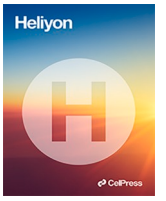
Heliyon 10 (2024) e34086

Contents lists available at ScienceDirect

Heliyon

journal homepage: www.cell.com/heliyon



Research article

Integration of technology acceptance models and government support to improve digital literacy

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ARTICLE INFO

Keywords:
Technology readiness index
Technology acceptance models
Theory of reasoned action expanded with motivation
Government support and digital literacy

ABSTRACT

Digital domain is important for the expansion of micro and small enterprises but the gap in readiness to accept the technology impacts businesses. Therefore, this research aims to build an integrated model of Technology Readiness Index, Technology Acceptance Models, and Theory of Reasoned Action expanded with Motivation and government support to increase digital literacy. There are 551 respondents consisting of owners and managers who have been running a business for at least a year. The integration model between Technology Readiness Index, Technology Acceptance Models, and Theory of Reasoned Action expanded with Motivation increases digital literacy, while government support positively influences the variable. The model emphasizes optimism and innovation as key factors in enhancing the construct of Technology Readiness Index model. The results show that there is a strong foundation for the establishment of Technology Acceptance Models and Theory of Reasoned Action expanded with Motivation aimed at supporting digital literacy. This contributes to developing knowledge about the integration model for digital technology acceptance. Practical contributions guide the government in creating appropriate policies to increase digital literacy in SMEs.

1. Introduction

Digital technology significantly improves business performance in Small and Micro Enterprises (SMEs) [1–3]. However, the adoption is limited, specifically in rural areas [4,5], and this creates a gap in the usage [5–7]. Based on Kominfo.go.id data, 32 % of the total 64 million or 20,480,000 Indonesian SMEs have adopted digital technology to improve marketing using cell phones and other computer devices [6]. Traditionally, mobile telephone communications are carried out in daily activities [7,8].

Some problems arise regarding the readiness to accept and use technology related to behavior. In this context, digital literacy (DL) requires knowledge readiness to access and process information, make business decisions, as well as provide information according to customer needs. The limitations of SMEs in having digital literacy skills are very different from large companies [9–11]. Applications to facilitate business performance have become commonplace for large companies due to the financial resources to increase capabilities [12]. There are limited resources and knowledge about risks, procedural complexity, and technical challenges [13,14]. Therefore, this research aims to build digital literacy skills by exploring technology readiness index (TRI) model on technology acceptance model (TAM) and Theory of Reasoned Action extended with Motivation (TRAM). Previous research explained that TRI was a theory related to the cause and effect of perceived usefulness (PU) and perceived ease of use (PEOU), which produced motivation to use digital technology intensively through attitude (AT) [15], and intention to use (ITU).

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https://doi.org/10.1016/j.heliyon.2024.e34086
Received 24 February 2024; Received in revised form 30 June 2024; Accepted 3 July 2024
Available online 5 July 2024

This research integrates four critical aspects of TRI model (optimism/OPT, innovation/INO, discomfort/DC, and insecurity/INSE) into TAM and TRAM. Previous results provided different concepts regarding the formation of TAM and TRAM, which originated from TRI. Essential aspects of TRI have different influences on PU, PEOU [16–19], and TRAM [20,21]. The difference in the contribution of the model is due to differences in factors causing disparities in the influence of TAM and TRAM. According to previous research, optimism and innovation are the most determining factors of behavior change in the models. These variables are considered to be able to solve the problems of discomfort and insecurity, which are obstacles to increasing digital literacy [22].

Considering the current condition of SMEs in Jambi City, Indonesia, the benefits and convenience of technology are limited to business communications using cell phones and have not answered broad business needs. Technology adoption can be increased with a wide market even though SMEs are simple in adopting technology [3]. Integration of TRI in TAM and TRAM leads to different behaviors and the integration greatly influences digital literacy, such as web skills to show products attracting buyers [23]. Previous results did not integrate TRI, TAM, and TRAM into digital literacy [1,19,20,24,25]. Therefore, this research contributes to overcoming the weaknesses observed in previous literature, providing a model capable of building digital literacy skills. There is also a program for strengthening digital literacy in SMEs [3,26,27]. Kayikci et al. [28] and Kumart et al. [29] reported that the government did not support the readiness to accept digital technology.

2. Literatur review and hypothesis development

2.1. Technology readiness index (TRI)

Technology Readiness (TR) is the reason for a society to accept or reject technology. TR refers to a perspective or mindset regarding the contribution to work as well as determining obstacles in the form of insecurity and discomfort [18]. The variable is measured to determine readiness based on confidence in using technology through TRI. According to Parasuraman and Colby [30,31], TR describes a perception of using technology, classifying the level of usage into five segments, namely explorer, pioneer, skeptic, paranoid, and slow. In TRI Model, higher scores are for optimism and innovation in explorer and pioneer segments [30,31]. Meanwhile, discomfort and insecurity are part of skeptical, paranoid, and slow groups. The measurement results of TRI model are also determined by differences between cultures [32], influencing the readiness to accept digital technology. Several previous results measured TRI using four dimensions, namely optimism, innovation, discomfort, and insecurity [31,33,34]. Therefore, this current research follows up on previous results using the dimensions of optimism and innovation as contributors and inhibitors in the form of discomfort and insecurity.

2.2. Technology acceptance models (TAM)

TAM shows technological readiness as well as the benefits and convenience of technology used. The model explains the ability to adopt information technology in the work environment [35] According to the model, a person's acceptance of technology is influenced by intention, which is shaped by belief in the perceived benefits and ease of using the technology for conducting business activities [36]. TAM explains the reason for accepting and rejecting new technologies based on perceptions. The model shows the rationale behind users' reliance on technology to attain convenience and obtain benefits through payments using cellular telephone [25], internet and online shopping [37,38], e-government [39], and digital technology [1,40]. TAM focuses on two primary constructs namely [1] PU, referring to a person's view of the extent technology can improve performance or effectiveness in carrying out specific tasks [2]. PEOU characterizes the perceptions regarding the simplicity of learning and using technology.

