

ISSN 2821-9074 (Online)

ISSN 2730-2601 (Print)

RICE Journal of Creative Entrepreneurship and Management, Vol. 4, No.2, pp. 62-77,

May-August 2023

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doi: 10.14456/rjcm.2023.11

Received 7.05.23/ Revised 5.08.23/ Accepted 21.08.23

Practical Learning Management System Combined with Case-Based Learning on Educational Resource Administration in the Digital Era

Darunee Panjarattanakorn^{1*}

Phongsak Phakamach²

Prapatpong Senarith³

Somsak Dolprasit⁴

Chaiyong Brahmawong⁵

Suriya Wachirawongpaisarn⁶

^{1,2,3,4,5} Rattanakosin International College of Creative Entrepreneurship

Rajamangala University of Technology Rattanakosin

*Corresponding author

¹Email: darunee.pan@rmutr.ac.th

²Email: phongsak.pha@rmutr.ac.th

³Email: prapatpongs@yahoo.com

⁴Email: somsak@hotmail.com

⁵Email: chaiyongb@yahoo.com

⁶ Educational Innovation Institute of
Promoting Alternative Education Association

⁶Email: suriya.wac@rmutr.ac.th

Abstract

The objectives of this research were to (1) design and create, test, use and evaluate a prototype of a practical learning management system combined with case-based learning on educational resource administration in the digital era; and (2) recommend the evaluated practical learning management system combined with case-based learning on educational resource administration in the digital era. The sample group consisted of 92 graduate students in the Master of Education Program at Rajamangala University of Technology Rattanakosin in Academic Year 2022. Ten experts in ICT systems and educational innovations helped evaluate the constructed learning management system. The research was in four steps: (1) study and analysis of user requirements, (2) system design and development, (3) system function testing and evaluation, and (4) system performance improvement. Quantitative data analysis was by using statistical packages for mean and standard deviation. The qualitative data analysis was by content analysis. The obtained results indicated: (1) the prototype of a practical learning management system combined with case-based learning on educational resource administration in the digital era uses a DBLC (Database Life Cycle) development process. The experiment with the operational system for graduate learning involves learning via educational technology with a simple implementation. The participating students have a high level of satisfaction with the system prototype; and (2) The system has a structure consisting of a website, teacher and student database, knowledge record, knowledge assessment, discussion board, knowledge base, download documents, related case studies, and pictures of various activities. The research findings pointed to the benefits of the prototype system in providing students with practical ICT and learning skills for educational resources management in the digital era.

Keywords: *Learning management system, practical learning, case-based learning, educational resource administration, digital era*

1. Introduction

Information and Communication Technology (ICT) is a valuable tool for progress in national development. It is relevant to people's way of life in modern society. All societies have changed and adapted as members of the e-Society. Organizations developing and implementing appropriate ICT systems help executives and operators receive accurate and timely information. As a result, their decision-making in planning the organization's operations can be efficient in solving problems on time. They are able to compete for advantage in providing services to customers (Laudon & Laudon, 2018). Therefore, studying how to apply the appropriate ICT system for the organization is essential. The practical application of ICT to make timely decisions requires concrete management planning and includes various strategies in systematic management so that the organization achieves its objectives and has continuous development and sustainable growth (Phakamach, 2010; Sinlarat, 2020). The role of universities is to understand the changes and learn new ways to keep up with modern Thai and international technology in education management (Demir et al., 2021) with the introduction of modern management and management techniques. They are applied to educational administration in institutions for maximum academic efficiency and effectiveness (Phangphol & Phakamach, 2021).

The Ministry of Higher Education, Science, Research and Innovation Thailand has encouraged the use of ICT to enable learners to learn and develop themselves to a higher level of knowledge. This is in line with the government's policy according to the 20-year national strategy 2017-2036, and under the ICT Master Plan 3 (ICT Master Plan 3) in Higher Education Act B.E. 2562 in that more educational platforms are to support the global connection of information and create a new avenue for education. People use this main road as a path to intellectual treasures and to develop new learning styles (Lyapina et al., 2019). Therefore, the Ministry has established policies and standards to encourage educational institutions and agencies to implement the policy to promote the development of ICT for education. Teachers, educational personnel and learners can use educational platforms to benefit teaching and learning. In this regard, educational institutions at all levels require an effective ICT management system with educational innovations as benchmarks for improving the quality of education at all levels (Panjarattanakorn & Phakamach, 2020).

Teaching in the era of transformational change from education disruption has a variety of teaching and learning management models to promote and solve educational management problems in various fields, especially in time of the post-pandemic (Ismaili, 2021). Teaching and learning management must align with the new learning paradigm to enable learners to seek knowledge on their own. The principles under the Higher Education Act B.E. 2562 show that thinking process skills are still essential as an intrinsic factor influencing a person's actions and expressions. People with high thinking abilities will be able to solve problems at ease. Therefore, the development of thinking ability is an integral part of the development of learners to live happily in a changing society.

