

A Conceptual Framework for the Development of a MOOCs-Based Knowledge Repository to Enhance Digital Entrepreneurs' Competencies

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Abstract—A conceptual framework for the development of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies as follows: (1) the digital knowledge engineering learning process was divided into six steps: (1.1) knowledge creation, (1.2) knowledge storage, (1.3) knowledge acquisition, (1.4) knowledge access, (1.5) knowledge sharing and (1.6) knowledge application; (2) the knowledge repository consisted of three subsystems: (2.1) user management system, (2.2), knowledge management system and (2.3) report management system; (3) the MOOCs-based learning management system comprised six elements: (3.1) reading material, (3.2) video lectures, (3.3) discussion forums, (3.4) quizzes, (3.5) assignment and (3.6) certificate; and (4) digital entrepreneurs' competencies comprised three levels: (4.1) use of digital technology for collaboration, (4.2) use of digital technology for work and (4.3) digital accessibility and awareness.

Index Terms—Knowledge repository, MOOCs, digital knowledge engineering, digital entrepreneur competencies.

I. INTRODUCTION

Thailand is entering the digital era with its official launch of national strategy 4.0 to accelerate the Kingdom's development, which is designed to support and promote innovation, technology and creative thinking [1]. The strategy formally came into effect with its publication in the 12th National Economic and Social Development Plan B.E. 2560–2564 (2017–2021) [2] as fundamental strategic factors in economic development covering all areas of economics, e.g. investment for research and development, development of science, technology and innovation, as well as workforce development for future and current labor markets consistent with the production of goods and services, and the evolution of technology. This also includes human development to equip professionals where people can adjust themselves to a changing environment; this is especially associated with human capital development through improving the quality of education, learning, skills and public health services in all regions of the Kingdom according to the 1st national strategy: human capital strengthening and development in regions of

the Kingdom, according to the 1st national strategy: human capital strengthening and development in regard to information system development, workforce demand and production with integrated planning of related agencies, establishment of information centers, providing consulting services for new entrepreneurs and freelancers in response to the 20-year national strategy (2016): [3] developing the potential of human resources and promoting equal opportunities in society.

As the dynamics of the 21st century affect all organizations today, they have to face significant change and apply cutting-edge technology to knowledge management. The process involves data associated with concepts, abilities and skills of personnel being collected and stored in the system. Knowledge management (KM) can be used for many purposes such as communication, sharing concepts, knowledge and skills across organizations leading to best practice, adaptability, problem-solving abilities and knowledge acquisition through development [4]. A KM system makes it easier to find information so people can actually apply knowledge in action in workplaces. Tools and cutting-edge technology, including digital technology, information systems for management and knowledge repositories are leveraged to provide people with easy access to information anywhere and anytime through an internet connection [5].

In 2012, MOOCs or Massive Open Online Courses were widely used by the top universities in the world. According to studies, MOOCs focus on cutting-edge technology education associated with the use of the internet and computers to assist with learning and teaching. MOOCs are considered educational resources enabling students and people to access education with open courseware (OCW) [6]. As previously mentioned, the role of entrepreneurs in economic development planning in Thailand today does not concern only investment or income but also structural change in business and society; immense value results from entrepreneurs' contribution to the economy [7]. In addition, human capital increasingly becomes important and many organizations have had to review their current practices, analyze the roles of performance management and enhance employees' competencies. Therefore, enhancement of employees' competencies should align with core competencies and the objectives of organizations so as to lead to the desired outcomes and enable employees to reach the goals they set for themselves [8]. In this paper, the findings suggest that entrepreneurs were facing a problem in meeting the demand for a workforce with specific skills, including job-related, professional, academic, ethics and moral skills. The lack of qualified employees is a serious problem for

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organizations since those skills are considered as employability skills, so there should be continuing professional development allowing employees to improve their capabilities [9].

Due to the importance of developing the potential of people in the country and accelerating economic growth with the application of innovation, technology and creative thinking for the knowledge-based economy, as well as awareness of the problems and development of entrepreneurs as drivers of economic growth in the country, the researcher came up with an idea in regard to a conceptual framework for development of knowledge repository MOOCs using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies in order to help them improve their knowledge, skills, abilities and attitudes for effective performance.