2.3. Theory of Reasoned Action extended with motivation (TRAM)

TRA is a theory that explains the positive or negative behaviors of a person. The theory shows the mechanisms through which a person or organization can influence behavioral intention [41]. The development of TRA is related to the Theory of Planned Behavior (TPB). The two theories focus on constructs related to personal motivational factors. Additionally, TRA can explain the behavior of SMEs in deciding to use digital technology to improve business performance. In this context, the theory includes attitude, subjective norm, behavior, and intention. Attitude refers to a person's ability to adopt a behavior, including the perception and evaluation of subsequent assessment. Subjective norms are evaluations perceived by others towards the adoption of certain behaviors [42]. This research measures TRAM in SMEs by analyzing positive behavior in the form of attitude towards digital technology, providing Motivation in the form of intention to use (ITU) technology.

2.4. Digital literacy

SMEs can access digital technology, which requires knowledge [43]. Digital literacy results in the ability to understand, obtain, and use information through facilities such as computers connected to the Internet. SMEs are expected to improve and possess a lower level of capability than large companies [12,44]. The application of digital technology is difficult due to age factor [45], causing cognitive abilities to decline.

Digital literacy requires readiness to accept technology and competence as well as self-confidence to create a sense of security [43]. Newly developing SMEs need to be more oriented due to vulnerability to the negative impacts of technology. These impacts affect the adaptation to change [46] and acceptance of technology in the form of ease of benefit and use. Literacy skills are related to TR, TAM,

and TRAM in adapting organizational conditions to the demands of technological developments toward success [47]. Embracing technology and enhancing digital literacy are essential strategies for adaptation and survival [48]. Furthermore, digital literacy solves business problems such as financial [49], information, interaction and collaboration, security, and problem-solving literacy [50]. The variable requires ease in using technology and experiencing the benefits of technology to motivate SMEs. Changes in consumer behavior to meet needs require SMEs to increase digital literacy and the motivation is supported by the government.

2.5. Government support

Government support also determines the success of SMEs in the era of digitalization. Digital domain cannot be avoided since all business processes are connected to internet services. Government support improves skills and contributes to economic growth by promoting the adoption of digital technology and innovation. Meanwhile, SMEs in developing regions require assistance with digital literacy [43]. There is an increased level of support for providers of infrastructure and facilities such as network expansion and service licensing [40,44]. However, digital gap is prominent in technological readiness since the support has not been directed towards digitalization skills [45,46]. In this context, support needs to be evaluated to motivate SMEs in solving digital problems [28,47]. The current research measures government support through the implementation of different programs.

2.6. Relationship between TRI and TAM

TRI consists of four components, namely optimism, innovation, discomfort, and insecurity. The model is the cause of the behavior of accepting technology and the aspect describes the mental condition of a person in viewing technology in the form of readiness [48]. The influence of the model for PU and PEOU is specific because of the differences in perspective [48]. Meanwhile, the contribution of TRI to TAM produces different behaviors and two decisions. The first decision of TRI as a contributing factor is related to the adoption of new technology. The second decision as an inhibitor factor prevents the continuation of using or developing new technology [30].

The dimension in TRI Optimism model refers to the level of confidence in using technology [49]. In this context, people with high optimism feel the benefits and ease of using technology [19]. TRI model shows the extent of innovation and the motivation results in technological benefits. Conversely, discomfort arising from different technological difficulties may lead to discontinuation of technology use [19]. This can be controlled by making improvements to change the uncomfortable condition. Similarly, insecurity can lead to anxiety, allowing a person to consider leaving technology. Previous research proved that contributory factors had a positive relationship with PU and PEOU [17,19,36]. Based on the results, the hypotheses proposed are as follows:

H1-2 = Optimism has a positive association with PU and PEOU.
H3-4 = Innovation has a positive association with PU and PEOU.
H5-6 = Discomfort has a negative association with PU and PEOU.
H7-8 = Insecurity has a negative association with PU and PEOU.
H9 = PEOU has a positive association with PU.

2.7. Relationship between TRI and TRAM

The integration of TRI into TRAM strengthens attitudes and intentions to use digital technology. Previous research found that technology readiness positively affected the intention to use technology, while security issues did not affect the intention to use technology [50]. Optimism and innovation influence attitudes and intentions to use technology [20]. The limitations of testing the TRI construct of optimism, innovation, discomfort, and insecurity on attitudes and intentions to use were discussed [20]. These measurements assess Parasuraman's TRI model [31] as a basic concept or fundamental perspective on technology. Based on the results, the hypotheses proposed are as follows:

H10-11 = Optimism has a positive association with attitude and intention to use technology.
H12-13 = Innovation has a positive association with attitude and intention to use technology.
H14-15 = Discomfort has a negative association with attitude and intention to use technology.
H16-17 = Insecurity has a negative association with attitude and intention to use technology.

2.8. Relationship between TAM and TRAM

The relationship between TAM and TRAM increasingly explains the impact of the benefits and convenience of technology, promoting the development of positive behavior using the continuous technology model. Natural behavior is developed after experiencing the benefits and convenience of technology [9,51,52] Previous research explained that perception of usefulness can increase behavioral attitude. Similarly, PEOU may not motivate a person to adopt technology due to difficulties and negative attitude [53]. According to Kim, TAM dimensions have a positive effect on intention to use the technology [54]. Rahayu and Day showed that SMEs were motivated to use e-commerce technology because of the perceived benefits. Therefore, the benefits of e-commerce motivate SMEs to continue using technology [55]. Another research explained that technology could be adopted continuously because of perceived benefits in the trading process [56]. Based on the result, the hypotheses proposed are as follows:

H18-19 = PU has a positive association with attitude and intention to use technology.
H20-21 = PEOU has a positive association with attitude and intention to use technology.

2.9. Relationship between TRI, TAM, TRAM, and digital literacy

Digital literacy includes skills in using, accessing, filtering, evaluating, creating, programming, and sharing digital content [57]. These skills relate to readiness, accepting technology by experiencing the benefits and PEOU, as well as the motivation to obtain a positive attitude and intention. Digital literacy is an essential skill to adapt organizational conditions to the demands of technological developments toward success [58]. TR, TAM, and TRAM models generate skills, promoting individuals to take action in using digital platforms such as transactions and understanding various marketing applications [59]. In this research, TRI is used to improve TAM and TRAM, hence, the impact on digital literacy is only explained by the model.