Case-Based Learning (CBL) is a teaching method in which learners can apply their knowledge in real situations to develop higher-order thinking. Most group learning has the critical goal on preparing learners for real-life practice. It is teaching that connects theory

with practice in which students can learn and deal with real situations (Raza et al., 2020). In the 21st century, the learning process puts teachers in a transition from educator to facilitator and requires tools for accessing knowledge through various methods. Technology or Learning Management Systems: LMSs, enable quick and efficient access to knowledge to be shared with classmates (Wachirawongpaisarn et al., 2020). This learning process is called “Active Learning,” which takes students in focus or student-centered. The teaching method with the 21st century skills, utilizes modern teaching and learning technology, and allows students to learn through various activities (Maslov et al., 2021). If a learning management system is applied to teaching and learning with case studies and practical courses, it will make learning management more efficient and effective (Lyons & Bandura, 2020).

“Educational resource administration in the digital era” was designed as a core course in the master of education program at Rattanakosin International College of Creative Entrepreneurship (RICE), the Rajamangala University of Technology Rattanakosin (RMUTR) Thailand. This course focuses on the design and development of ICT systems, processes, and innovations for managing educational resources in the digital age. It includes the management of educational innovations for high quality in the teaching and learning processes (Phakamach et al., 2021). Most of the learning takes place in a regular classroom, combined with learning material provision on web applications and learning process management system that connects learners with teachers and learners with learners. Providing additional teaching aids or e-course wares supports self-directed learning via knowledge management to help solve problems and obstacles in students’ learning (Yadav et al., 2017).

In this study, the researchers were interested in developing a practical learning management system combined with case-based learning on educational resource administration in the digital era. This learning system can support teaching and learning activities. The researchers designed and developed educational innovations with five dimensions: (1) electronic learning media, (2) a knowledge management support system knowledge repository, knowledge record, and a knowledge assessment form, (3) a database of teachers and students as well as academic services, (4) online electronic bulletin boards to exchange learning, and (5) linkage with universities (e-MIS). The prototype was meant as a model of a learning management system using software and services. The researchers assessed learning efficiency by satisfaction of the participating students under study. It was expected that performance improvements based on expert feedback would support the prototype which in turn should contribute to effective learning management on educational resources in the digital era.

2. Research Objectives

There were two objectives in this study:

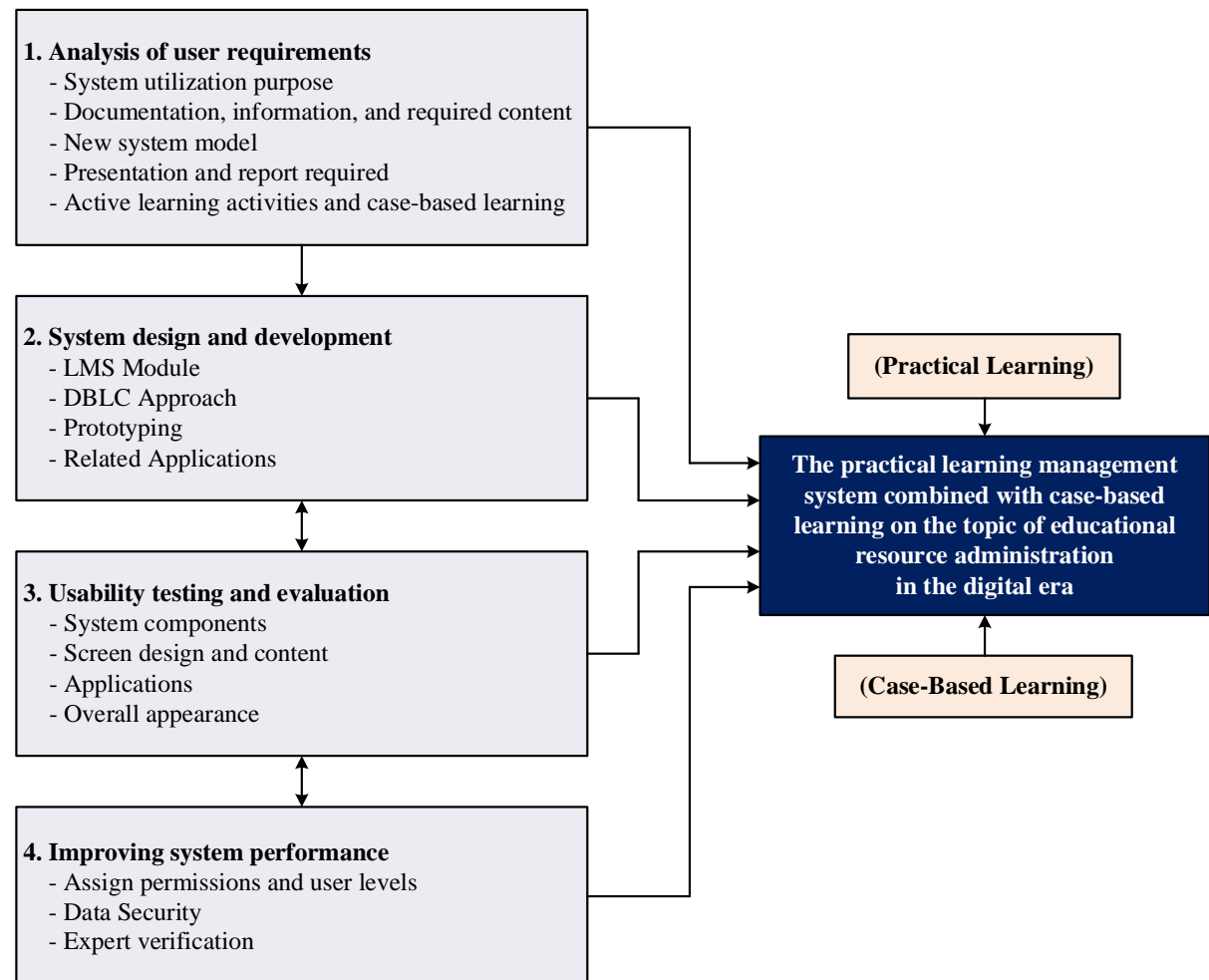
(1) design and create, test, use and evaluate a prototype of a practical learning management system combined with case-based learning on educational resource administration in the digital era, and