II. OBJECTIVES OF THE RESEARCH

- 1) Synthesis of a conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies.
- 2) Development of a conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies.

III. RESEARCH METHODOLOGY

Stage I: Regarding the synthesis of a conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies, the researcher conducted studies, analysis and synthesis from documents, textbooks, academic journals and relevant research papers from both domestic and international sources, published during 2001–2019 using a content analysis approach.

Stage II: The conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies was developed by conducting studies, analysis and synthesis through Stage I of the research.

IV. RESEARCH FINDINGS

Stage I: The synthesis process for the conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies was as follows:

A. Digital Knowledge Engineering Learning Process

The result of the synthesis of the digital knowledge engineering learning process is illustrated in Table I:

According to the synthesis result indicated in Table I, it can be summarized that the digital knowledge engineering learning process comprises six steps: 1) knowledge creation, 2) knowledge storage, 3) knowledge acquisition, 4) knowledge access, 5) knowledge sharing and 6) knowledge application.

TABLE I: RESULT OF SYNTHESIS OF DIGITAL KNOWLEDGE ENGINEERING LEARNING PROCESS

| Digital Knowledge Engineering Learning Process | Knowledge Creation | Knowledge Storage | Knowledge Acquisition | Knowledge Access | Knowledge Sharing | Knowledge Application |
|--|--------------------|-------------------|-----------------------|------------------|-------------------|-----------------------|
| Researcher | | | | | | |
| Mizoguchi, R. [10] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Thanachawengsakul, N., Wannapiroon, P., and Nilsook, P. [5] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Preece, A., Flett, A., Sleeman, D. <i>et al.</i> [11] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Center of Excellence for Unified Knowledge and Language Engineering [12] | | ✓ | ✓ | ✓ | | |
| ICT MOPH [13] | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Digital Knowledge Engineering Learning Process | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

B. Knowledge Repository System

The result of the synthesis of the knowledge repository system is illustrated in Table II:

TABLE II: RESULT OF SYNTHESIS OF KNOWLEDGE REPOSITORY SYSTEM

| Knowledge Repository System | User Management System | Knowledge Management System | Learning Management System | Report Management System |
|--|------------------------|-----------------------------|----------------------------|--------------------------|
| Researcher | | | | |
| Training Industry [14] | ✓ | ✓ | ✓ | ✓ |
| Fabio, F. B. and Veruska, D. S. C. [15] | ✓ | ✓ | | ✓ |
| Theeraroungchaisri, A. [16] | ✓ | ✓ | ✓ | ✓ |
| Rodpai, A. and Kittiphattanabawon, N. [17] | ✓ | ✓ | | ✓ |
| Kokaew, P. [18] | ✓ | ✓ | | ✓ |
| Phetwong, W [19] | ✓ | ✓ | | ✓ |
| Knowledge Repository System | ✓ | ✓ | | ✓ |

According to the result of the synthesis indicated in Table II, the knowledge repository system is divided into three subsystems consisting of: 1) user management system, 2) knowledge management system and 3) report management system.

C. Massive Open Online Course System (MOOCs)

The result of the synthesis of the elements of a MOOCs-based learning management system is illustrated in Table III:

As shown in Table III, a MOOCs-based learning management system comprises six elements: 1) reading material, 2) video lectures, 3) discussion forums, 4) quizzes, 5) assignment and 6) certificate.

TABLE III: RESULT OF SYNTHESIS OF ELEMENTS OF MOOCs-BASED LEARNING MANAGEMENT SYSTEM

| Researcher | Elements of MOOCs-based Learning Management System | Reading Material | Video Lectures | Discussion Forums | Quizzes | Assignment | Certificate |
|--|--|------------------|----------------|-------------------|---------|------------|-------------|
| | Elements of MOOCs-Based Learning Management System | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Wang, J. [20] | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| DSTI [21] | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Kolowich, S. [22] | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Nilsook, P. [23] | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Thailand Cyber University [24] | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Theeraroungchaisri, A. [16] | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Tinnawas, N. and Thammetar, T. [6] | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Wipawin, N. and Withayawuttikul, R. [25] | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Elements of MOOCs-Based Learning Management System | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

D. Digital Entrepreneurs' Competencies

The researcher carried out a synthesis of digital entrepreneurs' competencies based on digital literacy by using instruments for assessing digital competency aligning with international standards and globally recognized for digital literacy certification, as illustrated in Table IV:

As shown in Table IV, digital entrepreneurs' competencies comprised three levels:

Level 1: use of digital technology for collaboration, consisting of three elements, i.e. online collaboration, digital media program and digital literacy.

