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Unlocking Women's Empowerment towards Digital Inclusivity in East Kalimantan through Digital Competence Evaluation

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Abstract

The ability to use different Internet-mediated forms is a basic competence in the digital era, which indicates that women, too, need to have adequate digital skills for daily activities. However, previous studies found that women have a lower digital literacy index than men due to their sociocultural role and expectations and less motivation to engage with technology among older individuals. Digital competence is essential to enhance digital inclusivity, especially for women in East Kalimantan Province, following the future challenges of the Capital City of Nusantara (IKN) development and Indonesia Digital Vision 2045. This study employed a quantitative approach, which entailed adapting seven dimensions of digital competence from the DigComp 2.0 model as research instruments: basic knowledge of hardware and software, information and data literacy, communication and collaboration, digital content creation, security, problem-solving, and career-related competencies. This study involved a sample size of 538 women. The findings offer theoretical insights into the employment of the DigComp 2.0 model within a specific context and recommendations for women's empowerment strategies. The result showed that women's digital competence level in East Kalimantan was high, except for the content creation and problem-solving. Another intriguing finding is that the level of education was not directly related to the level of digital competence, which contradicts previous studies. Future studies could employ the same instrument to corroborate the findings in this study across diverse sociocultural contexts in Indonesia. Another direction is to consider psychological variables that could influence digital competence.

Keywords:
digital competence; digital divide; digital inclusivity; empowerment; women

Introduction

The Status of Digital Literacy in Indonesia 2020 showed that men have a higher digital literacy index than women (Ameliah et al., 2022), even though 49.7% of Internet users in the country are women (Kemp, 2021). The Ministry of Women's Empowerment and Child Protection reported that most women have little knowledge, ability, and opportunity to access technology (Wahyuningtyas & Adi, 2016), which was due to a low level of education, inadequate skills and facilities, absence of information and communication technology (ICT) training, and patriarchal culture (Suwana & Lily, 2017). The lack of women's participation in technology could influence their employment opportunities, research advancement, new technologies, and sustainable development (Hassan, 2021; Kerras et al., 2020). Thus, accessibility is becoming one of the fundamental aspects of digital inclusivity (Gurumurthy & Chami, 2017; Simamora & Ningsih, 2020). This implies that women must be well-educated to ensure they have greater access to both the

technical aspect and information related to the benefits of technology, content, and methods in teaching relevant skills (Mlambo-Ngcuka, 2018). These data suggest a need to enhance the digital competency of women in Indonesia, especially alongside the Digital Indonesia Vision 2045, which focuses on accessibility and infrastructure, information and technology usage, and competencies (Kominfo, 2023).

Previous studies have shown that women's digital literacy skills are crucial, especially in supporting economic development (Suarmini et al., 2018; Sujarwo et al., 2022) and protecting the family against the negative impacts of using digital media (Fatmawati & Sholikin, 2019; Rahayu & Haningsih, 2021). The provision of digital inclusivity for women in this Internet expansion era can significantly affect gender equality at work (Moorena et al., 2020; Woetzel et al., 2015), considering the practical skills that can open more employment opportunities for them (Kemkhadze, 2021). It is also important to note that being a mother and educator requires women to know how to mitigate the negative impact of digital platforms (Nathalia, 2017; Rahayu & Haningsih, 2021). The educator in this context has a symbolic meaning that describes the sociocultural role of women in Indonesian society. With adequate skills and knowledge of digital media, women can teach their children to use the Internet effectively, creating a better-quality young generation (Suwana & Lily, 2017).

However, studies investigating women's digital literacy skills in Indonesia are limited. Even the digital literacy index compiled by the Ministry of Communication and Information of Indonesia (Kominfo) has not yet considered society segments in their digital literacy strategies (Zahra, 2023), especially for women, even though studies confirmed that their literacy levels are lower than men (Brata et al., 2022; Fauzi et al., 2020; Long et al., 2023; Marini et al., 2020; Zahra, 2023). This circumstance prompts the stipulation of applicable evaluation instruments to assess the digital literacy competence of women that considers the sociocultural aspect in the Indonesian context. As such, strategies for women's empowerment can be better designed.

The locus of this study is the East Kalimantan Province, where the new capital city of Indonesia is located, as the current situation urges digital transformation and emphasises the importance of digital literacy (Kominfo, 2023; N. H. Putri, 2022). The Digital Indonesia Vision 2045 also emphasises the urgency of inclusivity in regions outside Java Island, where a particular strategy to enhance digital competencies is needed (Kominfo, 2023). The Status of Digital Literacy Indonesia 2020 noted that East Kalimantan's score was above the national average, but 51.8% of women in the area scored below the national average (Ameliah et al., 2022). The score reflects the accessibility of the Internet, which provides opportunities for women with a low educational background to become economically empowered (Kusumawardani et al., 2022).

