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Digital Literacy Learning System for Indonesian Citizen

Amalia Rahmah

STT Terpadu Nurul Fikri, Indonesia

Abstract

Today, Indonesian citizen experience a fast changing lifestyle related to information and communication technology (ICT) utility, such as gadget and internet. The ease of information and knowledge retrieval to support learning process comes with problems to be taken care of such as information overload, negative content, netiquette negligence, and gadget addiction. Meanwhile, Indonesia will face an upcoming challenge in the economic sector, Free Trade Area of the Asia-Pacific (FTAAP) in 2020. An initiative for economic integration uses ICT as economic hub to promote every sector growth in economy. A concept explored in this research context to answers those problems mentioned above and to overcome the upcoming challenge is improving quality of Indonesian human resources through digital literacy education. This paper discusses a learning system model dedicated to deliver digital literacy education to the Indonesian citizen. Objectives of this research are increasing awareness towards digital literacy concept and preparing citizen to be digitally literate and competent using ICT to support their learning process, doing their work more effective and efficient, and preparing Indonesian young generation to become qualified workforce competing in FTAAP 2020, furthermore international work competition. This paper delivers analysis for learning system model as a result from the initial research of research series about digital literacy education in Indonesia. Resulting model justified by sets of detailed scenario about how this model works.

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Keywords: digital literacy, eduknowledge, knowledge base, knowledge transfer, knowledge management, learning system

1. Introduction

Technology advance in 21st-century emergences a new way to get things done, not only in formal working activities but also in daily activities. One product of this advance is digital media. It changes how every aspect works, from hardcopy to paperless, from book to tablet, and from physical interaction to virtual collaboration. Internet is no longer complementary tool but primary need in this era. This dynamic new world requires new comprehension and communication skills, as well as new codes of conduct, to ensure that these powerful media and technologies are used responsibly and ethically [1]. United State President, Obama said that education deliver for kids nowadays held in 20th-century school in the when they should be prepared for 21st-century jobs. Education and technology

Email address: amaliarahmah2@gmail.com (Amalia Rahmah)

are inseparable. He understood that our future leaders must have strong digital technology skills and an unshakable ethical foundation underpinning their behavior in the digital world [1].

An initiative masterplan within ASEAN scope to promote economic integration toward FTAAP used ICT¹ as a hub to connect every participant countries to create single market [2]. Strategic thrust no.5 to achieve this is human capital development in ICT [2]. This strategy is aligned with the need for technology-based education in order prepare Indonesian competitive workforce ready for 21st-century jobs.

Coming to the 21th-century, we enjoys the advantages of data, information and knowledge from one hand, but from the other hand we are also perplexed by the information overload, information explosion, false information and misuse of knowledge [3]. The convergence of portable personal technologies, unfiltered access to information, and user-generated content profoundly impacts how this generation era grows and learns. There are more threats coming from contents shared through gadget, such as violence, cyber bullying, sexting, online predator [4] and moral-value paradigm shifting.

Digital literacy education is an approach to answer this digital era challenges, FTAAP agendas, and overcome problems related to digital media and ICT utility. Building consistency in behavior of using digital media wisely needs understanding about what, why, and how the utilization must be held. Knowledge plays a causal role in attitude-behavior consistency [5]. This is the reason why digital literacy education should be conducted using learning system embedded with knowledge management with purpose to guide learners achieve knowledge understanding so that it can lead to attitude-behavior consistency.

Previous explanations about the importance of digital technology in education, FTAAP agendas, problems and threats relying in digital media utility, and digital literacy education are background problems explored in this research paper. The research question in this paper is "how to educate Indonesian citizen to be digitally literate?".

