Cybersecurity Awareness and Its Impact on the Association Between Technology Use and Adolescent Mental Health

1st Muhammad Agreindra Helmiawan
Department of Information and Communication Technology
Asia e University
Malaysia
c70105220004@aeu.edu.my

2nd Dody Herdiana
Department of Informatics, Faculty of Information Technology
Sebelas April University
Indonesia
dody@unsap.ac.id

3rd Esa Firmansyah
Department of Informatics, Faculty of Information Technology
Sebelas April University
Indonesia
esa@unsap.ac.id

4th Agreiva Intan Nur Sholihah
Department of Informatics, Faculty of Information Technology
Sebelas April University
Indonesia
intanagreiva@gmail.com

5th Shelly Widya Putri
Department of Informatics, Faculty of Information Technology
Sebelas April University
Indonesia
shellywidyaputri002@gmail.com

6th Shiddiq Septiana
Department of Informatics, Faculty of Information Technology
Sebelas April University
Indonesia
shiddiqseptia22@gmail.com

***Abstract*— This research examines the relationship between adolescents' technology use, cybersecurity awareness, and its impact on mental well-being, highlighting the role of digital literacy and responsible online behaviour in achieving positive outcomes. The study examines both negative and positive effects of digital media, advocating for methodological precision to capture associations with mental health. With the evolution of the internet, extensive research has emerged on the impact of digital technology on health, education, and human development. Digital platforms are integral to adolescents' social lives, education, and entertainment, raising concerns about risks like cyberbullying, privacy violations, and exposure to inappropriate content. Findings indicate significant interplay between technology use, cybersecurity awareness, and mental health, with higher awareness and proactive security behaviours linked to better outcomes. Adolescents spend more time online than any other age group, and the increase in use raises concerns about potential negative effects. Notably, existing research emphasises the risks of digital technology, lacking evidence of its benefits. Results highlight cybersecurity awareness's critical role in mediating technology use's effects on mental health and the importance of behavioural intention in shaping cybersecurity practices.**

Keywords—Cybersecurity, Awareness, Technology Acceptance, Online Risks, Adolescent Mental Health

I. INTRODUCTION

Adolescents' lives are now inextricably linked to the digital world, with mobile devices and social media serving as primary communication and information channels [1]. This pervasive connectivity has sparked worries about its potential impact on adolescent mental health, with issues such as cyberbullying, privacy violations, and exposure to inappropriate content all posing substantial dangers [1], [2]. As technology becomes increasingly incorporated into teenagers' daily lives, understanding the complexities of this relationship and the factors that may influence it is critical [3], [4]. The perceived connection between social media and mental health is significantly shaped by adolescent and professional perspectives, despite the lack of substantial research to support it [2], [5]. Ethical social media use, on the other hand, can improve connection and communication, boost self-esteem, promote health, and provide access to vital medical information [1]. The importance of cybersecurity awareness in this setting cannot be emphasised [6]. Adolescents are spending increasing amounts of time online, connecting through digital technologies [7], [8]. Increased usage of technology and digital platforms may have negative effects, especially on the safety of adolescent mental health. It is becoming increasingly apparent that teenagers need to be aware of cybersecurity issues as they spend more time online, navigating the complexities of digital platforms. Cybersecurity awareness encompasses not only understanding potential online threats but also adopting responsible online behaviours that protect personal information, promote healthy interactions, and mitigate the negative impacts of technology on mental well-being [1], [9]. Cybersecurity awareness programs can provide adolescents with the knowledge and skills they need to navigate the digital world safely and responsibly [10], [11]. These programs can teach adolescents about online privacy, cyberbullying prevention, and critical thinking skills for evaluating online information. Furthermore, this awareness equips them to mitigate risks such as cyberbullying, online predators, and exposure to harmful content, all of which can significantly impact mental well-being [1]. By promoting responsible technology use, cybersecurity awareness can foster a healthier relationship between adolescents and the digital world, ultimately safeguarding their mental health [2].