Prior studies provide little knowledge on factors influencing women's digital competence and how this knowledge helps empower women. Accordingly, this study aims to fill the gap through three objectives: to measure women's digital competence, to determine which factors have a strong or weak influence on digital competence, and to look into the causes of low digital competence. We achieve these objectives by adding several items to the DigComp 2.0 Model. In doing so, we also confirm the appropriacy of the modified tool to assess digital competence in the Indonesian context.

Literature Review

Core Issues on Women's Digital Competence in Indonesia

Previous research on women's digital competence in Indonesia (Fauzi et al., 2020;

Marini et al., 2020; Sitepu & Rajagukguk, 2022; Suwana & Lily, 2017; Tisnawati et al., 2020) has identified the basic issues. First, due to their crucial role in family management, women are less involved in technology than men. As a result, their levels of digital literacy are lower (Fauzi et al., 2020; Marini et al., 2020; Tisnawati et al., 2020). It is also interesting to note that adult women's abilities to improve their digital skills are lower than younger women (Long et al., 2023; Sitepu & Rajagukguk, 2022). Each generation creates a social perspective in responding to new information (Susilo et al., 2020), and studies confirmed that Generation Z is more familiar with technology and motivated to acquire new knowledge about digital innovation than the older generations (Sitepu & Rajagukguk, 2022).

The DigComp 2.0 Model of Digital Competence

Several concepts related to mastering technology-related skills have been widely discussed in the last decade, including digital competence and digital literacy. Digital literacy is the key to mastering digital competencies. Digital literacy involves acquiring knowledge that is considered relevant to traditional literacy and media studies (Yanti & Yusnaini, 2018). According to van Deursen et al. (2014), literacy refers to particular competencies and knowledge, while skills refer to the more technical aspects of these competencies. Digital competencies are the outcomes of the practical and measurable impact of media literacy, information, and digital literacy (Iordache et al., 2017). In other words, an individual's level of digital literacy depends on their practical ability to use digital devices and software. Therefore, measuring digital literacy competence includes assessing practical skills related to knowledge and use of hardware, the basic knowledge and ability to use digital tools and software, and the basic knowledge and ability to use the Internet (Iordache et al., 2017). Meanwhile, Ferrari et al. (2012) consider digital competence as an inseparable component of life, with the following five aspects: information, communication, content creation, security, and problem-solving. The model of digital competence was first introduced in 2013 as a scientific project called The European Digital Competence Framework for Citizens or DigComp. In 2016, Vuorikari et al. (2016) updated the framework with DigComp 2.0, which focuses on a conceptual reference model to assist public authorities and private sectors in monitoring the practices of the citizens in Europe.

Vuorikari et al. (2016) developed DigComp 2.0 based on five aspects. The first is the *information and data literacy* used to identify, find, retrieve, store, collect, and analyse digital information and assess its relevance and purpose. The second is *communication and collaboration,* which determines the ability to communicate and collaborate in a digital environment, share resources through online media, interact and participate in communities and networks, and have an interculturality to have awareness. The third is *digital content creation,* which focuses on creating and editing new content, integrating and reworking previous information and content, and understanding the importance of practising intellectual property rights. The fourth is *security,* which focuses on personal protection, data protection, digital identity protection, security maintenance, and safe and sustainable use of information. The fifth is *problem-solving,* which indicates the ability to identify digital needs and resources, make decisions based on digital media that best suit the objectives or needs, solve conceptual problems by digital means, use technology creatively, and solve technical, personal, and external problems.

Law et al. (2018) compiled literacy frameworks used in 47 countries across different geographical regions and income levels to propose a global framework of DigComp 2.0

by adding two competencies, i.e., hardware and software fundamentals and career-related competencies. However, the framework must be adapted according to the local contexts to create relevant literacy programs and assessments (Bashir & Miyamoto, 2020). Previous studies have used the model to assess students' (Tejedor et al., 2020) and educators' competencies (Alarcón et al., 2020) and has also been observed to be evolving as it is applied to determine the digital divide in several countries (Ariansyah et al., 2020; Rai, 2019).

Women's Digital Competence Evaluation in Indonesia

The DigComp 2.0 model is one of the functional tools for evaluating digital competencies, yet not many studies have applied it to the Indonesian context. Candrasari et al. (2020) concentrated on the competence of young women, while Rahayu and Haningsih (2021) focused on DigCompEdu to measure the role of women as informal educators at home. Anjarwati and MLIS (2022) conducted a study that employed the DigComp model to examine security and privacy concerns related to youth social media use, with no particular emphasis on female users. Rahayu and Haningsih (2021) did not characterise women's digital competence for general purposes as the current study seeks, but they employed an information technology and pedagogy approach. Furthermore, Candrasari et al. (2020) and Anjarwati and MLIS (2022) use a qualitative approach, which cannot determine the reasons impacting women's low levels of digital literacy and competency. In other words, further research in the Indonesian context focusing on digital competency aspects is needed to inform women empowerment strategies.