Several SMEs have carried out marketing by using conventional digital media such as Guardian Sustainability Blog, CSRwire, Triple Pundit, and CSR Blog in Forbes, to increase reach [60]. Therefore, TAM can improve digital literacy skills after experiencing the benefits and PEOU. The model provides the benefit of improving digital literacy skills [61]. TRAM emphasizes the development of attitude and intention due to motivation to enhance abilities. A person's willingness to solve business problems using technology depends on attitude and intention. High attitude and intention to use technology can also improve digital skills [62]. Based on the result, the hypotheses proposed are as follows:

H22-23 = TAM on PU and PEOU has a positive effect on digital literacy.

H24-25 = TRAM on attitude and intention to use has a positive effect on digital literacy.

2.10. The relationship between government support and digital literacy

SMEs in developing countries need help with digitalization skills [63] through a learning process [64,65]. Previous research found that institutional support was considered the most influential factor, specifically in adopting digital technology [50,66,67]. Government policy should prioritize the requirements of SMEs, particularly in adopting digitalization [68]. Based on the result, the hypothesis proposed is as follows:

H26 = Government support has a positive association with digital literacy.

All hypotheses (H1–H26) can be explained in Fig. 1.

3. Method

3.1. Sample and data collection

The sample in this research was owner-managers and closed questions were asked according to the conditions and circumstances of business. The selection process relied on purposive sampling to obtain respondents who had been engaged in business for a minimum of 1 year based on accessibility and affordability. Furthermore, questionnaires were distributed using field instructors from the Department of Cooperatives as well as SMEs and students empowered to visit business actors. Field instructors and students were given explanations and guidance regarding the questionnaire.

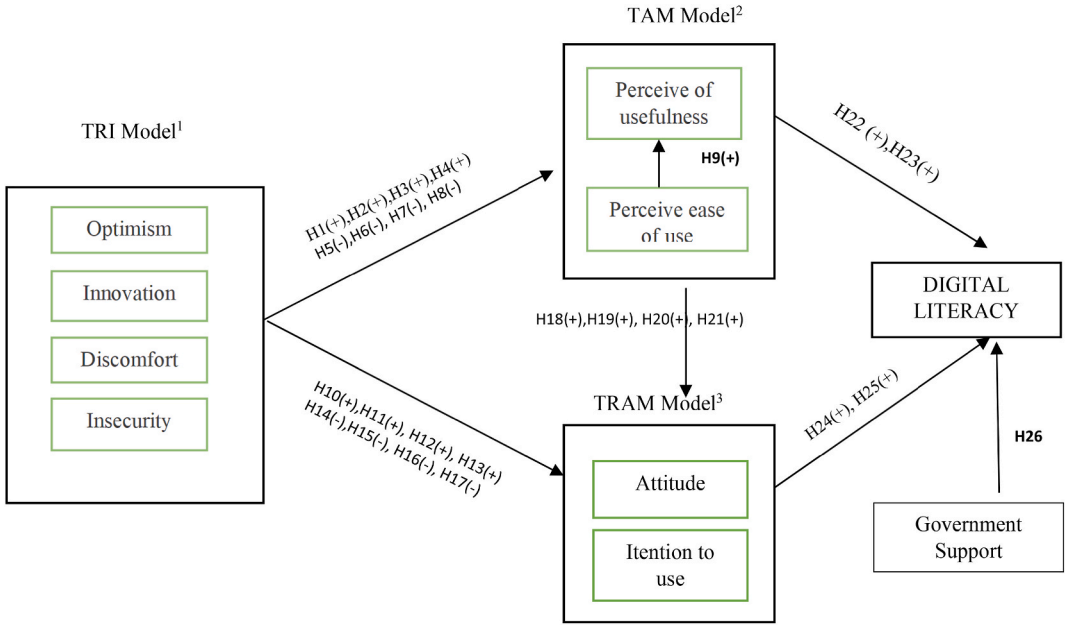

Fig. 1. TRI, TAM, TRAM Integration and Government Support Model strengthens digital literacy.

The research instrument uses 5 Likert scales, starting from 1, "strongly disagree," to 5, "strongly agree." A total of 30 questionnaires were distributed to respondents to ensure the ability of providing answers. Furthermore, the validity of distributing the first questionnaire was carried out using a validation and reliability test to avoid inaccurate measuring of the construct.

A total of 580 questionnaires were collected in a month and the answers provided were re-examined. Currently, there are only 551 questionnaires suitable as samples due to partial filling and removal of data. The sample size meets the requirements based on Kerlinger and Lee [69], stating that the minimum is 30 respondents. After the sample was confirmed, two stages of testing were carried out to test the measurement and structural models in assessing the level of relationship between variables.

3.2. Measure

To test the hypothesis, the variables use previous concepts to measure TRI through four dimensions, including optimism, innovation, discomfort, and insecurity [31,33,34]. The measurement of TAM uses the dimensions of PU and PEOU [1,31]. Meanwhile, TRAM measures attitude and intention to use technology [36]. The model measures digital literacy with five abilities, namely information, interaction and collaboration, digital content, security, and problem-solving [58]. Bakar et al. and Etim [70,71] were considered in measuring government performance to support digital literacy.

3.3. Data analysis

Data analysis uses inferential analysis to determine the magnitude of the influence of exogenous variables on endogenous. The inferential analysis adopts structural equation modeling (SEM) developed from economic and regulatory principles of psychology and sociology [72]. SEM model with Smart PLS (Partial Least Square) program shows unobserved concepts in relationships and determines measurement errors in the estimation process. Furthermore, the analysis with Smart PLS program can assess the reliability and validity of each construct. The interpretation of PLS is carried out to evaluate measurement models using convergent and discriminant validity. Convergent validity assesses indicator reliability, average variance extracted (AVE), and composite reliability (CR).

Discriminant validity should be determined using the Fornel method [73] to compare each construct's square root of AVE with the variance between constructs. Specifically, Fornell-Larcker Criterion method evaluates discriminant validity by comparing AVE with the correlation between latent variables. Discriminant fact is fulfilled when AVE is greater than correlation between latent variables. Conversely, when AVE is smaller than correlation between latent variables, the discriminant validity is not fulfilled. Heterotrait – Monotrait (HTMT) Ratio method is also used for discriminant evaluation, as reported in Table 3. This method compares the correlation between similar (monotrait) and different (heteroit) latent variables. In particular, HTMT method evaluates discriminant validity by

Table 1
Respondents' profile.