(2) recommend the evaluated practical learning management system combined with case-based learning on educational resource administration in the digital era.

3. Research Conceptual Framework

The researchers formulated the conceptual framework from the literature review and related research design process to create a practical learning management system combined with case-based learning on educational resource administration in the digital era. The research conceptual framework is shown in Figure 1.

Figure 1: Research Conceptual Framework



4. Research Methodology

This research aimed at developing a learning model for practical use at the graduate level with details as follows:

4.1 Population and Samples

The population selected for this research were students enrolled in the course RED 7306 on educational resources management in the digital era in a master's degree program in educational management and strategies at Rattanakosin International College of Creative Entrepreneurship (RICE), Rajamangala University of Technology Rattanakosin (RMUTR) in the first semester of Academic Year 2022. The sample group was 92 students from 116 students using the Krejcie and Morgan tables to determine the sample size. The researchers

set a target group of ten experts in ICT systems and educational innovation to provide validated data as needed.

4.2 Research Instruments

The research tools consisted of (1) a practical learning management system combined with Case-Based Learning on “Educational Resource Administration in the Digital Era” and (2) the tools for data collection as follows:

(1) Quality assessment form for ten experts in ICT systems and educational innovations using a 5-level estimation.

(2) Student satisfaction assessment form using a 5-level estimation to assess the suitability of the system in terms of components, design and content, and usability.

(3) Structured interview form to obtain interview data from the participating students on the system use issues: (1) knowledge and implementation, (2) behavior and response, (3) participation, (4) results of use, and (5) problems and suggestions.

4.3 Procedures in Conducting Research

This research is research and development (R&D) in nature--containing four steps:

(1) *Analysis of user requirements*, which is the study and analysis of user needs for both the faculty staff and students, in order to know the necessary requirements for constructing a learning management system.

(2) *System design and development* by using a learning management system and programs related to the development of online teaching materials, designing case studies related to the course, and including a preliminary test.

(3) *Functional testing and evaluation* in a 3-month trial phase, and satisfaction is assessed by students enrolled in the course RED 7306.

(4) *System performance improvement* by taking the test and evaluation results obtained from step 3 for confirmation and performance improvement of the constructed practical learning management system combined with case-based learning on “Educational Resource Administration in the Digital Era.”

4.4 Experiment and Data Collection

The experimental model and the data collection procedure were set as follows.

The preparation of the experiment includes:

(1) Ask for permission to collect data and test the system in the first semester of Academic Year 2022.

(2) Develop a learning system prototype on the Learning Center, send the data to the server, and test the use of the learning prototype.

(3) Assign the place and computer facilities and schedule the experiment by testing the operating system in the designated content on “Educational Resource Administration in the Digital Era.”

Experiment:

The system prototype was evaluated by ten experts and tested for performance evaluation according to the following format:

One-to-One Testing: An experiment with three students in the course--with their average grades at high, medium and low in the past semester. They were selected by simple random sampling to test the system for defects to be used for improvement at the value $E_1/E_2 = 61.08/62.22$.