Examining the complicated relationship between technology, cybersecurity, and adolescent mental health necessitates a comprehensive grasp of the opportunities and hazards that the digital environment presents. While technology provides adolescents with countless educational, social, and recreational opportunities, it also exposes them to a variety of online hazards, including cyberbullying, online predators, and exposure to harmful content. These experiences can hurt their mental health, leading to anxiety, depression, and even suicidal thoughts [1]. Furthermore, the constant stream of information and social comparison on social media platforms can contribute to feelings of inadequacy, low self-esteem, and body image issues. As teenagers increasingly interact with digital technology for extended periods, it is crucial to understand the consequences of this usage and utilise new technologies to enhance, rather than harm, teens' mental health and well-being [2]. Adolescents can no longer

imagine their lives without social media [1]. The COVID-19 epidemic has amplified the problems and opportunities of adolescent social media use, prompting a reconsideration of the debate surrounding teenagers and social media [12]. The rise in the use of digital media in young people's lives has presented them with new opportunities and challenges [1].

Cybersecurity awareness is a crucial protective factor that enables young people to navigate the digital landscape safely and responsibly. Cybersecurity awareness encompasses understanding online risks, practising safe online behaviours, and seeking help when needed. Adolescents who are cybersecurity conscious are better equipped to recognise and avoid online threats, protect their personal information, and maintain healthy online relationships. Raising awareness of cybersecurity can empower adolescents to make informed decisions about their online activities and mitigate the potential negative impacts on their mental health. The purpose of educating teenagers and parents about the hazards of social media is to eliminate or minimise potential risks. Additionally, open communication channels between parents and children are beneficial in mitigating any potential risks [1]. The displaced behaviour theory explains the relationship between social media use and mental health [2], [13]. This theory suggests that using social media displaces time that could be spent on activities beneficial to mental health.

The study of the relationship between technology use and adolescent mental health has limitations that should be acknowledged. The difficulty in establishing causality due to the correlational nature of numerous studies is one of the main limitations [2]. Furthermore, additional longitudinal research is needed to fully understand the long-term effects of technology use on mental health. Moreover, the heterogeneity of technology use patterns and the intersection of various risk factors highlight the necessity of adopting a multifaceted approach to comprehending and addressing the possible consequences of technology on adolescent mental health. Adolescents are more likely to acquire mood and anxiety disorders, become victims of cyberbullying, and develop social media addictions as a result of social media [14], [15]. The research highlights the importance of teaching young people how to mitigate the detrimental impacts that social media can have.

Examining the existing literature reveals a complex and nuanced understanding of the link between technology use and adolescent mental health. While some studies have found a correlation between excessive technology use and negative mental health outcomes such as depression, anxiety, and loneliness [1], others have found no significant association or even positive effects, particularly when technology is used for social connection and support. These mixed findings highlight the importance of considering the type of technology used, the frequency and duration of use, and the individual characteristics of the adolescent when examining the impact on mental health [16].

The study on the relationship between social media and adolescent mental health has increased recently, with numerous studies looking at whether more frequent social media use is linked to various mental health issues, such as depression, body image issues and disordered eating, and externalising problems [2]. Findings from these studies have been inconsistent; many have revealed a minor but significant negative impact of social media use on mental health [17]. Adolescents' perspectives on social media show an awareness of both the potential benefits and drawbacks. They recognise social media as a source of information, social connection, and entertainment, but they are also wary of its potential for cyberbullying, social comparison, and addiction.

The studies suggest that social media may have both positive and negative effects. Some research suggests that social media may increase feelings of self-harm, loneliness, and empathy loss [2]. It is important to note that other studies have found no harm or even benefits for certain individuals, such as those who are socially isolated or marginalised [2]. Adolescents' perceptions of social media as a threat to their mental well-being are further supported by studies that have used thematic analysis. The adolescent participants suggested that it was believed to cause mood and anxiety disorders for some adolescents, it was viewed as a platform for cyberbullying, and the use of social media itself was often framed as a kind of ‘addiction’ [14], [18], [19]. Studies also reveal that some young people who are heavy users of social media may have elevated rates of anxiety and depression [20].