2. Methodology

This research is an attempt to find solution about background problems explained above. Method used in order to attain this objective needs to combine two paradigms as thinking framework that confluence people, environments, and ICT as a problem solving process. These paradigms are behavioral science and design science. Behavioral science paradigm aims to analyze problem relevance and characteristics of environment which become the research object. Knowledge development in the research is conducted with knowledge base foundation suitable to the research context. This activity called rigor analysis which is done by theoretical review with purpose to find applicable knowledge and relevance analysis to find problem relevance. The design-science paradigm seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artifacts [6]. Design science paradigm aims to build and evaluate artifact as a solution to solve defined problem relevance. Artifact evaluation includes the two paradigms, namely truth for behavioral science and effective artifact utility for design science.

Objectives in this paper are constructing digital literacy learning system model with knowledge base as the artifact of design science. Rigor analysis conducted with theoretical reviews to build a knowledge base related to research topic. Literature reviews and observation from existing researches about Indonesian ICT adoption and current initiatives in digital literacy education are done as relevance analysis. The evaluation objective of resulting model seek for truth that is observed through descriptive method using informed argument for artifact truth and detailed scenarios to demonstrate its utility. This paper will explain the model through this scheme: relevance analysis, rigor analysis, model analysis to explain its components and relationship between them, model evaluation, and conclusion.

3. Relevance Analysis

Relevance analysis objective is finding environment needs and problem relevances between digital literacy education and Indonesian current condition.

¹Information and Communication Technology

3.1. Internet and Gadget Utility in Indonesia

Indonesia is facing digital age with over 43 million Facebook accounts in January 2012, 19 million accounts on Twitter, a jump of close to 400% in just one year [7]. Related to this fact, there are projections stating that number of gadgets penetration in Indonesia will surpass the number of Indonesian people. Inline with increasing trend in gadget utility, Internet access becomes dynamic and practical. Survey by PEW Research Center (2013) stated that data of smartphone ownership in Indonesia in the range of age 18-29 years old reach 18%, and 9% in the range of age 30-49 year [8]. These statistics show that Indonesian citizen has already adopted digital technology with internet based digital media accessed through gadgets, especially mobile phone. Digital literacy in context of digital devices utility can be concluded as moderate tends to high. Along with this aptitude, gadget users should be accompanied by an understanding how to use digital technology wisely.

3.2. Digital Literacy Education in Indonesia

In Indonesia, Digital literacy and ICT literacy education is conducted within IT curriculum in school for technical skills and informal blogs or portals for common knowledge in ICT. As learners need to become independent learners in an environment greatly shaped by ICT, it is inevitable that they will be pushed to adapt to the increasing complexity of the ICT landscape [9]. However, its implementation is limited by Indonesias economic problem, complicated by limited quantity and quality of ICT infrastructure, and the low awareness and knowledge of the public on ICT [9]. There are several initiatives engaged to ICT education for Indonesian citizen including digital literacy materials. First is ICT Watch ² with main objectives to promote skills and awareness for citizens to be able to negotiate and use the internet and web. A major ICT Watch program is Internet Sehat ³ or Healthy Internet, which involves teaching safe online practices and productive use of the internet [7]. SchoolOnffLine ⁴ is initiatives that allow schools that lack an Internet connection to teach students computer and Internet use [7]. For general technical skill, initiative Bisa Komputer⁵ focuses in delivering article about ICT, online media, and website and application recommendation. Digital Mommie ⁶ delivers ICT article especially about blogging for particular target readers, the mothers.

Aligned with mission to educate Indonesian citizen about digital literacy, there are other initiatives whose main objective is parenting education. Parenting topic becomes relevant with digital literacy education in 21st-century because of digital media and devices utility in children learning activities. Rumah Parenting (Yayasan Kita dan Buah Hati⁷) and SEMAI2045 ⁸ are both non-profit organization concerning in parenting with awareness about negative content ⁹ accessed and shared by kids and teens using digital media. Institut Ibu Profesional ¹⁰ is a community for mothers aiming for a continuous quality improvement of their selves and families. It has 8.574 registered members from all over the country. Closed interaction based on mobile devices conducted with strict rules about how to collaborate using mobile messaging. It's an example of digital literacy education delivered by creating supportive environment about how to be digitally literate for the learners.