Small Group: Nine students tested the experiment; they had averaged scores at high, medium and low in the past semester. They were selected by simple random sampling to test the system for defects to be used for improvement at the value $E_1/E_2 = 71.18/72.03$.

Field Testing:

(1) Ninety-two students used the system in a one-month workshop experiment in the following procedure: (i) Pretesting by an achievement test of 40 items, (ii) Learners studying the practical learning management system combined with case-based learning on educational resource administration in the digital era, (iii) Learners doing exercises from the system--ten items per learning unit, and (iv) Learners post-testing by the achievement test of 40 items for the overall efficiency of E_1/E_2 at 81.58/ 83.42.

(2) The researchers interviewed a sample group of students who used the system regularly.

(3) The researchers analyzed the results of the interview by content analysis and used the results to revise the system accordingly.

4.5 Data Analysis

The researchers analyzed the obtained data in the following sequence:

(1) *Analysis of user requirements* to illustrate the details that consist of (i) the purpose of the system, (ii) the required documents, information and content, (iii) the format of the new system, (iv) presentation and required report, (v) the activities of Practical Learning and Case-Based Learning, and (vi) practical activities.

(2) *Assessment of design and development* by ten experts in ICT systems and innovations for education administration to illustrate the details, which consist of (i) LMS Module, (ii) DBLC Approach, (iii) Prototyping, and (iv) related applications.

(3) *Functional testing and evaluation:* Assessment of the efficiency of the prototype system by experts and satisfaction by 92 students using a 5-level rating scale.

The research at this stage applied the process in steps 1 and 2 by assessing the effectiveness and satisfaction of use. The information adjusted the process as appropriate. The practical test was to obtain a system suitable for practical learning combined with case-based learning on educational resource administration in the digital era.

The participants were divided into two groups:

Group 1: 10 ICT experts in educational innovations.

Group 2: 92 students in educational resources management in the digital era (in a graduate course RED 7306).

The tool to collect data was an unstructured interview to check the learning system's effectiveness via identified problems and obstacles for corrective guidelines.

Data collection was divided by group:

Group 1: Workshops and interviews.

Group 2: Workshop facilitation and participant observation.

The questionnaire consisted of checklist questions on a 5-level estimation scale in three parts:

Part 1: Information about the respondents.

Part 2: Opinions on the use of the practical learning management system combined with case-based learning on educational resource administration in the digital era.

The score interpretation:

Strongly Agree; the weight was scored as 5.

Agree; the weight was scored as 4.

Neutral; the weight was scored as 3.

Disagree; the weight was scored as 2.

Strongly Disagree; the weight was scored as 1.

Part 3: Suggestions and guidelines for developing a practical learning management system combined with case-based learning on educational resource administration in the digital era.

Creation and verification of the questionnaire draft were submitted to experts for content validity and appropriateness of language use. The reliability by Cronbach's Alpha Coefficient was .958.

The data were then analyzed by statistical computer program:

Data analysis of group 1 was to find ways to improve and develop the system and recommend the effective use of the prescribed format.

Data analysis of group 2:

Part 1: Information on the status of the respondents by frequency and percentage.

Part 2: Information on opinions on the use of the practical learning management system combined with case-based learning on educational resource administration in the digital era. The scaled data were analyzed by mean and standard deviation.

Part 3: Information on recommendations and guidelines for developing a practical learning management system combined with case-based learning on educational resource administration in the digital era. The data were derived from content analysis to obtain recommendations and development guidelines.

The mean was obtained from the estimation scale questionnaire data with interpretation:

4.21 – 5.00: Highest efficiency and satisfaction

3.41 – 4.20: High efficiency and satisfaction

2.61 – 3.40: Moderate efficiency and satisfaction

1.81 – 2.60: Low efficiency and satisfaction

1.00 – 1.80: Lowest efficiency and satisfaction

where the spectral range determined by the formula = $(5-1)/5 = 0.8$

(4) Improvement of system performance

The researchers conducted interviews with ten experts in ICT systems and educational innovations using a non-structured interview, and applied the results to improve the system's performance. The prototype system is shown in Figures 2-6, respectively.