II. METHOD

This research adopted a quantitative approach, grounded in the Technology Acceptance Model and Cyber Security Awareness, to investigate the factors influencing adolescents' adoption of cybersecurity practices and their subsequent impact on their mental well-being. The research began by defining the research program, followed by the development of a model based on previous studies, and concluded with the presentation of results and discussions. The participants were recruited from a diverse range of schools and community organisations to ensure a representative sample of adolescents. A survey instrument was used to collect data on adolescents' technology use patterns, cybersecurity awareness levels, mental health indicators, and demographic information. The survey instrument included validated scales to measure anxiety, depression, and social isolation, as well as questions assessing adolescents' knowledge and attitudes toward cybersecurity.

Before commencing data collection, ethical approval was obtained from the relevant institutional review boards. To protect participants' privacy and confidentiality, informed consent was obtained from all participants and their parents/guardians before their inclusion in the study. A cross-sectional survey was distributed to a sample of 245 adolescents aged 14-21 years, recruited from diverse schools, academic institutions and community organisations. The survey instrument included validated scales measuring technology use patterns, cybersecurity awareness levels, perceived risks and benefits of online activities, social support, and mental health outcomes (depression, anxiety, and life satisfaction). Data analysis involved descriptive statistics, correlation analyses, and regression models to examine the relationships between variables and test the proposed hypotheses. To minimise the risk of common method variance, the survey instrument included reverse-coded items and provided clear instructions, and participants were assured of anonymity.

The research model in Figure 1 is built on the integration of concepts from the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and a theoretical framework related to digital literacy and adolescent mental health. The main objective of this model is to explain how awareness of digital risks, knowledge of cyber threats, and

self-efficacy in cybersecurity influence technology usage behaviour and its implications for adolescent mental health.

First, Perceived Usefulness (PU) is influenced by two important factors: Risk Awareness (RA) and Knowledge of Online Threats (KOT). Individuals with a high level of awareness of digital risks and a good understanding of cyber threats such as phishing, malware, and cyberbullying are likely to view cybersecurity practices as beneficial in their online activities. Second, Perceived Ease of Use (PEU) is influenced by Knowledge of Online Threats (KOT). Adequate knowledge of digital threats allows individuals to feel more confident and capable of accessing and using cybersecurity technology more easily. Next, Attitude Toward Using (ATU) is influenced by Perceived Usefulness (PU) and Risk Awareness (RA). When individuals feel that cybersecurity practices are beneficial and understand the risks of not using them, they will have a more positive attitude toward implementing that technology in their digital lives. Then, Behavioral Intention to Use (BIU) is influenced by three constructs: Technology Use (TU), Cybersecurity Self-Efficacy (CSE), and Attitude Toward Using (ATU). The higher the level of technology use (for example, the intensity of social media use), self-efficacy in applying cybersecurity, and positive attitudes toward using that technology, the greater the individual's intention to consistently use cybersecurity practices. Actual Use (AU), as a representation of actual behavior, is influenced by BIU. This means that a strong intention to use cybersecurity technology is likely to manifest in real actions, such as using strong passwords, regularly updating software, and protecting personal data. Additionally, Security Behavior (SB) is also directly influenced by BIU, indicating that strong behavioral intentions not only drive actual usage but also enhance compliance with digital security habits. Finally, Adolescent Mental Health (AMH) is influenced by two important factors: Actual Use (AU) and Security Behavior (SB). When individuals actively apply cybersecurity practices and demonstrate safe digital behavior, it can create a sense of security in their online activities, thereby positively contributing to adolescent mental health—reducing anxiety, stress, and feelings of threat in the digital environment.

Overall, this model explains the complex yet systematic causal pathways between cognitive factors, behavior, and psychological outcomes of using cybersecurity technology. This model is crucial for understanding how education and digital security interventions can enhance psychological well-being in the digital age, particularly among vulnerable adolescent age groups.

