Design and Development

The results showed that overall user performance and satisfaction were high. Therefore, choosing a standard development methodology as well as the right software can create a good quality platform, which is consistent with the research of Oliveira et al. (2016) and Chaiyasena et al. (2022). These researchers found that designing a good platform or application must take into account the user needs to create and implement the platform or application for maximum efficiency in accordance with the objectives of the development. Such concern was also expressed by Phakamach et al. (2021) who discussed the design and development of ICT systems to involve stakeholders in almost every part. Design and development rely on the competence of experts in many areas, particularly system analysts. System analysis aims at developing and solving the problems in support of users. In practice, the development of a system may rely on approaches to discovering existing problems and opportunities to solve them. For the implementation process, the system must be managed logically and coherently so that the management of the development process continues in a smooth flow. Users need to understand and feel confident that the new system can replace the manual operation to lessen users' burden (Altinay et al., 2019; Ratchavieng, 2020).

Usability Testing and Evaluation

The created platform can add certain functions and information in accordance with the user's needs—for teachers and students all alike. The development of the website format to support the expansion of knowledge management information definitely requires standard software to accommodate basic education management for now and in the future. The experts in the study asserted that the platform should contribute to increased efficiency and agility in teaching and learning at the basic education level. Prototyping can support today's on-the-shelf teaching and learning model because the platform is designed to be sufficiently flexible to support a wide range of applications. This point is in line with the findings by Kant et al. (2021) in that effectiveness in terms of users' satisfaction with a particular platform or application would help evaluate its appropriateness in support of the organization and that an accurate assessment process must align with the development method.

Platform Performance Improvement

To improve the platform to match with the Thai Education Commission's curriculum benchmarks, platform developers need to get the model of platforms compatible with standardized networking systems--hardware and software--to create sufficient learning functions to meet international standards. There is a standardized ICT storage model to maximize the benefits and support quality assurance operations in both the short and long term. Such emphasis was consistent with the viewpoints of Wachirawongpaisan et al. (2021) in that development variations of the application integrations and networking should allow the designed application to be responsive to users' needs. All functions Standardized R&D principles should be used to determine the scope of the application's functionality, taking into account the user's use first (Supermane & Tahir, 2018). Data Usage Only is necessary and most cost-effective for the user while Data Usage Unnecessary can be problematic to speed of access to the platform. Therefore, the usage data of the designed system must be analyzed not only with no less than a pre-operation allowance, but also its capacity to meet its long-term use when various standards or regulations can be further adjusted.

8. Feedback

The researchers put forward two kinds of feedback as follows:

8.1 Suggestions from Five Experts for Utilization and Development of the Platform

(1) The development of educational systems or platforms would require a qualified development team to achieve an appropriate and effective knowledge management system in accordance with the objectives of learning in the Thailand 4.0 era.

(2) In order for the learning management process to be fast and cost-effective, skills training should always be provided using browser programs or conversational tools before learning so that learners can understand the objectives. The correct format of use and the ability to solve problems should support self-study.

(3) Details appropriate to the subject course should be added, such as websites or related links, as well as active discussion board interaction sections. Required are in-depth training, alerts, hands-on guides to train learners comprehensively and promoted extensive learning.

(4) The development of online learning systems in the Thailand 4.0 era should use letters, graphics, audio, multimedia, and online meetings appropriately and consistently in order to achieve learning management in time of change.

(5) Platform performance testing should be carried out with periodic planning of test work so that the platform prototype can respond to all educational management functions with good quality of work.

8.2 Suggestions for Further Research

Based on the obtained findings, the researchers would like to suggest four issues for further research:

(1) R&D should be conducted in other school subjects that require knowledge management to improve teaching and learning at the basic education level.

(2) Research and development of platform database systems and the creation of ICT systems can support other types of database systems or the development of integrated mobile applications.

(3) Platform development approaches should be researched with Unity and Firebase for education, which are programs designed as APIs and cloud storage for Realtime application development.

(4) Research should be carried out in developing the created platform prototype into a smart application in school learning management system in Thai basic educational institutions.

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