Level 2: use of digital technology for work, consisting of three elements, including the use of MS Excel and MS PowerPoint.

Level 3: digital accessibility and awareness, consisted of three elements, i.e. computer usage, internet usage and digital literacy.

Stage II: Development of a conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs'

competencies.

Based on studies, analysis and synthesis from documents, textbooks, academic journals and relevant research papers from both domestic and international sources conducted in Stage I, a summary of a conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies is shown in Fig. 1 below:

Fig. 1 defines the elements of a conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies:

- 1) Stakeholders were divided into two groups: 1.1) Instructors at higher education institutions and the Office of the Higher Education Commission and 1.2) entrepreneurs in small and medium enterprises with experience in information and communication technology.
- 2) Digital knowledge engineering learning process – learning management by experts, skillful and experienced people that offered entrepreneurs the opportunity to perform their own studies, discover information and share knowledge to find out answers about topics that interested them. The process included six steps: 2.1) knowledge creation, 2.2) knowledge storage, 2.3) knowledge acquisition, 2.4) knowledge access, 2.5) knowledge sharing and 2.6) knowledge application.
- 3) The MOOCs-based knowledge repository was developed by a software package that facilitated access to information anywhere and anytime over an internet connection, with a responsive design so it can be used on any device. The elements of the system were as follows:
 - a) Knowledge repository system: the software developed for learning management to enhance digital entrepreneurs' competencies consisted of three subsystems: 1) user management system, 2) knowledge management system and 3) report management system.

TABLE IV: RESULT OF SYNTHESIS OF DIGITAL ENTREPRENEURS' COMPETENCIES

| Thailand Professional Qualification Institute (Public Organization) [26] | IC3 Digital Literacy Certificate [27] | International Computer Driving License [28] | Microsoft Office Specialist [29] |
|--|--|---|---|
| Level 1 Use of digital technology for collaboration | 1. Online collaboration 2. Digital media program 3. Digital literacy | Living Online | Online Collaboration and IT Security |
| Level 2 Use of digital technology for work | 1. MS Excel 2. MS Word 3. MS PowerPoint | Key Applications | Package Software including Word Processing, Spreadsheet, Presentation Microsoft Office suite including MS Word, MS Excel and MS PowerPoint |
| Level 3 Digital accessibility and awareness | 1. Computer usage 2. Internet usage 3. Digital literacy | Computer Fundamentals | Computer and Online Essentials |