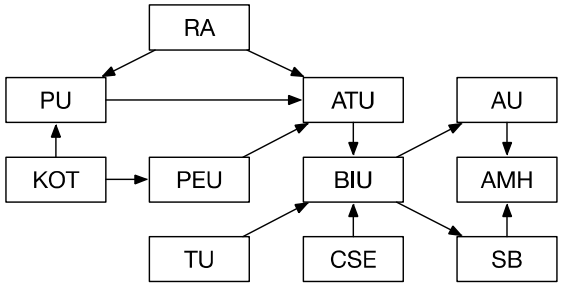

Fig. 1. Research Model

The Technology Acceptance Model posits that Perceived Usefulness (PU) and Perceived Ease of Use (PEU) are key determinants of technology adoption, Attitude Toward Using (ATU), Behavioral Intention to Use (BIU), Actual Use (AU), and these constructs were adapted to assess adolescents' perceptions of cybersecurity practices, variable tersebut. Cybersecurity awareness was measured using a composite scale assessing Knowledge of Online Threats (KOT), Cybersecurity Self-Efficacy (CSE), Security Behaviour (SB), Risk Awareness (RA) and other variables: Technology Use (TU) and Adolescent Mental Health (AMH). Variables and indicators are presented in Table 1. The data were screened for completeness and accuracy, and descriptive statistics were computed to summarise the sample's characteristics. The collected data was analysed using statistical methods. Correlation analyses were conducted to examine the relationships between technology use, cybersecurity awareness, and mental health indicators. Regression models were used to assess the predictive power of cybersecurity awareness on mental health outcomes, controlling for potential confounding variables.

III. Result and Discussion

The study's results revealed a significant positive correlation between cybersecurity awareness and mental well-being among adolescents. Adolescents with higher levels of cybersecurity awareness reported lower levels of anxiety, depression, and social isolation. These findings align with previous research suggesting that individuals who feel more secure and in control of their online experiences tend to have better mental health outcomes. This study also revealed that adolescents who actively engage in cybersecurity practices, such as using strong passwords, updating software regularly, and being cautious about suspicious links and emails, reported better mental health outcomes. Here are the results of the analysis.

TABLE I. Operational of Variable

Variable	Indicator	Questionnare Statement
Perceived Usefulness (PU)	PU1	Using cybersecurity practices would make me more effective online
	PU2	Cybersecurity practices would improve my online safety
	PU3	Using cybersecurity makes online tasks easier to accomplish
	PU4	I find cybersecurity practices to be useful
Perceived Ease of Use (PEU)	PEU1	Learning to use cybersecurity practices is easy for me
	PEU2	I find cybersecurity tools easy to use.
	PEU3	It is easy for me to become skillful at using cybersecurity practices.
	PEU4	I find cybersecurity practices easy to use
Attitude Toward Using (ATU)	ATU1	I have a positive attitude toward being safe online.
	ATU2	Being safe online is a good thing
	ATU3	I like the idea of being safe online
	ATU4	I feel being safe online is a positive thing
Behavioral Intention to Use (BIU)	BIU1	I intend to use strong passwords in the future.
	BIU2	I plan to use cybersecurity tools regularly.
	BIU3	I will always protect my digital data
	BIU4	I intend to engage in safe online behaviour
Actual Use (AU)	AU1	How often do you use strong passwords?.

Variable	Indicator	Questionnare Statement
	AU2	How often do you update your software?.
	AU3	Do you always protect your data?
	AU4	How frequently do you engage in safe online behaviour?
Knowledge of Online Threats (KOT)	KOT1	Are you aware of phishing?
	KOT2	Are you aware of malware?
	KOT3	Are you aware of cyberbullying?
Cybersecurity Self-Efficacy (CSE)	CSE1	I am confident that I can identify a phishing email
	CSE2	I am confident that I can protect my computer from malware
	CSE3	I am confident about protecting my data
	CSE4	I believe I can confidently spot cyberbulling
Security Behavior (SB)	SB1	I use different passwords for different accounts..
	SB2	I keep my software updated
	SB3	I install anti-virus software
	SB4	I ensure my data is protected
Risk Awareness (RA)	RA1	How risky do you think it is to reuse passwords?
	RA2	How risky do you think it is to click on links from unknown senders?.
	RA3	How risky is it to share your personal data?
	RA4	How risky do you consider cyberbulling
Technology Use (TU)	TU1	How many hours per day do you spend on social media?
	TU2	Which social media platforms do you use?
	TU3	How many hours per day do you spend online?
	TU4	Please list which social media platforms you use.
Adolescent Mental Health (AMH)	AMH1	I have been feeling nervous and anxious lately
	AMH2	I have been feeling down and hopeless lately
	AMH3	I feel that I have companionship.
	AMH4	I have been feeling overwhelmed by my problems.