3.3. Discussion

Analysis for relevance based on literature review and observation mentioned above can be summarized into several concerning items:

- a) Indonesia citizen have already adopted and used digital, so they need to be digitally literate as fulfillment competency to support digital technology and gadget utilization.
- b) There is a digital divide between areas for digital technology adoption in Indonesia by virtue of infrastructure and economic development limitation.

²<http://ictwatch.id> [Accessed on August, 1st 2015]

³<http://internetsehat.id> [Accessed on August, 1st 2015]

⁴<http://opensource.telkomspeedy.com/wiki/index.php/Schoolonffline> [Accessed on August, 10th 2015]

⁵<http://bisakomputer.com> [Accessed on August, 5th 2015]

⁶<http://im.digitalmommie.com> [Accessed on August, 2nd 2015]

⁷<https://www.facebook.com/yayasankitadanbuahhati> [Accessed on June, 20th 2015]

⁸<http://semai2045.org> [Accessed on July, 1st 2015]

⁹pornography, violence, game addiction

¹⁰<http://www.ibuprofesional.com> [Accessed on August, 13rd 2015]

- c) There are informal initiatives focusing in digital literacy education with contributors from practitioners, experts, or writers ¹¹. This condition gives the opportunity to this research not to make something new from scratch but collaborating and completing what's lack from current condition. Table 1 explains about the current state of each initiatives and this research position to those.
- d) State of art of this research focuses in delivering article and digital literacy material guided by parenting expert because main role models for next generation are their parents.
- e) Digital literacy education should involve every party in kids and teens education such as parents, teachers, and kids themselves.

TABLE 1: Research position and current state initiatives

Initiatives	Digital Literacy Focus	Learner Targets	Knowledge Source
ICTwatch and internetsehat	Technical skill, general knowledge	Public	Website contributors, practitioners
SchoolOnffLine	Technical skill	Teachers and Students	Experts and practitioners
Bisa Komputer	Technical skill, general knowledge	Public	Website contributors
Digital Mommie	Technical skill	Mothers	Single contributor
Rumah Parenting	Soft skill	Parents	Psychology experts and teams
SEMAI2045	Soft skill	Parents	
Institut Ibu Professional	Soft skill	Mothers	Practitioners, website contributors
This Research Series	Technical skill, soft skill	Parents, educators, kids and teens	Website contributors with experts guide

NOTE: In this context, soft skill is knowledge understanding related to digital media awareness to use it effectively and efficient. This skill is driven by desired characters building and guided with parenting method.

4. Rigor Analysis

Rigor analysis explores theories related to this research topic such as understanding, digital literacy, learning system, and eduknowledge.