Methods

We modified the DigComp 2.0 from Vuorikari et al. (2016) to measure women's digital competence in East Kalimantan. According to DigComp 2.0 from Vuorikari et al. (2016), measuring digital competence includes information and data literacy, communication and collaboration, digital content creation, security, and problem-solving. However, we modified the items of questions and statements to measure each aspect (shown in Table 1). For example, we asked respondents' responses regarding trolling, junking, and hate speech to approach their understanding of netiquette in the digital environment. We conducted a focus group discussion (FGD) with ten women to test the questionnaire. The result of the FGD helped us elaborate competencies in the DigComp 2.0 model to make respondents easily understand the purpose of each item. As a result, we modified the tool to measure digital competence from 21-item competencies to 63 items.

The respondents of this study were women aged 21 and older who were considered to be psychologically and legally mature. According to Munger et al. (2019), age is essential in the sampling strategy to study the effects of digital media. We use a quota sampling technique assuming that the population of the study object is uncertain and the number of Internet users in East Kalimantan is enormous. In the quota sampling technique, researchers can determine the number of samples in the group they want to study (Iliyasu & Etikan, 2021). In this type of sampling, the researcher determines a specific characteristic basis that acts as a quota for selecting samples (Bhardwaj, 2019). Therefore, we decided on a minimum of 500 women aged at least 21 years who live in districts/cities in East Kalimantan based on the responses in the online survey.

The research process commenced in June 2021 by constructing the modified model and examining the instruments through a focus group discussion involving women respondents. This extensive process concluded in May 2022. The study encompassed a sample of 538 women, gathered over ten days from January 21st to 30th, 2022, utilising the

Table 1.
Digital Competence Aspects and Items of Competences

No	Digital competence aspects	Items of Competences (the modified items in italic style)
1	**Information and data literacy**	To browse data, information, and digital content on the Internet
2		To search for the necessary data, information and digital content on the Internet
3		To filter data, information and digital content on the Internet
4		*To analyse the credibility and reliability of data, information and digital content sources on the Internet*
5		*To compare the credibility and reliability of data, information and digital content sources on the Internet*
6		*To evaluate the credibility and reliability of data, information and digital content sources on the Internet*
7		*To organize, store and retrieve data, information and digital content on the Internet according to personal necessities*
8		To analyse the credibility and reliability of the obtained data, information and digital content from the Internet
9		To examine the credibility and reliability of the obtained data, information and digital content from the Internet
10		To evaluate the credibility and reliability of the obtained data, information and digital content from the Internet
11		To choose and process the obtained data, information, and digital content from the Internet for specific purposes (education, work, etc.)
12	**Communication and Collaboration**	To interact through a variety of digital devices
13		*To understand certain digital applications that are essential for daily activities*
14		To share data and digital information with other people through an application
15		To help others, giving advice and references about devices and digital platforms to other people
16		To share opinions regarding specific issues in society through digital platforms, e.g., by sending comments, posts or threads on social media
17		To seek opportunities for self-empowerment and participate in the digital sphere, e.g., joining a webinar
18		To utilize digital tools and devices for collaboration with other party
19		To arrange and create resources and knowledge, e.g., writing together on Google Docs, creating projects on Canva, etc.
20		To understand the digital norms when using the technologies and interacting in the digital environment
21		*To protect the privacy of information*
22		*To respect other people's opinion*
23		*To implement the values of Pancasila in digital activities*
24		*To identify participation in trolling activities*
26		*To identify participation in junking activities*
27		*To identify participation in scamming activities*
28		*To identify participation in hate speech activities*
29		To choose the appropriate communication strategies according to audience characteristics
30		To create and manage more than one digital account
31		To protect personal reputation in digital activities
32		To protect personal data and information retrieved from digital services
33	**Digital content creation**	To create and edit digital content in different formats
34		To express oneself through digital means
35		*To vary information and content for sharing activities in a digital environment*
36		To create new, original and relevant content and knowledge
37		To understand how copyright and licences apply to data, information and digital content
38		*To have concerns regarding the implementation of copyright and licences of digital data and information*
39		To create a digital program or application to solve a given problem or perform a specific task
40	**Digital security**	To protect devices and digital content and to understand risks and threats in digital environments
41		To know about safety and security measures and to have due regard to reliability and privacy
42		To protect personal data and privacy in digital environments