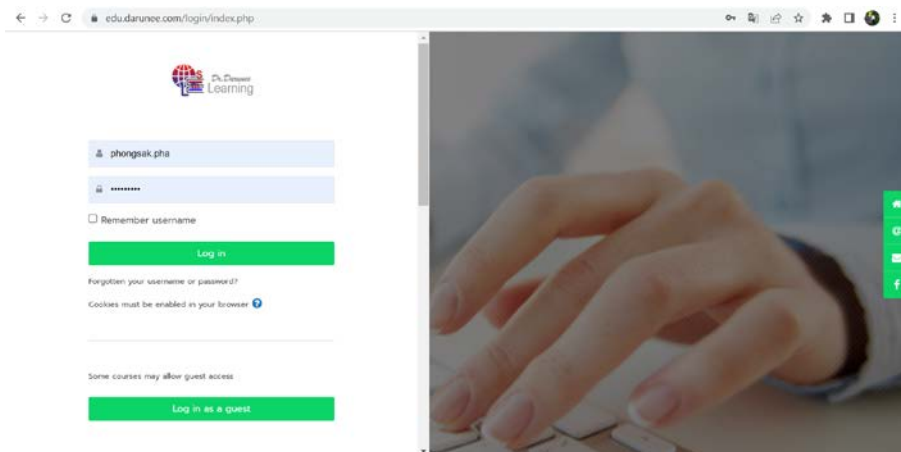
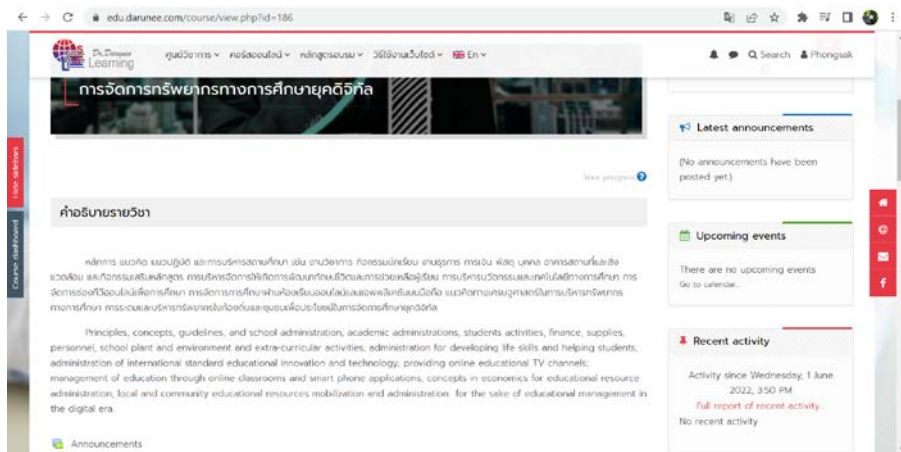
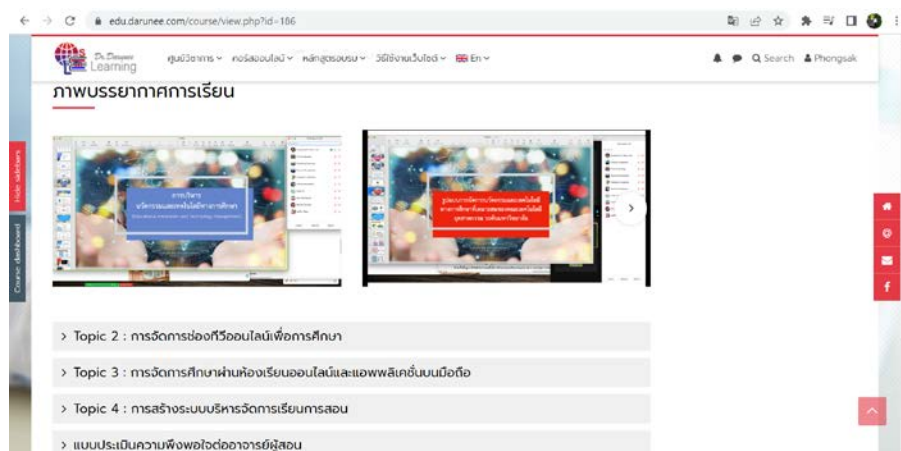
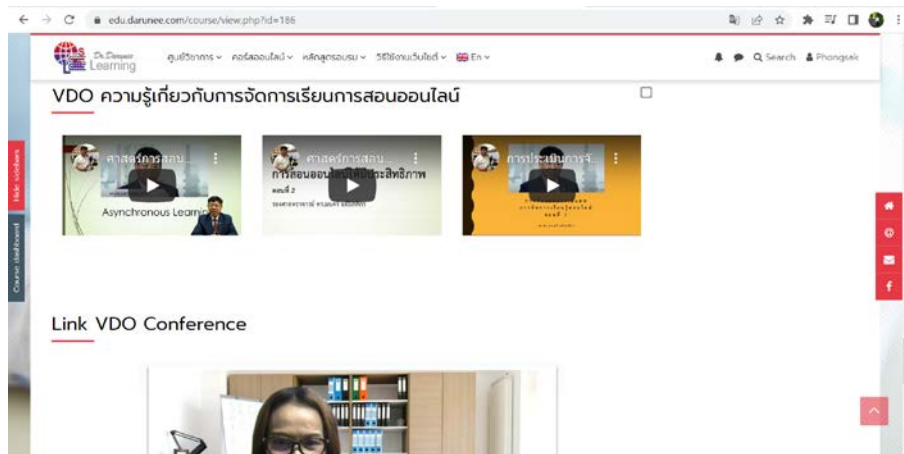
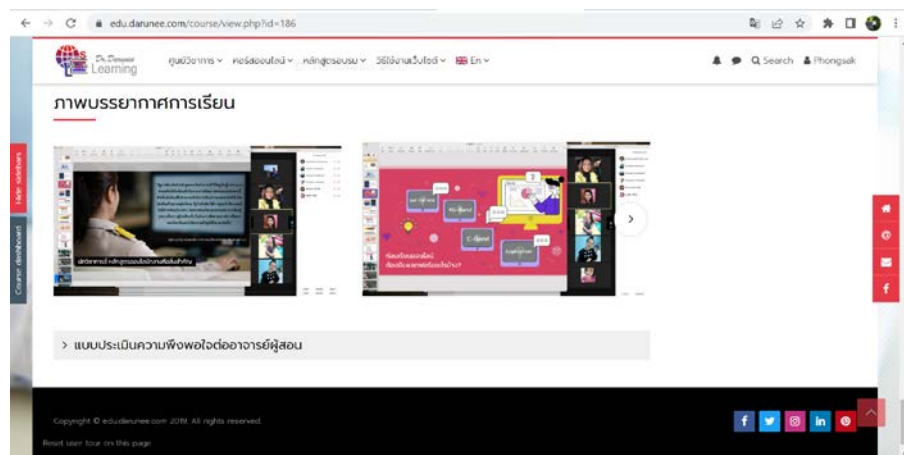
Figure 2: Login Window (Panjarattanakorn et al., 2022)**Figure 3:** Practical Learning Systems of RED 7306 Course (Panjarattanakorn et al., 2022)**Figure 4:** Example Course Content (Panjarattanakorn et al., 2022)