Item	Frequency	Percentage %
Age of the owner-manager		
20–30	102	18
31–40	159	29
41–50	216	39
51–60	64	12
>70	9	2
Total	**551**	**100**
Level of Education		
Elementary level	26	5
Junior High School	57	10
Senior High Scool	316	57
Collage	152	28
Total	**551**	**100**
Gender		
Female	452	82
Male	99	18
Total	**551**	**100**
Owner-manager experience (year)		
1–5	352	64
6–10	123	22
11–15	44	9
16–20	19	3
21 and above	13	2
Total	**551**	**100**
Type of business	52	9
Craft	297	54
Culinary	80	15
Fashion	122	22
Other businesses (Trade and services)	**551**	**100**
Total		

Source: results of data collection (2023)

Table 2
Convergent validity.

Construct and indicators	Indicator	Loading Factor
TRI	Optimism *CA = 0.870; CR = 0.905; AVE = 0.657*	0.784
	• Digital technology can control business activities	0.827
	• Products or services that use technology provide convenience for users	0.798
	• Digital technology makes it easy to access information at any time	0.822
	• Current advances in digital technology will make all business matters easier	0.823
	• I am optimistic that technology will be able to answer my business needs	0.831
	Innovation *CA = 0.821; CR = 0.882; AVE = 0.650*	0.852
	• Other business people ask me about digital technology	0.823
	• I can find products or services that have used high technology through my efforts	1.000
	• I always follow developments in the latest digital technology applications	0.869
	• I like the challenge of learning digital technology	0.918
	Discomfort *CA = 1.000; CR = 1.000; AVE = 1.000*	0.874
	There are complications in using technology because I do not understand it	0.728
	Insecurity *CA = 0.874; CR = 0.912; AVE = 0.723*	
	• I am worried that the system will make an error when I make a non-cash payment through cellphone	
	• I feel unsafe making financial transactions online	
	• I feel that I cannot protect my data properly if I use digital technology	
	• I feel unsafe using digital technology because there are many online scams	
TAM	Perceived Usefulness *CA = 0.877; CR = 0.907; AVE = 0.620*	0.758
		0.801
	• All business information can be immediately known using technology	0.827
	• Technology makes it easy to reach many buyers in all regions	0.809
	• Digital technology makes the electronic payment process easier	0.792
	• With digital technology, business networks are increasingly easy to reach	0.735
	• Digital technology provides access to resources and training that can help SMEs continue to learn and develop by taking online courses	0.783 0.823
	• By adopting the right cybersecurity measures, digital technology can help SMBs protect customer data, transactions, and other business information from cybersecurity threats	0.806 0.833
	Perceived Ease of Use *CA = 0.849; CR = 0.893; AVE = 0.625*	0.702
	• I think digital technology is easy to learn	
	It is not difficult to use online sales applications such as Shopee, Lazada, Tokopedia, Bukalapak, Market Place, and others.	
	• It is very easy to become proficient in using non-cash payment applications through mobile phone	
	• In my opinion, digital technology will be easy to apply if there are instructions or guidance on how to use it	
	• Using various sales applications can be learned through the internet	
	• The ease of using digital technology requires high technical knowledge or skills to operate	
TRAM	Attitude *CA = 0.910; CR = 0.928; AVE = 0.649*	0.814
		0.788
	• I am passionate about following technological developments	0.840
	• Digital technology can provide solutions to many business problems	0.731
	• Have the motivation to increase sales by using digital technology	0.839
	• Have the courage to sell live using digital technology applications.	0.811
	• Have an open attitude towards digital technology and are willing to learn and adapt to constantly changing technological developments.	0.813 0.805
	• Digital technology makes me love and want to know more about what customers think about products or services	0.840
	• Digital technology makes me want to interact with buyers anywhere	0.842
	Intention to Use *CA = 0.878; CR = 0.911; AVE = 0.673*	0.854
		0.755
	• Currently, my business is very dependent on the use of technology	
	• I know customer comments about products and services intensively or continuously using digital technology	
	• I am enthusiastic and proactive in using digital technology.	
	• To increase sales I have to use digital technology continuously	
	• I use non-cash payments more often than cash payments in my business	
Digital Literacy	*CA = 0.872; CR = 0.913; AVE = 0.723*	0.884
	• The ability to increase information literacy (the process of obtaining business information) through digital technology.	0.876 0.792
	• Have the ability to interact and collaborate with buyers, business partners, and suppliers using digital technology	0.847
	• Ability to create and develop digital content	
	• Security literacy can avoid harmful content, such as data loss or fraud	
Government Support	*CA = 0.825; CR = 0.919; AVE = 0.851*	0.929
	The government has provided digitalization training such as e-commerce and others	0.915
	The government provides infrastructure to support access to digital technology	

Notes: TRI: Technology Readiness Index, TAM: Technology Acceptance Model, TRAM: Theory of Reasoned Action extended with Motivation, CA: Cronbach Alpha significant more than 0.6, CR Composite reliability is significant more than 0.7, AVE: Average Variant Extracted determines convergent validity for all indicators representing the construct significant level of more than 0.5.

comparing the correlation between measurement variables with monotrait and heteroit. Discriminant validity is considered fulfilled when HTMT value is less than 0.9. Furthermore, the variable can be seen from the loading factor based on Hair et al. [72], where value greater than 0.7 is acceptable.

Before testing the relationship between variables, the variance inflation factor (VIF) value must be determined to determine the presence of bias in the regression results. Hair et al. [73] explained that a VIF value below three already indicates an ideal value. Apart from testing VIF, the next step is to assess the model's quality, which shows the model's strength using the coefficient of determination (R2) and effect size (F2). The criteria for determining the R2 value are a strong model with a value of 0.67, a medium model with a value of 0.33, and a weak model with a value of 0.19 [74]. The influence of each variable in this research can be used using an effect size (f2) with a power value of 0.02, meaning a small influence, 0.15 a medium influence, and 0.35 a large influence.