No	Digital competence aspects	Items of Competences (the modified items in italic style)
43		*To have concerns regarding privacy problems of one's devices*
44		*To have an understanding of the importance of protecting personal data and digital information*
45		*To be able to protect data and personal information on one's devices*
46		*To understand how to protect the information of personal identity for the safety of oneself and others*
47		To understand that digital services use a "privacy policy" to inform how personal data is used
48		To be able to avoid health risks and threats to physical and psychological well-being while using digital technologies
49		*To avoid mental health risks/threats while using or consuming digital content*
50		To be able to protect oneself and others from digital risks such as bullying, body shaming, etc.
51		To be aware of digital technologies for social well-being and social inclusion
52		To be aware of the environmental impact of digital technologies and their use
53	**Problem-solving**	To identify technical problems when operating devices and using digital environments
54		To solve them (from troubleshooting to solving more complex problems)
55		To assess needs and to identify, evaluate, select, and use digital tools and possible technological responses to solve them
56		To adjust and customise digital environments to personal needs (e.g., accessibility)
57		To use digital tools and technologies to create knowledge and to innovate processes and products
58		To engage individually and collectively in cognitive processing to understand and resolve conceptual problems and problem situations in digital environments
59		To understand where one's digital competence needs to be improved or updated
60		*Please provide us with a further explanation about the reason for the previous question*
61		To be able to support others with their digital competence development
62		To seek opportunities for self-development and to keep up-to-date with the digital evolution
63		*Please provide us with a further explanation about the reason for the previous question*

Source: Modified competence items from the DigComp 2.0 model (Vuorikari et al., 2016)

Table 2.
Demographics Variables

Variables	Description
Age	**Age of respondents in a numerical scale, ≥ 21 years old**
Education	**Respondent's education achievements are categorized into six groups:** a. **Primary education** b. **Junior high school** c. **Senior high school** d. **Bachelor's degree** e. **Master's degree** f. **Doctoral degree**
Occupation	a. **Public Officer** b. **Lecturer** c. **Teacher** d. **Housewife** e. **Private employee** f. **University student** g. **Honorary employee** h. **Health workers (doctor, midwife, nurse, clinical psychologist)** i. **Entrepreneur** j. **Retired** k. **Others** l. **Unemployed**
Domicile	**The domiciles of samples represented nine cities/regencies in East Kalimantan province.**

Source: Instruments by the authors (2022)

Google Forms accessible via the following link: http://bit.ly/digitalperempuan1. In the data collection, we also hired and trained enumerators who actively sought eligible respondents and assisted the respondents in filling out the questionnaire. As a result, the sample covered nine out of ten cities/ regencies in East Kalimantan, excluding the regency of Mahakam Ulu due to some technical limitations. Even though the number is small to represent women in East Kalimantan, we contend that our strategy guarantees the quality of the data obtained in this study. On top of that, this research aims to propose a modified model of digital competence that is acceptable and suitable for the Indonesian context and applicable to assess women's digital competence in other locations and stimulate similar studies in other regions.

Results

This present study has identified the digital competencies of women in East Kalimantan in accessing, analysing, evaluating, creating, reflecting, and acting in the digital environment. The initial analysis process following the data collection was checking the modified aspects of the DigCom 2.0 model using Confirmatory Factor Analysis (CFA).

Confirmatory Factor Analysis of the Modified DigComp 2.0 Model

This study found that the fit indices in the digital literacy model and women's information have a ChiSquare value = 126,374 and a p-value = 0.000 <0.05, which means significant. The value of GFI = 0.912, CFI = 0.937 (> 0.900) means the model is fit, indicating that aspects of information and data literacy, communication and collaboration, creating digital content, security, and solving problems are theoretically appropriate and are part of digital literacy skills. AGFI value = 0.735, TLI = 0.875 (expected > 0.900) but the value (< 0.900), and RMSEA = 0.213 (expected < 0.05) but the value (> 0.05). One or two criteria of goodness of fit that have met the model are enough to conclude that the tool is acceptable. In other words, the theoretical model of digital literacy and information skills from DigComp 2.0 is satisfactory for a theoretical model for measuring digital literacy skills. In addition,