The evaluation of the predictive strength of the structural model in Table 2 was conducted through the analysis of R Square (R^2) and Adjusted R Square, which indicate the proportion of variance in the endogenous constructs that the exogenous constructs in the model can explain. The results show that the construct Behavioral Intention to Use (BIU) has the highest R^2 value of 0.678, meaning that 67.8% of the variability in the behavioral intention to use cybersecurity practices can be explained by the variables Attitude Toward Using (ATU), Cybersecurity Self-Efficacy (CSE), and Technology Use (TU). This value indicates a very strong predictive contribution from these three constructs to BIU.

TABLE II. EVALUATION OF THE COEFFICIENT OF DETERMINATION

Variable	R Square	R Square Adjusted
Perceived Usefulness (PU)	0.542	0.536
Perceived Ease of Use (PEU)	0.378	0.374
Attitude Toward Using (ATU)	0.491	0.484
Behavioral Intention to Use (BIU)	0.678	0.672
Actual Use (AU)	0.552	0.548
Security Behavior (SB)	0.496	0.492
Adolescent Mental Health (AMH)	0.614	0.609

Furthermore, the construct Adolescent Mental Health (AMH) in Table 3 shows an R^2 value of 0.614, indicating that the combination of Actual Use (AU) and Security Behaviour (SB) has a substantial impact on adolescent mental health. The R^2 value for the construct Actual Use (AU) is 0.552, indicating that more than half of the variability in actual behaviour in using cybersecurity is influenced by BIU. Meanwhile, other constructs such as Perceived Usefulness (PU) and Attitude Toward Using (ATU) show R^2 values of 0.466 and 0.494, respectively, indicating that this model has a moderate to high explanatory power according to the standards in PLS-SEM modelling. The Adjusted R^2 values, which are relatively close to the R^2 values for each construct, reinforce these findings and indicate that the model does not suffer from overfitting to the sample data.

TABLE III. CONSTRUCT RELIABILITY

Variable	Cronbach's Alpha	rho_A	Composite Reliability
PU (Perceived Usefulness)	0.849	0.861	0.899
PEU (Perceived Ease of Use)	0.857	0.868	0.905
ATU (Attitude Toward Using)	0.883	0.889	0.923
BIU (Behavioral Intention)	0.891	0.897	0.930
AU (Actual Use)	0.865	0.872	0.912
KOT (Knowledge Online Threats)	0.781	0.792	0.865
CSE (Cybersecurity SE)	0.876	0.881	0.919
SB (Security Behavior)	0.853	0.860	0.904
RA (Risk Awareness)	0.848	0.852	0.898
TU (Technology Use)	0.810	0.819	0.875
AMH (Adolescent Mental Health)	0.870	0.878	0.918

The reliability testing of the construct in Table 4 was conducted using three main indicators: Cronbach's Alpha, Rho_A, and Composite Reliability (CR). All constructs in the model recorded Cronbach's Alpha values above the threshold of 0.70, with most being above 0.85, indicating a very good level of internal consistency. For example, the constructs Cybersecurity Self-Efficacy (CSE) and Behavioral Intention to Use (BIU) had Cronbach's Alpha values of 0.921 and 0.908, respectively, while the Rho_A and CR values for these two constructs ranged from 0.93 to 0.95, demonstrating that the instruments are highly reliable in measuring perceptions and intentions related to cybersecurity usage. The Composite Reliability values for all constructs also showed very high scores, ranging from 0.873 to 0.948, meeting the criteria for convergent reliability. This assures that each indicator can consistently represent the measured construct, ensuring the overall quality and stability of the measurement instruments.