4. Results

4.1. Respondents' characteristics

The research sample consists of 551 SMEs whose characteristics have been identified, including age, education, occupation, as well as type and length of business. The most dominant age of SMEs is between 41 and 50 around 39 %, as reported in Table 1. According to Jo, Yang, and Yan [37], age determines a person's ability to accept and use digital technology. The use of digital technology is also strengthened by gender and education [58]. In this case, respondents had a high school education level of 57 % with the female gender being 82 %. The maximum duration of SMEs business is around 1–5 years, where looking for opportunities to survive and develop, cannot be avoided. The type of SMEs that received the most responses was culinary sector at 54 %

4.2. Common Method Bias

This research did not find problems with Common Method Bias (CMB) because the results obtained for Common Method Bias were still below 3.3. According to Podsakoff et al. Al [75] stated that the possibility in the data collection process will always exist if data is collected from the same source and simultaneously, so it can create a risk of consistency in a study. Proving the results of this research uses the Variance Inflation Factor (VIF) value. If all VIF test results are equal to or lower than 3.3, then the model is considered free from CMB [76]. The VIF test results can be seen in Table 4, explaining that all indicators in the research are free from CMB problems.

4.3. Measurement models

To increase digital literacy, two measurements of TRI, TAM, and TRAM integration models were conducted. Table 2 shows the measurement model for testing the instrument by evaluating validity and reliability. Furthermore, validity tests comprise convergent and discriminant validity. Convergent validity includes AVE, CR, and discriminant validity of factor loadings. Table 3 shows the evaluation of discriminant validity through the method of [77,78]. According to the criteria of Fornell and Larcker (Fornell and Larcker, 1981), the correlation between constructs can be compared with the square root of AVE. The diagonal construct must be

Table 3
Validity discriminant.

		AT	DL	DC	GV	ITU	INO	INSE	OPT	PEOU	PU
Fornel-Larcker criterion	AT DL	0.806	0.850	1.000	0.992	0.820	0.835	0.850	0.811	0.764	0.777
	DC	0.694	−0.269	−0.0.001	0.383	0.618	−0.045	−0.052	0.543	0.706	
	GV	−0.192	0.546	−0.195	0.358	−0.118	0.323	−0.066	0.655		
	ITU	0.444	0.712	−0.270	−0.065	0.397	0.558	−0.090			
	INO	0.667	0.687	−0.004	0.732	0.534	0.653	−0.122			
	INSE	0.594	−0.089	0.011	0.308	0.605	0.556				
	NGV	−0.074	0.492	−0.172	0.449	0.601					
	OPT	0.395	0.521	−0.272	0.414						
	PEOU	0.613	0.713	−0.204							
	PU	0.696	0.608								
		0.726									
Heterotrait-Monotrait (HTMT) ratio	AT DL	0.775	0.283	0.025	0.445	0.780	0.052	0.055	0.636	0.841	
	DC	0.200	0.644	0.209	0.445	0.126	0.385	0.074	0.753		
	GV	0.511	0.800	0.305	0.070	0.445	0.673	0.106			
	ITU	0.736	0.825	0.019	0.855	0.605	0.819	0.129			
	INO	0.701	0.092	0.059	0.362	0.717	0.674				
	INSE	0.076	0.558	0.183	0.555	0.682					
	NGV	0.437	0.591	0.289	0.491						
	OPT	0.686	0.839	0.219							
	PEOU	0.810	0697								
	PU	0.816									

Note(s): The square root of AVE is shown diagonally in italics, AT: Attitude, DL: Digital Literacy, DC: Discomfort, GV: Government, ITU: Intention to use, INO: Innovation, INSE: Insecurity, OPT: Optimism, PEOU: Perceived ease of use, PU: Perceived usefulness.

Table 4
Results of hypotheses testing.

No.	Relationship	β	t- statistics	P- Value	Effect Size (F2)	Confidence Interval (95 %)	VIF	Decision
H1	OPT →PU	0.362	9.130	0.000	0.194	[0.281; 0.441]	1.689	Support hypotheses
H2	OPT → PEOU	0.287	6.696	0.000	0.102	[0.202; 0.370]	1.530	Support hypotheses
H3	INO→ PU	0.008	0.185	0.853	0.000	[-0.071; 0.096]	1.958	Support hypotheses
H4	INO→ PEOU	0.441	10.632	0.000	0.238	[0.348; 0.517]	1.584	Support hypotheses
H5	DC→PU	0.015	0.580	0.562	0.001	[-0.041; 0.065]	1.091	Support hypotheses
H6	DC→ PEOU	−0.105	3.256	0.001	0.020	[-0.161-0.040]	1.070	Support hypotheses
H7	INSE→ PU	−0.060	1.881	0.928	0.061	[-0.116; 0.001]	1.012	Support hypotheses
H8	INSE→PEOU	−0.061	1.991	0.136	0.047	[-0.123; 0.002]	1.005	Support hypotheses
H9	PEOU→PU	0.496	12.174	0.000	0.316	[0.416; 0.569]	1.923	Support hypotheses
H10	OPT →AT	0.121	3.182	0.002	0.023	[0.047; 0.242]	2.014	Support hypotheses
H11	OPT→ ITU	0.087	2.010	0.045	0.009	[-0.001; 0.171]	2.014	Support hypotheses
H12	INO→AT	0.163	3.955	0.000	0.107	[0.077; 0.240]	1.959	Support hypotheses
H13	INO→ ITU	0.348	7.460	0.000	0.124	[0.258; 0.436]	1.959	Support hypotheses
H14	DC→ AT	0.016	0.601	0.548	0.000	[-0.034; 0.064]	1.091	Support hypotheses
H15	DC→ ITU	−0.010	0.038	0.736	0.001	[-0.075; 0.049]	1.091	Rejected hypotheses
H16	INSE→AT	0.022	0.864	0.388	0.001	[-0.026; 0.071]	1.021	Rejected hypotheses
H17	INSE→ITU	−0.046	1.348	0.178	0.004	[-0.110; 0.022]	1.021	Rejected hypotheses
H18	PU→ AT	0.342	7.839	0.000	0.330	[0.264; 0.432]	2.483	Support hypotheses
H19	PU→ ITU	0.235	5.179	0.000	0.099	[0.152; 0.321]	2.483	Support hypotheses
H20	PEOU→ AT	0.314	6.359	0.000	0.110	[0.218; 0.401]	2.535	Support hypotheses
H21	PEOU→ITU	0.150	3.014	0.003	0.018	[0.047; 0.242]	2.535	Support hypotheses
H22	PU→ DL	−0.0.064	1.646	0.360	0.100	[-0.138; 0.010]	2.545	Rejected hypotheses
H23	PEOU→ DL	0.335	7.421	0.000	0.023	[0.239; 0.427]	2.535	Support hypotheses
H24	AT →DL	0.164	3.938	0.000	0.029	[0.086; 0.244]	2.971	Support hypotheses
H25	ITU→ DL	0.362	7.950	0.000	0.215	[0.272; 0.453]	1.947	Support hypotheses
H26	GV→DL	0.210	6.002	0.000	0.107	[0.145; 0.284]	1.318	Support hypotheses
R^2 Perceive of Usefulness → 0.596; R^2 Perceive Ease of Use → 0.480; R^2 Attitude → 0.606: R^2 Intention to Use → 0.491 R^2 Digital Literacy → 0.688								