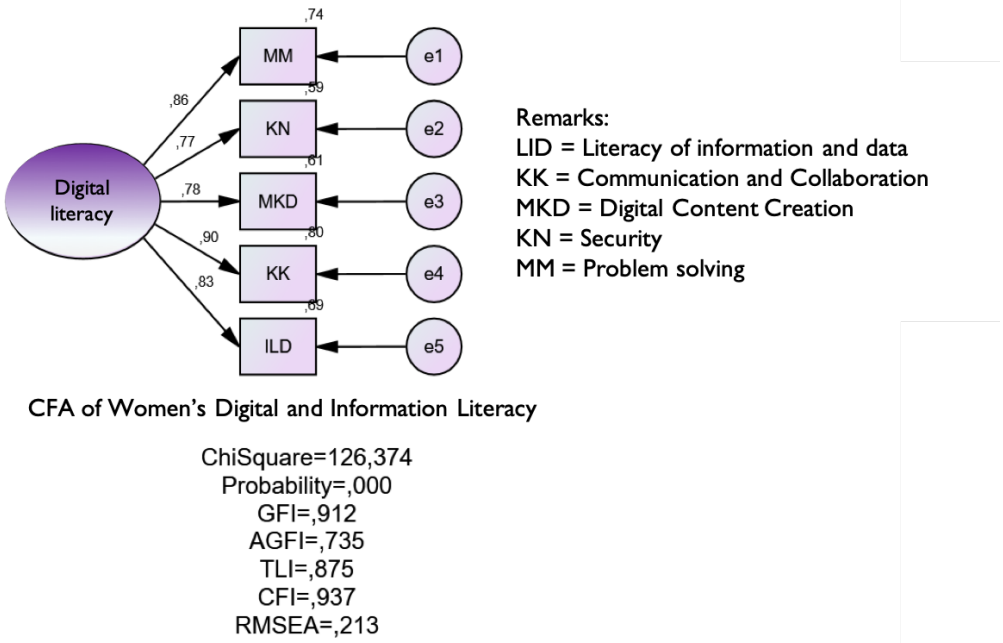

Figure 1. Diagram of the Path of DigComp 2.0

Source: Obtained from primary data (2022)

Table 3.
The Results of Reliability Construct and Extracted Variance

Variable	Aspects	Loading Standard	Construct Reliability	Extracted Variance
Women's Digital Competence	Information and data literacy	0.831		
	Communication and Collaboration	0.895		
	Digital content creation	0.782	0.916	0.687
	Digital security	0.770		
	Problem-solving	0.859		

Source: Obtained from primary data (2022)

confirmatory factor analysis has shown that the indicators and aspects that make up digital literacy skills are indicators and aspects that are appropriate and proven to be influential. The following figure portrays the path analysis diagram of the CFA.

The minimum standard of value for the reliability construct is 0.500. Table 3 depicts all seven aspects of women's digital competence, which was 0.916 or above the standard. This value indicates the items were reliable to achieve the purpose of this study. Even though the score of construct validity was 0.687 or below the ideal score of 0.700, the good result of construct reliability tolerated this score (Santrock, 2017).

Respondents Demographics

Demographic information includes the age, occupation, and domicile of the respondents. Table 4 below displays results from the primary data analysis of demographic information. We grouped respondents' ages into several categories to simplify the analysis because the gap in respondents' ages is too distant. In education, we used the 'others' option with the assumption to provide opportunities for samples whose education goes through equalization or the Package A Pursuit (Kejar Paket A) program.

From Table 4, we can see the dominant age of respondents in this study is 21 to 25. This range of age is the early stage of maturity. Piaget and Campell (2014) described media users at

Table 4.
Demographic Information

Age (years old)	**Frequency**	**Percentage (%)**
21-25	220	40.9
26-30	70	13
31-35	31	5.8
36-40	55	10.2
41-45	51	9.5
46-50	57	10.6
51-55	37	6.9
56-60	15	2.8
61-65	2	0.4
Total	538	100
Education	**Frequency**	**Percentage (%)**
Elementary School (SD)	16	3%
Junior High School (SLTP)	18	3.3%
Senior High School (SMA)	259	48.2%
Undergraduate (S1/D3-D4)	205	38.1%
Master's Degree (S2)	33	6.1%
Doctoral (S3)	7	1.3%
Total	538	100%
Occupation	**Frequency**	**Percentage (%)**
Public Officer	16	3%
Lecturer	17	3.2%
Teacher	1	0.2%
Housewife	254	47.2%
Private employee	205	38.1%
University student	33	6.1%
Part-time employee	7	1.3%
Health workers (doctor, midwife, nurse, clinical psychologist)	11	2%
Entrepreneur	26	4.8%
Retired	2	0.4%
Others	17	3.2%
Unemployed	18	3.3%
Total	538	100%

Source: obtained from primary data (2022)

this age as having the highest skill in reflective thinking, which aligns with the post-frontal that combines logic and emotional experience in solving ambiguous problems (Santrock, 2017). The table also shows that 48.2% of the respondents have finished higher education, while 38.1% hold an undergraduate degree. Education background and an individual's capability in adaptation and self-control are intertwined. As many as 47.2% of respondents considered themselves full-time homemakers without business or work affiliations, while 38.1% were employees in the private sector.