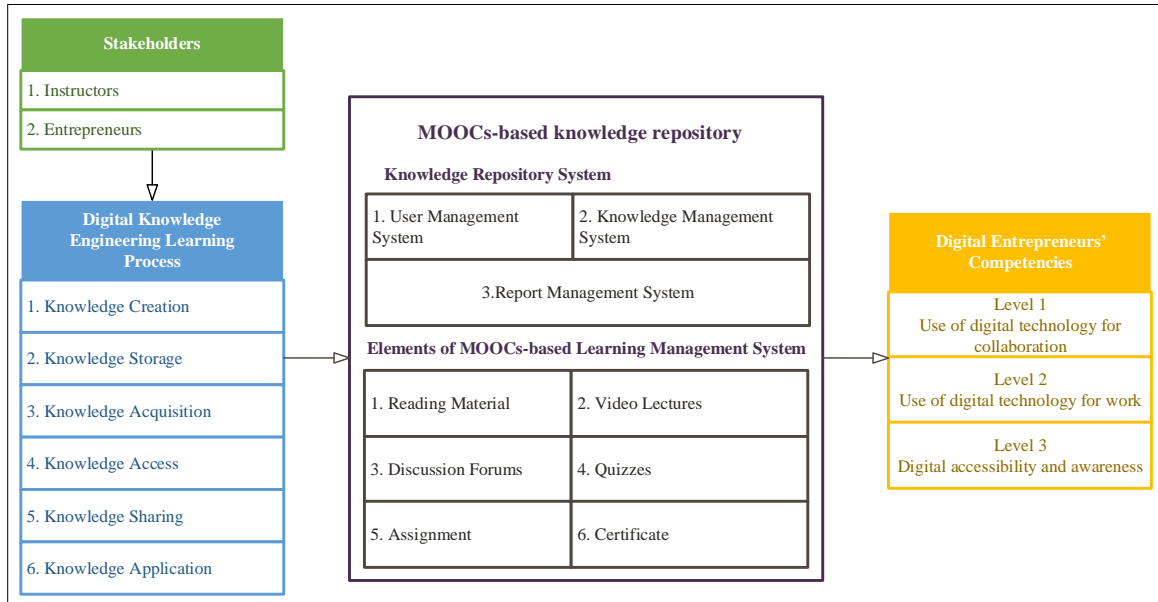


Fig. 1. Conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies.

- b) MOOCs-based knowledge repository: the software was designed to act as an open educational resource made available on the internet to provide entrepreneurs with the information in the knowledge repository. It was developed for use as self-study material for independent study, which is freely accessible without limitations of place or time. The MOOCs-based learning management system comprises six elements: 1) reading material, 2) video lectures, 3) discussion forums, 4) quizzes, 5) assignment and 6) certificate.
- 4) Digital entrepreneurs' competencies were defined as aspects of knowledge, skills and attributes, which entrepreneurs could develop through the MOOCs-based learning management system. The competencies were divided into three levels:
 - Level 1: use of digital technology for collaboration, consisting of three parts, i.e. online collaboration, digital media program and digital literacy.
 - Level 2: use of digital technology for work, consisting of three elements, including the use of MS Excel and MS PowerPoint.
 - Level 3: digital accessibility and awareness, consisting of three elements, i.e. computer usage, internet usage and digital literacy.

V. CONCLUSIONS

In regard to the development of a conceptual framework of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to enhance digital entrepreneurs' competencies based upon the information gathered from documents, textbooks, academic journals, concepts and theories of relevant research paper from both domestic and international sources, as well as analysis and synthesis of data using a content analysis approach, the elements of the concepts included stakeholders, digital knowledge engineering learning processes, MOOCs-based knowledge repositories and digital entrepreneurs' competencies. This study was consistent with the concept of

teachers' professional development for MOOCs-based education (Massive Open Online Courses), written and compiled by the Thailand Cyber University Project, Office of Higher Education Commission [24], which states that information and communication technology is used in educational organizations worldwide so as to provide an alternative to how education is delivered; it enables students to progress through self-study at anytime and anywhere. MOOCs were involved in courses and curriculum design for online education provided by educational institutions offering students opportunities to choose courses based on their own interests without registration fees. This study was also consistent with the concept of education and learning development for people of all ages set out in the National Education Plan of Thailand B.E. 2560–2574 (2017–2031) [30], which has the objectives of an opportunity guarantee of education, equality in education, educational development, educational standards, and employment and income under the context of the Thai and global economies in a society driven by innovative technology and creative thinking as well as wisdom, lifelong learning and a supportive learning environment. This will allow students to perform their own studies, discover information and share knowledge, whereas teachers or experts can use their expertise to pass on knowledge through digital technology [5], [31]–[33].

VI. SUGGESTIONS

The researcher would like to make suggestions and recommendations, which may be taken from this study for future research:

- 1) The development of future learning ecosystems according to the concept of a MOOCs-based knowledge repository using a digital knowledge engineering learning process to describe the roles of teachers and entrepreneurs in the learning environment as well as with a digital knowledge engineering learning process through the use of a MOOCs-based knowledge repository.
- 2) The development of a MOOCs-based knowledge

repository using a digital knowledge engineering learning process.

- 3) The implementation of a learning ecosystem based on a digital knowledge engineering learning process in teaching, so as to enhance the competencies of digital entrepreneurs who use MOOCs-based knowledge repositories alongside digital knowledge engineering learning processes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Nattaphol Thanachawengsakul, Ph.D. conducted research to synthesis and development the conceptual framework of the research, being advised and until the research finished.

Assoc. Prof. Panita Wannapiroon, Ph.D. advised and designed the conceptual framework of the research and checked, including to audit the research methodology. She checked content of the research.

All research were approved it.

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