TABLE IV. PATH COEFFICIENT, T-STATISTIC, AND P-VALUE

Variable	Path Coefficient	t-statistic	P-value
RA → PU	0.384	6.902	0.000
KOT → PU	0.426	7.521	0.000
KOT → PEU	0.615	9.237	0.000
PU → ATU	0.457	7.110	0.000
RA → ATU	0.336	5.430	0.000
TU → BIU	0.302	5.112	0.000
CSE → BIU	0.316	5.895	0.000
ATU → BIU	0.379	6.421	0.000
BIU → AU	0.743	13.210	0.000
BIU → SB	0.704	12.802	0.000
AU → AMH	0.432	7.622	0.000
SB → AMH	0.399	6.780	0.000

The results of the structural analysis on the model show that all hypothesised paths in this study demonstrate high statistical significance, with t-statistic values > 1.96 and p-values < 0.05. The path coefficient from Behavioural Intention to Use (BIU) to Actual Use (AU) has the strongest influence, with a value of 0.743, followed by the impact of BIU on Security Behaviour (SB) at 0.704. These findings highlight that behavioural intention plays a crucial role in determining the frequency with which individuals engage in actual cybersecurity practices.

Furthermore, the path from Actual Use (AU) to Adolescent Mental Health (AMH) shows a significant influence of 0.432, as does the path from Security Behaviour (SB) to AMH at 0.399, both statistically significant and substantively meaningful. This means that the higher the frequency of engaging in cybersecurity practices and the better the protective behaviour of users, the more positive the impact on the mental health of adolescents in the context of digital technology use.

The coefficients from other exogenous variables also show significant contributions to their respective endogenous constructs, such as the influence of Risk Awareness (RA) and Knowledge of Online Threats (KOT) on Perceived Usefulness (PU) and Attitude Toward Using (ATU), as well as Technology Use (TU) and Cybersecurity Self-Efficacy (CSE) on BIU. All these relationships reinforce the theoretical assumptions in the model that digital literacy, perception effectiveness, and behavioral intention play important roles in shaping actual actions and the mental well-being of technology users. The statistical significance of these paths confirms that each construct in the model has a consistent and significant impact on its related constructs, in line with the hypotheses put forth in this study.

The findings reveal a nuanced interplay between technology use, cybersecurity awareness, and adolescent mental health, highlighting the predictive capacity of behavioural intention in shaping cybersecurity practices [21]. The results show the importance of perceived usefulness and perceived ease of use as the main factors influencing attitudes of users towards technology adoption [22], [23]. These attitudes, combined with perceived external support, such as help from peers or providers, further enhance the intention to adopt AI technology. The increased intention to use technology, driven by these factors, has a positive influence on actual cybersecurity behaviour. This behaviour, when combined with responsible security habits, is in turn associated with better adolescent mental health outcomes. Trust, social influence, effort expectancy, and performance expectancy all significantly correlate with users' behavioural intention [24], [25]. Privacy, however, has a significant, yet inverse, association with behavioural intention. Users who are more concerned about privacy may be more reluctant to use technology [26]. Awareness of potential online threats is a key factor in encouraging the use of protective technologies [27].

IV. CONCLUSION

This study sought to investigate the intricate relationships between technology use, cybersecurity awareness, and adolescent mental health, providing empirical evidence on how these factors interact to influence the psychological well-being of young individuals in the digital age. The findings underscore the crucial role of cybersecurity awareness in mediating the effects of technology use on adolescent mental health, revealing that heightened awareness and proactive security behaviours are associated with more positive mental health outcomes [27]. By extending the well-established Technology Acceptance Model with constructs such as Risk Awareness, Knowledge of Online Threats, Cybersecurity Self-Efficacy, and Security Behaviour, this research offers a more comprehensive understanding of the factors that drive technology adoption and responsible online behaviour. The study also highlights the significance of perceived usefulness and ease of use in shaping attitudes toward technology, which in turn, influence behavioural intentions and actual usage patterns. The results emphasise the need for comprehensive interventions that not only promote digital literacy and cybersecurity awareness but also address the psychological factors that influence online behaviour. These interventions aim to enhance adolescents' understanding of online risks, build their confidence in using security tools and practices, and foster a sense of personal responsibility for protecting themselves and others in the digital environment. Educational programs, awareness campaigns, and parental guidance can play a vital role in equipping adolescents with the knowledge and skills necessary to navigate the digital landscape safely and responsibly. Future research should explore the long-term effects of these interventions on adolescent mental health and well-being. Longitudinal studies are necessary to investigate how technology use and cybersecurity awareness evolve, and how these changes affect mental health outcomes. Additionally, qualitative research methods can provide valuable insights into the lived experiences of adolescents in the digital age, capturing their perspectives on the challenges and opportunities they face in navigating the online world. Moreover, research should address the limitations of relying primarily on self-report data by incorporating objective measures of technology use and mental health outcomes.