Note(s): AT: Attitude, DL: Digital Literacy, DC: Discomfort, GV: Government Support, ITU: Intention to use, INO: Innovation, INSE: Insecurity, OPT: Optimism, PEOU: Perceived ease of use, PU: Perceived; VIF, Variance Inflation Factor.

superior to the construction outside the relevant diagonal [78]. Meanwhile, the discriminant validity can be obtained from the loading factor based on Hair et al. [72], where a value greater than 0.7 is acceptable.

Table 2 explains that all constructs and dimensions are more valid with a Cronbach's Alpha significance level of 0.6. AVE shows convergent validity for the dimensions representing constructs with a significance level of more than 0.5. The construct items and dimensions meet composite reliability with a significance level of more than 0.7. The model has discriminant validity by proving that there is a better AVE square root value for each construct greater than the correlation value.

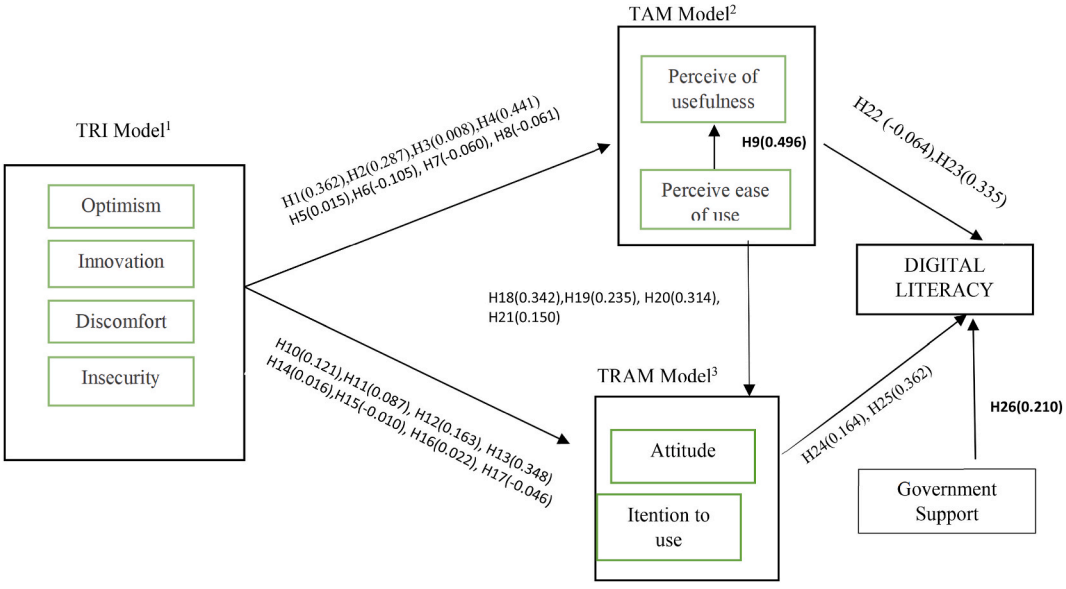

Fig. 2. Results Model with Smart-PLS Software (Bootstrapping result calculations).

4.4. Hypothesis test

4.4.1. Model structure

Hypothesis testing is carried out using Bootstrapping result calculations (Fig. 2), which explain the relationship between variables. The impact of relationships between variables is assessed using p-values. These variables have a positive relationship when the p-value is less than or equal to 0.05. Hypotheses in H1, H2, H3, H4, H5, H6, H7, and H8 of the integration model measure the extent to which four TRI aspects can influence TAM. The results show that optimism and innovation (H1 –H4) with conditions (H1, $\beta = 0.362$, $P = 0.000$; H2, $\beta = 0.287$, $P = 0.000$; H3, $\beta = 0.008$, $P = 0.853$; H4, $\beta = 0.441$, $P = 0.000$) and (H9, $\beta = 0.496$, $P = 0.000$) have a positive effect on PU and PEOU. Meanwhile, discomfort and insecurity with conditions H5–H8 (H5, $\beta = 0.015$, $P = 0.562$; H6, $\beta = -0.105$, $P = 0.001$; H7, $\beta = -0.060$, $P = 0.928$; H8, $\beta = -0.061$, $P = 0.136$) have a negative effects on the variables, except H5 have a positive effect.

H10–H13 with the results of the supporting factor hypothesis (H10, $\beta = 0.121$, $P = 0.000$; H11, $\beta = 0.087$, $P = 0.002$, H12, $\beta = 0.163$, $P = 0.000$, H13, $\beta = 0.348$, $P = 0.000$) suggest that there is a positive relationship between optimism and innovation with attitude and intention to use technology. H14–H17 with conditions (H14, β, 0.016, $P = 0.548$, H15, $\beta = -0.010$, $P = 0.736$, H16, $\beta = 0.022$, $P = 0.388$, H17, $\beta = -0.046$, $P = 0.178$) state that there is a negative relationship between insecurity and the intention to use technology. Digital literacy cannot be explained even though the relationship between discomfort as well as attitude and intention to use is positive since the hypothesis is rejected. The same result is reported in the relationship between insecurity and attitude.

The hypothesis results in H18–H20 (H18, $\beta = 0.342$, $P = 0.000$; H19, $\beta = 0.235$, $P = 0.000$; H20, $\beta = 0.314$, $P = 0.000$; H21, $\beta = 0.150$, $P = 0.000$) shows that TAM can strengthen TRAM. The direct influence of TAM and TRAM models resulting from the integration of TR (H22 – H25) with conditions (H22, $\beta = -0.064$, $P = 0.360$) suggests that there is a negative relationship between PU and digital literacy. The hypothesis results (H23, $\beta = 0.335$, $P = 0.000$) show that PEOU has a positive relationship with digital literacy. TRAM reports H24, $\beta = 0.164$, $P = 0.000$ where attitude has a positive effect on the variable. For H25, where $\beta = 0.362$ and $P = 0.000$, intention to use affects digital literacy. Testing the hypothesis of institutional support proves that government institutions influence the variable (H26, $\beta = 0.210$, $P = 0.000$).