Figure 5: Example of an Instructional Video with a Case Study (Panjarattanakorn et al., 2022)**Figure 6:** Picture of the Workshop in the Course (Panjarattanakorn et al., 2022)

5. Results

The researchers developed a practical learning management system combined with case-based learning on educational resource administration in the digital era, and obtained the findings as follows:

5.1 Research Results on Objective 1

The researchers designed, created, tested the use and evaluated a constructed prototype of a practical learning management system combined with case-based learning on educational resource administration in the digital era. The major findings were:

5.1.1 User requirements Analysis

(1) The user requirements analysis revealed users' needs in critical areas: (i) It must be a system to support teaching and learning in a given course; (ii) The system must support the process of teaching and learning with complete support functions; (iii) the system should provide operating parts consistent with the course content; (iv) the system should have relevant practical learning and case studies to enhance knowledge and understanding of the target topic; and (v) the system designed and built must operate by the designated class schedule.

(2) Guidelines and recommendations were secured for developing a practical learning management system combined with case-based learning on educational resource administration in the digital era. The system development method should be chosen according to the standard model like DBLC to achieve an operational learning system combined with case study learning.

5.1.2 System Design and Development

System design and development with the DBLC standard method carried six key steps: (i) System Analysis, (ii) System Design, (iii) System Implementation, (iv) System Installation, (v) System Operation and Evaluation, and (vi) System Maintenance and Evolution.

5.1.3 Functional Testing and Evaluation

The test and trial of a practical learning management system combined with case-based learning on educational resource administration in the digital era were by 92 students enrolled in RED 7306 course in the first semester of Academic Year 2022. The quality assessment was by experts and the satisfaction assessment by the participating students, as shown in Tables 1-2.

5.1.4 The effectiveness of the constructed practical learning management system combined with case-based learning on educational resource administration in the digital era, was obtained from 10 experts, as reported in Table 1.

Table 1: Results of Efficacy Assessment by Experts

Topics and Assessment Items		\bar{x}	S.D.
System components	1. Website	4.24	0.55
	2. Record knowledge	4.18	0.65
	3. Measuring and evaluating knowledge	3.88	0.55
	4. Discussion board	4.22	0.50
	5. Knowledge repository	4.06	0.55
	6. Learning activities	4.20	0.55
	7. Pictures of various activities	3.98	0.65
Screen design and content	8. Content and Consistency	4.42	0.45
	9. Format and font size	4.10	0.65
	10. Font color and background	4.06	0.55
	11. Visual and sound effects	4.16	0.65
	12. Multimedia system	3.62	0.50
	13. Instructions and Manuals	3.71	0.55
	14. Overall screen	4.39	0.50
	15. Design process	4.33	0.55
Usability	16. Membership system	4.32	0.45
	17. Back-end system	4.17	0.65
	18. Link section	4.22	0.45
	19. Interaction section	4.38	0.65
	20. Search system	3.98	0.55
	21. How to use it for the purpose	4.45	0.45
	22. Practice in the course	4.17	0.55
Total		4.14	0.55