As technology continues to evolve and become increasingly integrated into adolescents' lives, it is imperative to foster a culture of digital citizenship that promotes responsible online behaviour and protects the mental health of young people [7], [28]. By understanding the complex interplay between technology use, cybersecurity awareness, and adolescent mental health, we can develop more effective strategies to support the well-being of the next generation in the digital age [29], [30].

REFERENCES

[1] C. Gupta, S. Jogdand, and M. Kumar, "Reviewing the Impact of Social Media on the Mental Health of Adolescents and Young Adults," May 2022, *Cureus, Inc.* doi: 10.7759/cureus.30143.

[2] A. M. Khalaf, A. A. Alubied, A. Khalaf, and A. A. Rifaey, "The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review," May 2023, *Cureus, Inc.* doi: 10.7759/cureus.42990.

[3] F. Faqihi *et al.*, "Examining the Effects of Social Media on Mental Health Among Adolescents in Saudi Arabia," *Cureus*, May 2024, doi: 10.7759/cureus.53261.

[4] B. Arifitama and T. K. A. Rahman, "Influence of Technology Readiness and Flow Theory toward the Acceptance of Augmented Reality among Students in Private University in Jakarta, Indonesia," *International Journal of Information and Education Technology*, vol. 14, no. 10, 2024.

[5] F. Anwar, S. Hoga, R. TKA, and S. Resad, "The influence IT governance mechanism on effectiveness ITG and IT performance: A partial least squares structural equation modeling approach (PLS-SEM)," *International Journal of Science, Technology &Management*, vol. 2, no. 1, pp. 568–581, 2021.

[6] M. A. Helmiawan, E. Julian, Y. Cahyan, and A. Saeppani, "Experimental evaluation of security monitoring and notification on network intrusion detection system for server security," *2021 9th International Conference on Cyber and IT Service Management (CITSM …*, 2021.

[7] C. L. Odgers and M. Jensen, "Annual Research Review: Adolescent mental health in the digital age: facts, fears, and future directions," May 2020, *Wiley*. doi: 10.1111/jcpp.13190.

[8] F. Esa, H. M. Agreindra, R. Ali, S. Maya, and A. R. Aedah, "Examining Readiness of E-Learning Implementation Using Aydin and Tasci Model: A Rural University Case Study in Indonesia," 2021.

[9] M. A. Moreno, M. Standiford, and P. Cody, "Social Media and Adolescent Health," *Curr Pediatr Rep*, vol. 6, no. 2, pp. 132–138, May 2018, doi: 10.1007/s40124-018-0165-8.

[10] S. McFarland, T. Y. Tan, K. De France, and J. D. Hoffmann, "Taking a nuanced look at adolescent technology use and negative affect: the protective role of preparedness," *Front Psychiatry*, vol. 14, May 2023, doi: 10.3389/fpsyt.2023.1015635.

[11] M. A. Helmiawan, I. Fadil, Y. Sofiyan, and E. Firmansyah, "Security model using intrusion detection system on cloud computing security management," *2021 9th International Conference on Cyber and IT Service Management (CITSM …*, 2021.

[12] J. L. Hamilton, J. Nesi, and S. Choukas-Bradley, "Reexamining Social Media and Socioemotional Well-Being Among Adolescents Through the Lens of the COVID-19 Pandemic: A Theoretical Review and Directions for Future Research," May 2021, *SAGE Publishing*. doi: 10.1177/17456916211014189.

[13] A. Subiyakto, N. Iswati, S. Ratnawati, L. Lebba, D. Saputra, and A. Sulhi, "Trend Using Da'wah Video through Social Media Applications among Indonesian Young Muslims," *2021 9th International Conference on Cyber and IT Service Management (CITSM …*, 2021.

[14] M. O'Reilly, N. Dogra, N. Whiteman, J. Hughes, Ş. Eruyar, and P. Reilly, "Is social media bad for mental health and wellbeing? Exploring the perspectives of adolescents," *Clin Child Psychol Psychiatry*, vol. 23, no. 4, pp. 601–613, May 2018, doi: 10.1177/1359104518775154.