The regression results with Bootstrapping in Table 4 show the strength of the model explained by R2, which is that digital literacy is a strong model built from the integration of the TRI, TAM, and TRAM models with an R2 value of 0.688. The influence between variables explains this model's effect size (f2); some variables are still weak, namely below 0.02 and moderate, with values above 0.15 and a large influence above 0.35. Overall, this integration model is a strong model for building digital literacy in SMEs in Jambi City.

4.5. Impact–performance map analysis

Table 5 shows IPMA results for digital literacy to identify constructs of performance and importance relatively high [61]. The results found that TRI construct had higher optimism performance (optimism = 74,699, innovation = 63,811, discomfort = 51,407, insecurity = 45,965) compared to TAM (PEOU = 65,563 and PU = 73,977). However, for the suitability of TRI, innovation had a higher level of importance at 1.067. PEOU had a higher importance of 1.470 than optimism, innovation, discomfort, and security at 0.980, 1.070, −0.089, and −0.106, respectively. Innovation was more prominent at the significance level between TRI and TAM. TRAM construction resulting from IPMA showed a higher level of interest attitude than PU ($0.661 > 0.416$) and lower than PEOU ($0.661 < 1.470$). Performance attitude was higher in TRI construct except for optimism ($71{,}044 > 63{,}811$; 51,407; 45,965). For the intended use, the performance was below TAM model ($59{,}358 < 73{,}977$; 65,563). The level of importance showed that intention to use was higher than attitude ($0.974 > 0.661$), but performance was lower ($59.358 < 71.044$). The influence between models from hypotheses H1–H26 is presented in Fig. 3 and Table 4 as TRI, TAM, and TRAM integration.

5. Discussion

H1–H8 integration of TRI on TAM and H10 – H 17 on TRAM explain the condition. The readiness of SMEs to accept technology on supporting factors has different results in influencing TAM and TRAM. The condition of TRI is the cause of changes to TAM and TRAM [18]. Some of the causes of TRI model conditions in SMEs come from external factors, including personality differences such as optimism, innovation, discomfort, insecurity, or differences in situations and variables [79,80].

Table 5
Importance–performance map of the target construct digital literacy.

Constructs	Digital Literacy	
	Important	Performance
OPT: Optimism	0.980	74.699
INO: Innovation	1.067	63.811
DC: Discomfort	−0.089	51.407
INSE: Insecurity	−0.106	45.965
PU: Perceived usefulness	1.470	65.563
PEOU: Perceived ease of use	0.416	73.977
AT: Attitude	0.660	71.044
ITU: Intention to use	0.974	59.358
GV: Government Support	0.575	64.552

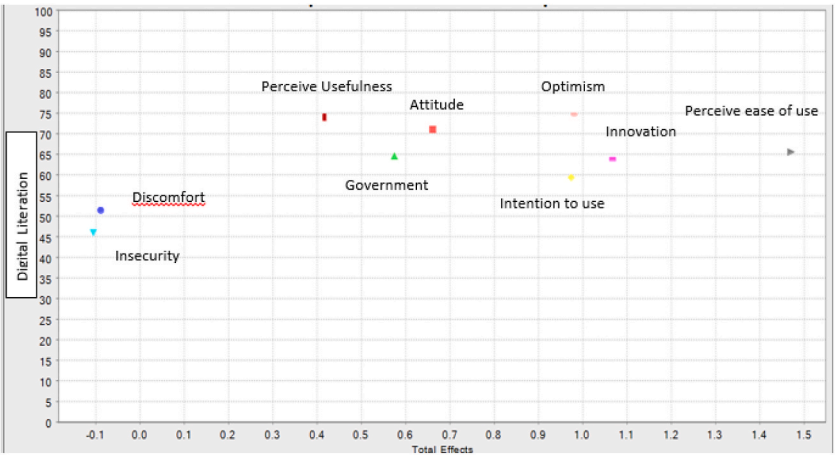

Fig. 3. Components of digital literacy.

Integrating TRI into TAM shows that the optimistic construct of the model can increase PU and PEOU. This relationship shows that there is a direct relationship between optimistic behavior and the use of technology. In contrast to innovation construct, PEOU supports the hypothesis. This condition shows that SMEs with high innovation increasingly use technology for business needs. However, PU does not support business performance and supports the results of previous research [19]. Meanwhile, discomfort and insecurity cannot explain TAM model, even though the relationship is negative. The results show that SMEs have obstacles in using technology (H5–H8). This condition suggests that there is high discomfort and insecurity in using digital technology, resulting in low benefits and low levels of technology use according to Lin et al. [18] and Walczuch et al. [19]. In contrast, Kamble et al. [17] and Ferreira et al. [54] reported that TRI had a positive effect on PEOU and PU, without measuring the constructs.

The influence of TRI construct on TRAM differs from TAM in terms of the causal factors. In TRAM, the contributing factors can positively change attitude and intention to use (H10–H13). Optimism and innovation form a courageous attitude to sell directly using marketplace applications and make people prefer to learn about technological developments. The influence of optimism and innovation enhances the intention to use digital technology proactively and enthusiastically. Regarding inhibiting factors, the construct of discomfort has a positive relationship and influence on attitude. This positive relationship shows that the more uncomfortability of SMEs with the state of technological readiness is directly proportional to attitude. In addition, inconvenience is irrelevant and cannot explain the intention of use. A similar result is reported for the construct of insecurity, which cannot explain attitude and intention to use digital technology. The inhibiting factors prevent SMEs from improving digital literacy skills and business performance. This result is different from previous research where TRI construct cannot explain attitude and intention [21]. Meanwhile, Lin & Chang [20] stated that TRI had a positive impact on attitude and intention to use technology.

The state of readiness to accept technology from integrating the three models shows that most SMEs have not used digital technology for broader business needs. Despite intensive use of social media such as WhatsApp, Facebook, and Instagram, digital technology does not support business needs to expand market share [6]. SMEs are still waiting to use online payment methods, thereby increasing the consumers to make transactions. Security literacy is a problem because there is limited knowledge on the dangers of online fraud through social media such as WhatsApp. Fraudulent file transmission has prompted UKM managers or owners to exercise caution when handling files. There are still SMEs in Indonesia, specifically in Jambi City, who use non-Android cellphones and cannot connect to the internet.