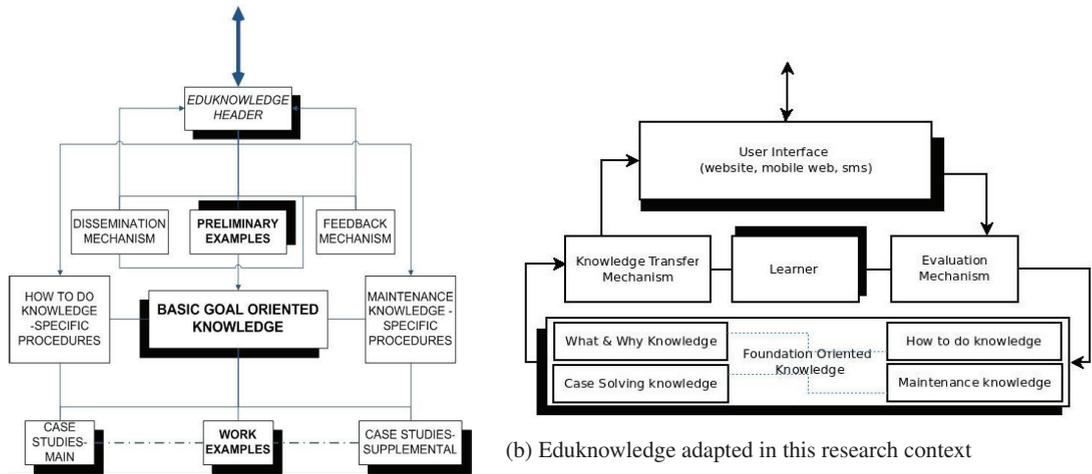
4.1. Knowledge and Understanding

Theory suited to explain knowledge in this paper context is D-I-K-W hierarchy [10]. Education given through learning system aims for high-level understanding called wisdom. In this state, learner understands about how to explore, explain, and understand the knowledge, and furthermore how to use the knowledge into practice [3]. The understanding level can be used as an approach to evaluate learner state of knowledge comprehension. Learning system analyzed in this research has added a component called learner persona, an unique representation of each learner based on his/her state of learning material comprehension. This way the system can give a recommendation for learning material suitable for specific user persona.

4.2. Learning System and Knowledge Management

Learning process can be seen as a process for acquiring information and processing experience, in which the learner selects and constructs knowledge that is useful and appropriate for him/herself and in turn uses this to drive and determine his/her own continuous learning process [11]. Learning in the view of modern constructivist learning theories is not just transferring knowledge; it is a highly individualized task of construction [11]. Construction has meaning building understanding and furthermore wisdom so that it can lead to better attitude-behavior and decision making. Knowledge management is a concept to collect, process, and organizing knowledge in specific domain thus support learning process in order to build comprehensive knowledge construction.

¹¹Practitioners are people whose job and daily activities related to the topic. Experts are practitioners with formal background study. Writers are people whose job dedicated to write article for the corresponding website



(a) Eduknowledge Framework [11]

FIGURE 1: Eduknowledge

4.3. Eduknowledge

Eduknowledge could be defined as a process of developing and adapting specific knowledge for educational purposes [11]. Eduknowledge as a framework to knowledge structuring enables individualized learning process presented as a scheme shown in Figure 1a. Adapted eduknowledge framework in this research context shown in Figure 1b containing interface with ICT support, learners, knowledge transfer and evaluation mechanism to educate learner, and foundation-oriented knowledge.

4.4. Digital Literacy

Discussion about digital literacy disassociated with the term digital technologies. Familiar term representing digital technology in daily use is gadget, defined as mobile device used to interact with digital media such as text, images, audio, videos, programs, game, and online-based communication between two or more people. European Information Society (Martin, 2005, p. 135) stated that digital literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process [12]. The definition resembles this research context in order to empowering digital media user with comprehensive knowledge suitable with their role and purpose. This can be attained with learning material covering three dimensions of digital literacy: technical, cognitive, and socio-emotional [13]. Technical related to how to use and interact with digital technology devices. Cognitive relative to how to create, evaluate, and retrieve useful digital information. Socio-emotional is related to how to responsibly use ICT (digital technology) for socializing, learning, and collaborating such as social-media literacy, netiquette.

5. Model Analysis

Eduknowledge framework components derives model components in context of digital literacy education and Indonesia’s related relevance analysis. Learning system model built using those constructs explained above shown in Figure 2.

5.1. Foundation

It is shown in the 1a and 1b that knowledge base built as learning material is driven by goal. Goal in this context can be interpreted as something to achieve, and to solve. In order to achieve this goal, certain code of conduct must