Descriptive analysis and categorisation

The categorisation is a statistical description of the research subjects based on the researcher's needs. In this study, we have divided the range of value categories into five intervals based on the assumption

Table 5.
The Categorization Score of Each Digital Competence Aspect

Tendency Interval	Score	Category	F	Percentage
Information and Literacy				
X ≥ M + 1.5 SD	≥ 36	Very high	370	68.8%
M + 0.5 SD < X < M + 1.5 SD	30 – 36	High	120	22.3%
M – 0.5 SD < X < M + 0.5 SD	25 – 29	Average	30	5.6%
M – 1.5 SD < X < M – 0.5 SD	19 – 24	Low	15	2.8%
X < M – 1.5 SD	< 19	Very low	3	0.6%
Communication and Collaboration				
X ≥ M + 1.5 SD	≥ 65	Very high	380	70.6%
M + 0.5 SD < X < M + 1.5 SD	55 – 65	High	128	23.8%
M – 0.5 SD < X < M + 0.5 SD	45 – 54	Average	27	5%
M – 1.5 SD < X < M – 0.5 SD	35 – 44	Low	2	0.4%
X < M – 1.5 SD	< 35	Very low	1	0.2%
Digital Content Creation				
X ≥ M + 1.5 SD	≥ 23	Very high	178	33.1%
M + 0.5 SD < X < M + 1.5 SD	19 – 23	High	176	32.7%
M – 0.5 SD < X < M + 0.5 SD	16 – 18	Average	87	16.2%
M – 1.5 SD < X < M – 0.5 SD	12 – 15	Low	69	12.8%
X < M – 1.5 SD	< 12	Very low	28	5.2%
Security				
X ≥ M + 1.5 SD	≥ 42	Very high	417	77.5%
M + 0.5 SD < X < M + 1.5 SD	36 – 43	High	92	17.1%
M – 0.5 SD < X < M + 0.5 SD	29 – 35	Average	19	3.5%
M – 1.5 SD < X < M – 0.5 SD	23 – 28	Low	8	1.5%
X < M – 1.5 SD	< 23	Very low	2	0.4%
Problem-solving				
X ≥ M + 1.5 SD	≥ 29	Very high	247	45.9%
M + 0.5 SD < X < M + 1.5 SD	25 – 29	High	147	27.3%
M – 0.5 SD < X < M + 0.5 SD	20 – 24	Average	88	16.4%
M – 1.5 SD < X < M – 0.5 SD	16 – 19	Low	35	6.5%
X < M – 1.5 SD	< 16	Very low	21	3.9%
Digital Competence Overall Score				
X ≥ M + 1.5 SD	≥ 247	Very high	0	0
M + 0.5 SD < X < M + 1.5 SD	209 – 247	High	250	46.65%
M – 0.5 SD < X < M + 0.5 SD	171 – 208	Average	220	40.9%
M – 1.5 SD < X < M – 0.5 SD	133 – 170	Low	59	11%
X < M – 1.5 SD	< 133	Very low	9	1.7%

Source: Obtained from primary data (2022)

Table 6.
The Digital Competence Aspects with Low and Very Low Scores for Items Measured

Aspect	Low	Very Low
Information and digital literacy	17.6%	4.4%
Communication and Collaboration	2.9%	1.5%
Digital content creation	45.6%	32.4%
Security	11.8%	2.9%
Problem-solving	33.8%	27.9%

Source: Obtained from primary data (2022)

that the subject score in a normal distribution uses six standard deviation units (Azwar, 2017). The categorisations are very low ($X \leq M - 1{,}5SD$), low ($M - 1{,}5SD < X \leq M - 0{,}5SD$), average ($M - 0{,}5SD < X \leq M + 0{,}5SD$), high ($M + 0{,}5SD < X \leq M + 1{,}5SD$), and very high ($M + 1{,}5SD < X$), in which M refers to *Mean* and SD refers to *Standard of Deviation*. We did not use standardised scores because the items of digital competence measure the level of each digital competence aspect. Azwar (2017) stated that the basis for determining norms should use hypothetical instead of empirical/Z scores because the high and low scores depend on their position in the range of possible scores obtained on the total score. The Likert rating uses a five-score scale to let subjects choose the most frequent attitude tendencies. Using continuous variables might evade the flexibility and capability for this purpose.

Based on the primary data analysis in Table 5, the descriptive test on the information and literacy aspect reached 68.8%, a very high category, and obtained an empirical mean value of 69.25 or higher than the hypothetical mean value of 50. The communication and collaboration aspect also stands in the very high category of 70.6%. This aspect obtained the empirical mean value of 20.29, higher than the hypothetical mean of 17.5. Similar results occurred in digital content creation, security, and problem-solving.

After carefully examining the digital competence aspects, we analysed further using the Naïve Bayes prediction. Naïve Bayes is a classification approach to predict performance by classifying probability estimates (R. E. Putri et al., 2014). In line with previous research (Tripathi et al., 2019; Tsangaratos & Ilia, 2016), this study found that Naïve Bayes had a precision value higher than other classifiers. Accordingly, we used Naïve Bayes to predict the determinant aspects of digital competence. Table 6 shows the results of the Naïve Bayes prediction that the responses with a low value in creating digital content and problem-solving are likely to be classified as having low digital competence.