Limited knowledge is detrimental to digital literacy, such as mastery of information, digital content, security, and business problem-solving [64]. Furthermore, other problems were reported, where UKM managers needed help in understanding instructions for using digital technology application media. This was because there were terms to be understood, such as the process of making transactions on Shopee. In general, knowledge should be expanded to improve digital skills using cell phone facilities such as browsing information [63]. The application of the technology behavior differs from the results of Yousafzai et al. [81], where individuals use technology because of business needs, increasing ability to fight negative attitude towards technology. The results prove differences in attitude toward digital technology, supporting previous research [17,80].

The influence of TAM and TRAM on digital literacy produces different results. In TAM model, only PEOU can explain digital literacy directly, as a stronger predictor than PU. This variable is different from the research by Ferreira et al. [48], where PEOU is not a predictor of PU. In TRAM, attitude and intention can increase digital literacy. The research shows that through high optimism and innovation, TRI can become a solid root for TAM to support TRAM in strengthening attitude. This is achieved by having high motivation to realize a positive intention to increase digital literacy. Even though discomfort and insecurity are still problems in digital technology, supporting factors, such as optimism and innovation provide the best support for TRI. This result confirms the opinion of Ajzen [82] that a stronger ability to change behavior is directly proportional to positive results. Therefore, increased optimism and innovation are related to attitude and intention of SMEs to improve digital literacy skills [59–62]. Sevensen [2] explained that people could have positive traits and intention toward digital literacy due to a high level of optimism and innovation to solve problems of

discomfort and insecurity. The research succeeded in proving the government's influence on digital literacy (H29) in the form of training, providing various applications to improve marketing and strengthen access to technology [3,26,83]. However, this is different from several results, where the government cannot explain digital literacy [28,29].

A total of four decisions were provided in explaining digital literacy. The first decision of TAM and TRAM builds on the strengths of TRI. For the second decision, TAM model states that only PEOU can increase digital literacy. The third decision is that TRAM model regarding attitude and intention to use can increase the variable. Fourth, with program policies, government support can improve digital literacy. This research found that constructs playing an essential role in optimism and innovation, have succeeded in strengthening TAM and TRAM in increasing digital literacy to support the results of IPMA analysis.

6. Conclusions and policy implications

In conclusion, this research was carried out to analyze the integration model of technology acceptance through TRI, TAM, and TRAM models to increase digital literacy. The results showed that TRI model strengthened TAM and TRAM in influencing digital literacy. The relationship between the integration proved that TRI model had a negative relationship with the construct of discomfort and insecurity. However, the model could not explain TAM in the dimensions of PU and PEOU. The integration relationship between TRI and TRAM found that discomfort construct had a positive relationship with attitude. Increased levels of SMEs uncomfortability and technological readiness were directly proportional to positive attitude. In addition, the integration of TRI and TRAM found no relationship between discomfort and intention to use, as well as insecurity, attitude, and intention to use. This absence of a relationship showed that TRI model on inhibiting factors could not explain TAM and TRAM.

Different integration results were reported between TRI with TAM and TRAM. The integration of the three models on the contributing factors, namely optimism, and innovation, made a positive contribution. The results produced TAM and TRAM models through optimism and innovation to increase digital literacy. Meanwhile, government support had a positive influence and relationship with digital literacy.

IPMA calculation results reported a gap between supporting and inhibiting factors. Government support positively influenced digital literacy only to the extent of providing facilities and infrastructure, expanding networks, and licensing. However, the concept did not lead to optimal digital training programs to overcome inconvenience and insecurity.

The results could be a direction for the government to create policies leading to the readiness of overcoming discomfort and insecurity in using digital technology. SMEs and digital literacy must be interconnected to create policies integrating all government organizations with empowerment programs.

7. Implications for stakeholders

The results provide implications for stakeholders in understanding the current condition of SMEs. However, not all SMEs can use technology to improve business performance. The condition includes direction for stakeholders in creating various strategies. The stakeholders in this research include Department of Industry and Trade, Department of Cooperatives and SMEs, Department of Food Crops, Department of Agriculture, Department of Tourism, and Department of Cooperatives and SMEs.

Coordination and collaboration are carried out for SMEs to receive equitable digitalization education and avoid overlapping training programs. Another implication for stakeholders is to create an integrated database for determining groups of SMEs to receive training.

Stakeholders from government collaborate with private such as community empowerment institutions, large companies, and state-owned enterprises namely Pertamina, telecommunication, state electricity, and academics to empower digitalization skills and increase knowledge. In addition, the implications can be to form associations to transfer knowledge [84]. Associations are expected to share knowledge with SMEs to understand digitalization.

8. Limitations and future research

This research can explain digital literacy from TRI, TAM, and TRAM integration models but has several limitations. First, only the effect of TAM and TRAM on digital literacy was reported. In this context, the research did not directly test TRI model on the variable. Meanwhile, other external factors can be added to strengthen digital literacy combined with TRI model due to limited analyses of the factors influencing digital literacy from the perspective of readiness to accept technology. Second, this research was only conducted in cities with performance that produced high levels of optimism and interest in innovation. Therefore, the results strengthen TRAM model in forming attitude and intention to increase digital literacy. Future analyses should retest the model to determine the possibility of experiencing the same problems since urban SMEs have lower infrastructure and education.

Funding

This research was funded by a grant from the Ministry of Education, Culture, Research and Technology of Indonesia with funding decision letter number 0557/E.5.5/AL.04/2023.

Data availability statement

The datasets in the research are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Susi Desmaryani: Writing – original draft, Supervision, Methodology, Formal analysis, Conceptualization. **Ahmad Soleh:** Writing – review & editing, Methodology, Data curation. **Irmanelly:** Writing – original draft, Resources, Formal analysis. **Iqra Wiarta:** Visualization, Validation, Software, Project administration, Investigation, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

The author is grateful to all parties who have helped to obtain data and contribute ideas, especially the Ministry of Education, Culture, Research, and Technology of Indonesia, the Department of Cooperatives and SMEs, as well as the Department of Industry and Trade. Furthermore, the author is grateful to Business Actors for assisting in filling out the research questionnaire.

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