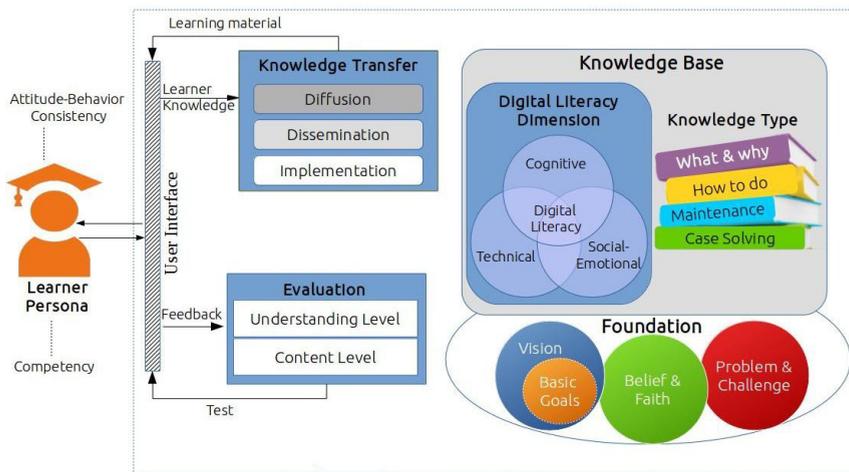


FIGURE 2: Digital Literacy Learning System for Indonesian Citizen

be followed. Goal based knowledge with certain code of conduct is represented by three pillars constructing learning foundation: vision, belief and faith, problem and challenge. Vision represents long-term objectives to achieve. This goal then derived into basic goal with shorter term and detailed desired achievement. Vision for this learning system is preparing Indonesian citizen, young and adult generation, to become digitally literate, in capability, skill, and attitude in utilizing digital technology for daily activities and works. Indonesia is a religious country with most society values are based on citizen belief and faith [9]. These two represent basic rules about what human should do, the right way to do, how to interact with each other. Problem and challenge are things to solve with wisdom resulting from high-level knowledge understanding. Upcoming challenge to overcome for Indonesia citizen is FTAAP 2020, therefore digital literacy education goal is to prepare Indonesian workforces to compete in the challenge.

5.2. Knowledge Base and Knowledge Transfer

Knowledge base is storage where knowledge is collected, processed, and prepared for transfer as learning material. Collected knowledge is about digital literacy with wide scope of discussion covering three digital literacy dimensions. Knowledge as learning material is delivered in the form of one of these knowledge type answering question about what and the importance (why), best practice (how to do), tips and tricks (maintenance), problem case examples and how to solve it (case solving). Goal-based knowledge is then delivered to learners through three types of transfer activities, those are diffusion, dissemination, and implementation [15]. Diffusion for promoting awareness about digital literacy utilizes available knowledge accessed via every interface tools. Diffused knowledge answers what and why questions. It is processed and delivered for general audience. Dissemination involves activities with particular learners. This activity needs learner profiling provided by learner persona. Learning material for this type discusses how to do and maintenance knowledge. Implementation is transfer activity with the goal of creating behavior change [15]. Dissemination and implementation held with collaboration feature provided in user interface. Knowledge delivered for implementation activity discusses problem solving cases. Main contributors for this type of knowledge are experts and practitioners. Collaboration with previous digital literacy education initiatives could enrich the knowledge base. This activity allows the learners to share their cases which later moderated to be stored in the knowledge base.

5.3. Evaluation and Learner Persona

Evaluation is conducted to assess learner comprehension about digital literacy. Comprehension is assessed for its understanding level and content level. Understanding consists of five levels lead to attitude-behavior consistency. These five are know-what, know-why, know-how, know-best practice, and know-how to solve problem cases. Content level refers to bloom's digital taxonomy [14]. Learner persona/profile describes personal or group characteristic determined by one or more of these categories: basic goal, age, role, social class, understanding level, and content level. These broad range of characteristics covers every party involved as digital media users (digital literacy learners)

in Indonesia. Learner understanding aims for attitude-behavior consistency in utilizing digital technology in proper and effective ways, and expertise in working-with-ICT competencies.