Table 1 shows the system's overall quality at a high level in all aspects (\bar{x} =4.14, S.D.=0.55). As for each aspect, all 7 items were at a high level (\bar{x} =4.10), in the order of the

highest to the lowest: (i) website, (ii) discussion board, and (iii) learning activities. In terms of screen and content design, 8 items were overall at a high ($\bar{x}=4.09$), in the order of the highest to the lowest: (i) content and consistency, (ii) overall screen, and (iii) design process. As for the usage aspect in 7 items, the overall picture was high ($\bar{x}=4.24$) from the highest to the lowest: (i) how to use it for the purpose, (ii) the membership system, and (iii) the interaction section.

5.1.5 The results on the satisfaction assessment by 92 participating students regarding the use of the constructed practical learning management system combined with case-based learning are shown in Table 2.

Table 2: Results of the Satisfaction Assessment by Students

Topics and Assessment Items		\bar{x}	S.D.
System components	1. Website	4.39	0.45
	2. Record knowledge	4.21	0.67
	3. Measuring and evaluating knowledge	4.17	0.58
	4. Discussion board	4.23	0.74
	5. Knowledge repository	3.78	0.49
	6. Learning activities	4.33	0.67
	7. Pictures of various activities	4.27	0.62
Screen design and content	8. Content and Consistency	4.38	0.58
	9. Format and font size	4.25	0.57
	10. Font color and background	4.18	0.71
	11. Visual and sound effects	3.58	0.58
	12. Multimedia system	4.16	0.67
	13. Instructions and Manuals	3.77	0.62
	14. Overall screen	4.35	0.68
	15. Design process	4.30	0.50
Usability	16. Membership system	3.98	0.77
	17. Back-end system	3.76	0.68
	18. Link section	4.24	0.59
	19. Interaction section	3.97	0.65
	20. Search system	4.37	0.73
	21. How to use it for the purpose	4.41	0.65
	22. Practice in the course	4.28	0.68
Total		4.15	0.64

Table 2 shows students' overall system satisfaction at a high level in all aspects ($\bar{x}=4.15$, S.D.=0.64). As for three aspects, 7 items of the system were at a high level ($\bar{x}=4.19$) in a sequence: (i) website, (ii) learning activities, and (iii) pictures of various activities. In terms of Screen Design and Content, 8 items were at a high level ($\bar{x}=4.12$), in a sequence: (i) content and consistency, (ii) instructions and manuals, and (iii) overall screen. As for the usage aspect, 7 items were also at a high level ($\bar{x}=4.14$) from the highest to the lowest: (i) how to use it for a purpose, (ii) the interaction section and (iii) practice in the course.

5.1.6 The results of the interviews with students' opinions toward the prototype of a practical learning management system combined with case-based learning on educational resource administration in the digital era. There were five aspects in their opinions:

5.1.6.1 Knowledge and implementation: The participating students were positive to the constructed learning management system in teaching and learning educational resources management in the digital era at the graduate level.

5.1.6.2 Behavior and response: The participating students used the interaction section with the instructor and between learners together. Their practice in brainstorming, one-on-one discussion, group discussion, doing exercises and presentation of assignments, was supported by the search system and link sections to knowledge record for exchanging and sharing knowledge. The students were able to gain experience in designing strategies for developing educational resource management models for educational innovations as well.

5.1.6.3 Participation: The participating students found the system motivating and creating an atmosphere of exchange and knowledge transfer in social media, participatory operations, and case-based learning. The students were able to practice design and develop skills in building a modern educational platform.

5.1.6.4 Knowledge and Skills: The participating students were satisfied with the knowledge and skills applied to educational resources management in the digital era.

5.1.6.5 Problems and Suggestions: The participating students preferred to customize the screen by themselves. When in this course, they accessed social networks and practice sessions at times convenient to their needs.

5.1.7 System Performance Improvement

The research team synthesized the results of testing and trials of the system from the experts' quality assessment and the students' satisfaction assessment to improve the system's functional efficiency. Ten experts in ICT systems and education innovations were interviewed for feedback and suggestions for further improvements in system performance. The interview results were meant to improve interactive digital content, online interactions, techniques and methods for academic achievement.

5.2 Research Results on Objective 2

The researchers designed, created, tested the use and evaluated the constructed prototype of the practical learning management system combined with case-based learning on educational resource administration in the digital era. The learning system presented the teaching-learning digital methods with sufficient quality in recommending the system implementation for students at the graduate level.

