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Development of digital literacy indicators for Thai undergraduate students using mixed method research

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ABSTRACT

Digital transformation and the Internet strongly affect students' integration of technologies and their acquisition of more skills supporting their education and preparation for the workplace. This research paper developed digital literacy indicators for Thai undergraduate students using mixed method research. The purpose was to identify the actual definition, factors, and indicators of digital literacy in Thai society. The key informants were five experts in ICT, HR, and education. The second phase was to develop the measurement of digital literacy indicators using the confirmatory factor analysis (CFA) approach with a sample consisting of 1,183 undergraduate students. Data collection was conducted through a questionnaire with 54 questions. The results revealed that digital literacy criteria for Thai undergraduate students consisted of four factors containing 12 indicators. The first factor and its related operation skills consisted of cognition, invention, and presentation. The second factor was thinking skills consisting of analysis, evaluation, and creativity. The third factor was collaboration skills consisting of teamwork, networking, and sharing. The fourth factor was awareness skills consisting of ethics, law literacy, and safeguarding self. CFA was employed to test the construct validity of the research latent variables that revealed the harmony correlation of empirical data contained in this research model (chi-square = 25.007 with 21 degrees of freedom; $p = 0.247$; RMSEA = 0.0127; RMR = 0.00658; GFI = 0.996; and AGFI = 0.987). The weight factors of latent variables were 0.802, 0.897, 0.894, and 0.536, respectively. The value of reliability according to Cronbach's alpha coefficient of correlation was 0.644, 0.804, 0.799, and 0.288, respectively. Moreover the correlation matrix of the 12 observed variables showed correlation among latent variables with a significant level of statistic correlation at 0.01; the correlation values ranged between 0.031 and 0.612. These results were employed to develop a digital literacy test for undergraduate students to assess their skills and promote their study lives.

Introduction

The 21st century is centered on the digital economy and society. This is an extension of the development of the industrial society that expanded throughout the 20th century. Internet and digital technology provide the infrastructure of business processes and the primary communication channel in the daily lives of people. The

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number of Internet users worldwide has tripled over a ten-year period (2005–2015) from 1,024 million to 3,174 million users (The Statistics Portal, 2016). Likewise, increasing digital technology has changed the way people communicate, collaborate, create works, solve problems, make decisions, and consume information. Technology has also changed the learning paradigm for undergraduate students who must learn to harness the power of digital technologies to achieve successful study (Simpson & Obdalova, 2014; UNESCO, 2004). Present day education needs to shift from traditional teaching and learning methods based on printed materials toward digital formats. In addition, by increasing the quantity of learning resources on websites, the Internet provides a wide range of disciplines and learning opportunities. Digital literacy is a skill of the 21st century that is required for students (Leahy & Dolan, 2010).

Digital literacy has positive effects on students' skills that are essential for successful learning. Our environment is surrounded by digital technology. The enormous digital content resources are more easily accessed than traditional, paper-based resources for learning. Modern companies and organizations use computers to replace employees performing routine physical and cognitive tasks. Computers also assist employees who perform non-routine problem-solving tasks. Companies require employees to apply ICT in the work place for communication, information sharing, and simulation of business processes. Students who do not have strong digital literacy may face poor academic achievement and fewer employment opportunities. The challenge that universities face today is to embed digital literacy in the education system. Undergraduates will become workers who acquire not only knowledge, but also skills in technology to perform their jobs effectively. This paper focused on determining a digital literacy definition, applications, and performance standards for undergraduate students.

Literature Review

Digital literacy is a term popularly used today. Gilster (1997, p. 1), who initiated the term in his book “Digital Literacy”, defined it as the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers. Wilhelm (2004) suggested that a digitally literate person should be able to access, manage, integrate, evaluate, and create information. Cornell University (2009) defined it as the ability to find, evaluate, utilize, share, and create content using information technologies and the Internet. The American Library Association (2013) defined it as the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills. Digital literacy (DL) is a comprehensive concept for important skill clusters whose names are often used as synonyms, but their content is not exactly the same. Computer literacy entails a deeper understanding of digital technology and comprises both user and technical computing skills. It focuses on technical people who are computer professionals. Information literacy usually means the ability to locate, identify, retrieve, evaluate, process, and use digital information optimally. Cyber literacy includes competence using the Internet, communication, and the Web (Karpati, 2011; Leahy & Dolan, 2010).

The competencies of digital literacy include many domains with various models. Eshet-Alakali and Amichai-Hamburger (2004) proposed a DL model that includes the ability to use digital software and hardware that includes cognitive, motoric, sociological, and emotional skills. The International Society for Technology in Education (2007) defined the digital literacy standard and indicators as creativity and innovation, communication and collaboration, research and information fluency, critical thinking/problem solving and decision making, digital citizenship, and technology operations and concepts. Bawden (2008) described a set of DL skills that consisted of ICT skill, information literacy regarding information evaluation, media literacy, and Internet/network literacy. Calvani, Fini, and Ranieri (2009) emphasized the co-existence and integration of dimensions characterized on technological, cognitive, and ethical levels. Van Deursen and Van Dijk (2009) proposed a digital literacy model consisting of four skill groups: operational skills, formal skills, information skills, and strategic skills. The Media Awareness Network of Canada (2010) established the definition that digitally literate citizens can use, understand, and create with digital technologies. UNESCO's six basic competencies of digital literacy are accessing, managing, evaluating, integrating, creating, and communicating information. These skills need to be employed individually or collaboratively in a networked, computer-supported, and web-based environment for learning, working, or leisure (Karpati, 2011). Ferrari (2012) explained the abilities of digital literacy in seven areas: information management, collaboration, communication and sharing, creation of content and knowledge, evaluation and problem solving, and technical operations.

In Thailand, very little of the literature has discussed the definition and competencies of digital literacy. The first source was issued by The Department of Education of Thailand (2010). It provided four core digital literacy skills comprising technology, critical thinking, collaborative working, and social awareness skills. Later, a research paper by Jongsermtrakoon and Nasongkhla (2015) defined digital literacy as the ability to use digital materials including the skills to define, access, evaluate, manage, integrate, create, and communicate. More recently, a research paper by Phuapan, Viriyavejakul, and Pimdee (2016) defined six factors of digital literacy for Thai students, being the ability to access, manage, integrate, evaluate, create, and communicate. Their model consists of 19 indicators.

Research Objectives

The research aimed to study the definition of digital literacy, applications of digital literacy to develop learning quality, and the elements of digital literacy for Thai undergraduate students. An additional objective was to develop the measurement of digital literacy indicators using the confirmatory factor analysis (CFA) approach.

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