5.4. User Interface

User interface provides interaction media between learner and learning system. It is utilized digital media with specific functions and features to support knowledge transfer and evaluation. It is implemented using technology such as website, mobile web, social media, and SMS broadcast. The first function of user interface is delivering learning material from the knowledge base. Knowledge diffusion process can be conducted using website and mobile website to deliver any type of knowledge. Knowledge dissemination process can be conducted using website, mobile web, social media, and SMS broadcast to particular and engaged learners. Knowledge implementation process can be conducted using website, mobile web, and social media to deliver knowledge about problem solving cases and provide collaboration media for learner and knowledge worker¹² team to discuss. The Second function of user interface is delivering test and feedback between learning system and learner. Test content is summary from learning material taken from knowledge base to evaluate digital literacy understanding of the learner. Feedback is presented by learner as digital literacy comprehension state evaluation.

6. Scenarios for Model Justification

Resulting model utility could be implemented in many alternatives scenarios. This paper explains three cases with scenario of how the model is implemented in different domains.

6.1. Case 1: Pornography

Based on Yayasan Kita dan Buah Hati research in 2013, 95% elementary students class 4-5 from 100 children in Indonesia have accessed pornography, and 60% access using their own or their parents gadget [17]. This is the reasons why gadget utility by kids and teens should be monitored and controlled. Vision for this domain is free from pornography-Indonesian young generation. Every belief teach that children shouldn't be exposed to negative content. Technology advance emergences challenge where pornography has become business commodity with children as its main target [17]. Indonesian current problem related to this issue is the lack of awareness of the danger of pornography which effect is permanent brain damage that leads to ability loss to differentiate between right and wrong [17]. Digital literacy for this domain is dedicated to every party involved in children life and education: parents, educators, children and teens. Knowledge transfer is conducted to deliver brain damage article (diffusion) via website and mobile website, warning for pornography threats via SMS broadcast, how to activate parental-control gadget (dissemination) via website and mobile website, and what kind of therapy suitable for pornography addict (implementation) via collaboration media with expert (messaging, email). Evaluation could be conducted using simple survey asking for awareness of pornography threats (via social media and SMS), questionnaire asking about effects of pornography (via mobile website) and insight about parental-control gadget.

6.2. Case 2: Netiquette for Bachelor

Vision for this domain is preparing university and senior high school graduates to be digitally literate and qualified workforce. Upcoming challenge is FTAAP 2020. Learner is group of last-semester university students and seniors high school students. They have already learned about ICT utilization as formal course resulting understanding level from analyzing to creating. Learning material suitable for this domain are netiquette (applying), how to built summary about a topic (analyzing), collaborating wisely to create new idea (evaluating), and tips trick to create and broadcast their own content wisely (creating). Evaluation is conducted through questionnaire asking about netiquette in work and collaboration, copyright and article resouce reability tracking, and steps to broadcast content wisely.

¹²person in charge of maintain knowledge base, knowledge source, or experts

7. Conclusion

Research question is answered with proposed learning system model for digital literacy embedded with knowledge base which is built to fit into Indonesia characteristics. Digital divide in Indonesia requires digital literacy education delivered through several knowledge transfer mechanisms. Specific informal initiatives in digital literacy education focusing in parenting with parents as role model, so that the education should be delivered to every party involved in kids and teens education. Indonesia is religious country so digital literacy education should follow code of conduct given by belief and faith of its citizen. Several type of learner roles and groups requires a profiling mechanism showing learner digital literacy comprehension and basic goal. It's answered by learner persona. Different state of learner comprehension and goal requires knowledge type alternatives and understanding levels evaluation. Broad range of covering for digital literacy education in Indonesia requires every dimensions of digital literacy. This model utility is simulated and justified using case scenarios to show how it is implemented. Proposed model is result of initial research series. This model needs continuous improvements concerning several factors: detailed curriculum for every role and group of learners mentioned in learner persona, most effective knowledge transfer, and indicators and how to measure for evaluation of comprehension. Next research is conducted in order to build digital literacy curriculum and evaluation indicators.

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