Correlation of Digital Competence

The data showed that education has a small and negative correlation with the level of digital competence ($r = -0.236$, $p = 0.000$). This is mainly because they often avoid discussions unrelated to their profession and do not usually have any special interest in media literacy. The issue is surprising because media literacy education for those in post-secondary or higher education appears minimal or in the infancy stages (Schmidt, 2013). This means women at higher educational levels are familiar only with certain everyday media and are significantly less comfortable with various other technological, media, and digital platforms.

Discussion

Indonesia has designated a territory in the province of East Kalimantan as the future Capital City of Nusantara (IKN). Similar to how the development of Jakarta as the capital city has impacted its surroundings (Jabodetabek areas), the development of IKN will affect other cities in East Kalimantan province. Following the central government's objectives to build IKN as a superhub of economic clusters toward advanced technology and sustainability (Anirwan et al., 2024), people in East Kalimantan will be challenged by fierce competition in the future. Today, residents of

cities surrounding IKN are uncertain about their future competition (Ariyanti et al., 2022) and uneasy about how to contribute to the development of IKN (Rahmawati et al., 2023). One of the aspects that need to be considered is the limited access to the Internet due to inadequate infrastructure and equipment, considering East Kalimantan still has the second-lowest Internet penetration rate in the Kalimantan area, according to (APJII, 2022). Since women's participation has not been discussed in IKN's development plans (Jahriyah et al., 2022), women may not have sufficient digital capabilities to be involved in developing their area, severing the digital divide in the region.

The findings also show that the ability scores in all aspects of women's digital competence tend to be highly distributed. It means that women in East Kalimantan can use devices very well. There are 68% of women who have very high abilities related to information and data literacy aspects. The percentage indicates that women in East Kalimantan are accustomed to using their digital devices to browse, search, and filter data (filtering), information, and digital content and then evaluate data and digital content. Furthermore, the use of digital literacy in communication and collaboration was also high, particularly in interacting through digital technology. Psychologically, women need social support from their environment, which is why the effective contribution of digital literacy for building relationships with other people is high. This result confirms the findings of previous studies (Fauzi et al., 2020; Tisnawati et al., 2020) about the significance of digital networking in women's empowerment. Digital networking is necessary for them to seek job opportunities and economic-related activities and fulfil their sociocultural responsibilities in society (Tisnawati et al., 2020).

The capability in security aspects is also high, meaning that women who use hardware and software have adequate knowledge of the importance of security factors in using gadgets. Regarding technical security, women still need assistance from more skilled personnel, as depicted by the response scores on this item, which tend to be low. It aligns with previous studies that women tend to have low technical skills in technology (Candrasari et al., 2020; Fauzi et al., 2020; Rahayu & Haningsih, 2021).

The categorisation of digital competence scores showed that 40% of the respondents had moderate skills, 11% were at a low level, and 1.7% were at a very low level. The low levels were caused mainly by the content creation aspect, with a score of 45.6% in low and 32.4% in very low, as well as the aspect of solving problems, with 33.8% and 27.9%, respectively. This point is also observed in the work of Siahaan and Gunawan (2021) about the digital competency of university students in Indonesia, which found that digital content skills are low. Rizal et al. (2021) also discovered that digital content creation among female physics teachers was low. Moreover, Rizal et al. (2021) note that women's digital creation score is significantly below men's compared to other aspects. These findings elucidate an interesting point in the study of digital competence since the production and reproduction of digital content aspect is a strategic part of achieving personal and professional goals (Iordache et al., 2017). Besides, this finding supports Ariansyah et al. (2020), who found that all coefficients of ICT skills of digital competence in East Kalimantan are lower than the national average, including the skills related to content creation.

The data distribution in creating digital content is even in each category. Women whose abilities are very high in this aspect are only 33%, while the rest are very low at 5.2%. For the item measured, the result shows 45.6% of responses categorised as low and 32.4% as very low, which is the highest among other aspects. This result is in line with Rahayu and Haningsih (2021), who stated that most

women in their study scored the lowest in content creation competence. They assumed the finding was related to the low education level of respondents. Meanwhile, this study found that education has a small and negative correlation with the level of digital competence. Digital content creation is essential, especially for women in micro and small enterprises (MSE). Given that the predominant occupation of respondents is full-time homemaking, there is an opportunity to empower them with digital content creation skills that enable them to pursue side businesses or jobs that support families without overlooking their main responsibilities at home (Tisnawati et al., 2020).