6. Conclusion and Discussion of the Results

The research results can be concluded and discussed as follows:

6.1 Conclusion

(1) The research and development methods for the constructed practical learning management system combined with case-based learning on educational resource administration in the digital era were in four steps: (i) Analysis of user requirements, (ii) Design and development of systems, (iii) Functional testing and evaluation, and (iv) Improvement of system performance. The constructed learning system can support teaching and learning at the graduate level. The system provides operating sections consistent with the course content as well as case studies to enhance knowledge and understanding.

(2) The design and development of the constructed practical learning management system combined with case-based learning on educational resource administration in the digital era carry clear procedures and practices as responsive to students' needs for learning management in a graduate course.

(3) The efficiency of and satisfaction with the constructed practical learning management system combined with case-based learning on educational resource administration in the digital era, were assessed as positive by the ICT experts and the participating students.

(3.1) The efficiency of the system in the experts' opinions was at a high level ($\bar{x}=4.14$, S.D.=0.55), indicating that the constructed system functioned well as a tool for teaching and learning in the graduate course RED 7306 course.

(3.2) Overall satisfaction with the constructed system from the participating students' opinions was a high level ($\bar{x}=4.15$, S.D.=0.64), indicating that the students were positive to the learning management system on educational resources management in the digital era.

6.2 Discussion

The researchers discussed the major findings as follows:

(1) The developed learning system prototype was adapted from the research and development by Davenport & Michelman (2018), Panjarataanakorn & Phakamach (2020), and Kant et al. (2021) in five steps: (i) course content analysis; (ii) system design by ordering content classified by learning principles and resources in creating a virtual learning room and knowledge processing; (iii) the development of the system used the principles of 4Is: Information, Interactive, Individual, and Immediate Feedback; (iv) the use of the system for teaching and learning via the online communication channels; and (v) testing for the efficiency of the system by the opinions of student users. These five steps worked well for the system design and development.

(2) The evaluation results by the ICT experts were positive at a high level, indicating good quality lessons systematically arranged via the ADDIE process. The media production relied on trials and modifications to be consistent with the research framework, as seen earlier in the work of Boonprom (2020), Phakamach et al. (2021), Demir et al. (2021), and Trivedi et al. (2022). However, this present study refined a compact learning management system with quick access to the subject contents, multimedia and graphics. Quick access to contents with resources, references and graphics was emphasized as giving more educational options (Phakamach & Chaisanit, 2019; Wachirawongpaisarn et al., 2020).

(3) The satisfaction assessment results by the participating students were in favor of the constructed learning management prototype on educational resource management in the digital era. The system can support learning management well as expected by the developers. Lyons & Bandura (2019), Daultani et al. (2021), and Singh et al. (2021) reported similar results from the model system of four elements: data source and content, support resources, discussion boards, online learning activities with case studies. Their virtual learning model was able to support learners under study well with high satisfaction.

(4) The interview results from the ICT experts pointed to good functions in the constructed learning system. Such interview data served to confirm the system's efficiency of a quality learning management system, as earlier used by Kant et al. (2021) and Tam (2022).

7. Suggestions

Based on the major findings, the researchers would like to suggest the following:

(1) A learning support system requires a qualified development team, such as teachers, educators, educational psychologists, programmers, and educational innovation and technology designers.

(2) For the learning management process to provide quick access and be cost-effective, there should be digital literacy training on browser programs or applications for users in support of self-study.

(3) Appropriate details should be fully prepared, such as the website, related case studies, and the interaction sections.

(4) The development of online learning systems should carry consistent fonts, graphics, quality sounds and multimedia for effective case-study learning and processing.

8. Further Research

The researchers would like to see further research into the inclusion of more elements on standard learning materials to suit users' learning styles. New digital platforms based on blended learning models and modern learning resources could be challenges for learning system developers.

To the researchers, the design and development methodology should deserve further elaboration for teaching and learning at the graduate level. Such R&D elaboration in the direction to facilitate case-based learning on selected digital platforms could provide good opportunities for continuing studies accessible to learners both in urban and suburban locations.

9. Acknowledgements

The authors of this paper would like to acknowledge the academic support from Rattanakosin International College of Creative Entrepreneurship (RICE), Rajamangala University of Technology Rattanakosin (RMUTR), and the Educational Innovation Institute, Promote Alternative Education Association, Thailand.

10. The Authors

Darunee Panjaratanakorn, Phongsak Phakamach, Prapatpong Senarith, Somsak Dolprasit and Chaoyong Brahmawong are lecturers in the Graduate Department of Educational Administration and Strategies, Rattanakosin International College of Creative Entrepreneurship (RICE), Rajamangala University of Technology Rattanakosin (RMUTR), Nakhon Pathom, Thailand. The sixth author Suriya Wachirawongpaisarn is working for the Educational Innovation Institute, Promote Alternative Education Association. All co-authors are specialists in educational administration and share their research interests in the areas of leadership and educational change, digital transformation in education, educational technology development, and the use of educational technology and innovations.

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