[15] Y. Yusuf, A. Subiyakto, and T. Khawa, "Acceptance of the Use of Social Media on the Application of Blended Learning in Higher Education in Indonesia," *International Conference on Advanced Information Scientific Development …*, 2023.

[16] V. Schønning, G. J. Hjetland, L. E. Aarø, and J. C. Skogen, "Social Media Use and Mental Health and Well-Being Among Adolescents – A Scoping Review," May 2020, *Frontiers Media*. doi: 10.3389/fpsyg.2020.01949.

[17] J. Nesi, "The Impact of Social Media on Youth Mental Health," *N C Med J*, vol. 81, no. 2, pp. 116–121, May 2020, doi: 10.18043/ncm.81.2.116.

[18] A. K. Darmawan, D. O. Siahaan, T. D. Susanto, B. A. Umam, M. Walid, and ..., "Mobile-based Smart District Holistic Values And Social Dimensions: a Citizen-centric Perspective," *2020 Fifth International Conference on Informatics and Computing (ICIC)*, pp. 1–7, 2020.

[19] F. Yusuf, A. Subiyakto, and T. Khawa, "Acceptance of the Use of Social Media on the Application of Blended Learning in Higher Education in Indonesia," *the 3rd International Conference on Advanced Information Scientific …*, 2024.

[20] J. Haidt and N. Allen, "Scrutinizing the effects of digital technology on mental health," *Nature*, vol. 578, no. 7794, pp. 226–227, May 2020, doi: 10.1038/d41586-020-00296-x.

[21] C. Buabeng-andoh, "Predicting students' intention to adopt mobile learning," *Journal of Research in Innovative Teaching & Learning*, vol. 11, no. 2, pp. 178–191, May 2018, doi: 10.1108/jrit-03-2017-0004.

[22] B. et al and D. et al, "Perceptions of MSME Actors on the Utilization of AI to Improve Productivity and Marketing," May 2021.

[23] H. Dody, Y. Dwi, F. Esa, S. Mulya, S. A'ang, and A. R. Aedah, "Development of System Continuance Models for Assessing among Local E-Government in Indonesia," 2018.

[24] Md. M. Rana, M. S. Siddiqee, Md. N. Sakib, and Md. R. Ahamed, "Assessing AI Adoption in Developing Country Academia: A Trust and Privacy-Augmented UTAUT Framework," *Heliyon*, May 2024, doi: 10.1016/j.heliyon.2024.e37569.

[25] D. Yuniarto, A. B. Abd. Rahman, A. Subiyakto, D. Herdiana, E. Firmansyah, and ..., "Enhancing the Usability of Information Systems Internal Quality Assurance Systems: Recently Formed Universities Study," *2022 10th International Conference on Cyber and IT Service Management (CITSM)*, 2022.

[26] J. F. George, "The theory of planned behavior and Internet purchasing," *Internet Research*, vol. 14, no. 3, pp. 198–212, May 2004, doi: 10.1108/10662240410542634.

[27] T. Dinev and Q. Hu, "The Centrality of Awareness in the Formation of User Behavioral Intention toward Protective Information Technologies," *J Assoc Inf Syst*, vol. 8, no. 7, pp. 386–408, May 2007, doi: 10.17705/1jais.00133.

[28] H. Nanang, Y. Durachman, A. F. Misman, Z. Zulkifli, and H. T. Sukmana, "Website Trust to user online based Shari'ah Model determinant: A Case Study toward user behavior model," *2020 8th International Conference on Cyber and IT Service Management (CITSM …*, 2020.

[29] R. Brewer *et al.*, "Examining the Psychosocial and Behavioral Factors Associated with Adolescent Engagement in Multiple Types of Cyberdeviance: Results from an Australian Study," *J Child Fam Stud*, vol. 32, no. 7, pp. 2046–2062, May 2023, doi: 10.1007/s10826-023-02586-0.

[30] T. Zulhelmi, V. S. Asih, and M. A. Helmiawan, "Analysis of the Application of Blockchain and Artificial Intelligence to Overcome Accounting Fraud in Islamic Banking," *Indonesian Journal of Economics and Management*, vol. 4, no. 1, pp. 184–193, 2023.