The problem-solving aspect, i.e., how women use digital technology creatively and the ability to identify digital competency gaps, also has an even distribution. As many as 45.9% of the sample have good problem-solving skills, but 10.4% of participants have not been able to use their gadgets to help them solve problems, which has a similar result to Rahayu and Haningsih (2021) in this aspect. The participants' abilities to use devices for problem-solving are 33.8% and 27.9%. Problem-solving indicates an individual's capacity to engage cognitive processing in understanding and solving problems where the solution is unclear (OECD, 2014). This capability is essential for women's empowerment, considering that today's industry and companies need individuals who can solve problems and provide solutions using digital technology tools (Vuorikari et al., 2016). In economic and social empowerment, problem-solving ability is related to being economically independent and socially skilled in the digital world. In addition, problem-solving has a significant relationship with competence in information management and evaluation (Vuorikari et al., 2016). This relationship significantly relates to women's ability to deal with negative situations or threats in the digital world, such as hoaxes. Someone who engages in non-ethical digital content activities, for instance, hoaxes and hate speech, may be competent and aware that they have violated the rules (Vuorikari et al., 2016). Therefore, measuring the ability to create content also involves indicators of development and modification and knowledge of licenses and copyrights (Law et al., 2018).

In one of the statements in the problem-solving group that says *I understand the digital skills that need to be improved,* respondents with higher education levels mostly responded by disagreeing or strongly disagreeing. This finding indicates that women with higher education levels (aged 30 and above) are less interested in upgrading their digital skills. We analysed the open-ended question to dig deeper into the response and found that women above that age have well-established jobs, using digital software only based on their personal and work needs. Some respondents with those criteria stated they were not interested in learning or following the development of digital technology as it is time-consuming and may be challenging. AWA (39 years old, entrepreneur) wrote, "*New technology is developing and changing so quickly, so it takes time for me to learn and adapt myself in using the technology*." While N (45-year-old lecturer) says, "*It is hard to improve my knowledge of digital technology as every device and technology update is complex in its way... I cannot possibly learn it all*." This finding supported the World Wide Web Foundation study (Jellema & Brudvig, 2015), highlighting the complexity of the obstacles that made Indonesian women less interested in learning digital technology.

An equally important finding is that women's digital competence in East Kalimantan is negatively related to the level of education, meaning that higher education is not a benchmark for higher digital competence. This finding contests the result of previous studies (Ariansyah et al., 2020; Rahayu & Haningsih, 2021; Suwana & Lily, 2017; Tisnawati et al., 2020), which found the low level of digital

literacy skills of women was determined by the low level of their formal education. The essential question now is why women with high levels of education have lower digital literacy than women with a lower level of education. Women with high-level education already have a particular societal status and an adequate understanding of themselves (including their ambitions and necessities) and have already settled in a certain level of career or even a middle-up management career. In these contexts, women hold power and independence in societal structure (including in a family).

For respondents whose education level is senior high school (SMA) or undergraduate (S1), learning and following technological developments is one way to increase their identity and be known by others to be recognised and make friends more broadly. TN (a 21-year-old university student) wrote, "*Photo and video editing are important for me as a student and an endorser. I also feel satisfied having nice pictures on Instagram, and people like my content*." Meanwhile, OBP (22 years old, university student) wrote, "*…by learning how to use the new version of apps or devices, I can be more confident when hanging out with my friends... sometimes I feel kind of FOMO (fear of missing out) if I missed out an update on technology*." However, not all the respondents answered the close-ended questions, so these findings still need further research to produce more promising data. On the other hand, this finding is also in line with the result of previous studies (Long et al., 2023; Sitepu & Rajagukguk, 2022) that there is a gap in motivation to engage with technology between younger and older women.

Conclusion

Ensuring digital competence is essential for empowering women towards digital inclusivity in East Kalimantan, particularly amidst the challenges posed by IKN Nusantara and Indonesia Digital Vision 2045. This study offers the applicable instruments to assess the digital competence of women that can scrutinise influencing factors on the formation of digital competence, which have not been explored in prior studies. Regarding digital competence aspects, the results confirm that collaboration and communication scored the highest score among the five digital competence aspects. This aligns with previous studies stating that women engaging in empowerment activities can reap the benefits of networking. Based on that, this study recommends empowerment activities with a community-based design by focusing on strengthening the community and personal digital competence, especially digital content creation and problem-solving skills. Another noteworthy result is that women with higher education backgrounds tend to be less skilled in digital technology. On the practical side, the empowerment activities can segment the target based on age/generation, education, or occupation since this study assumes their motivation is different in engaging with technology.

The digital competence evaluation instrument for women presented in this study needs more comparable studies to confirm its reliability and consistency in the varied sociocultural backgrounds in the Indonesian context. This study also opens opportunities for future research that can explore the psychological variables that affect digital competence in addition to the basic knowledge studied in this study, such as self-disclosure, self-confidence, motivation, and engagement. Another unaddressed question in this research is how the level of education is negatively related to digital competence, unlike the previous studies. Future research can focus on answering this issue in detail to validate the analysis of this study.

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