JPPIPA 11(7) (2025)

Jurnal Penelitian Pendidikan IPA

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Analyzing the Acceptance of IoT-Based Toddler Scales Among Health Workers Using the Technology Acceptance Model (TAM)

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Received: May 21, 2025
Revised: June 05, 2025
Accepted: July 25, 2025
Published: July 31, 2025

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DOI: 10.29303/jppipa.v11i7.11442

Abstract: This study aims to evaluate the acceptance of IoT-based toddler scales by cadres and health workers at *Posyandu* by applying the Technology Acceptance Model (TAM). A total of 50 respondents were involved, and the collected data were analyzed using SmartPLS to test the influence of TAM variables on technology acceptance. The analysis revealed that attitude (ATU) was able to explain 63.7% of the variance, indicating that a positive attitude towards technology is a major factor in acceptance. Furthermore, perceived benefits (PU) contributed 57.1%, indicating that respondents adequately recognized the advantages of IoT-based scales. Behavioral intention (BI) also exerts a moderate influence with a contribution of 53.1% of the variance in technology use. However, actual use (AU) only reached 26.5%, indicating a significant gap between intention to use and implementation of the technology in the field due to resistance in the form of concerns related to potential labor reduction. countfor lte to This finding confirms that while the benefits and attitudinal aspects support technology adoption, external factors such as fear of job loss remain barriers to actual implementation.

Keywords: Internet of things; *Posyandu;* Technology acceptance model; Toddler scales

Introduction

Integrated health service posts or *Posyandu* in Indonesia are part of health services that provide some essential medical services for the general public. Additionally, *Posyandu* is the first health service that can be visited by the community at the village level to obtain basic health services, especially for pregnant women and toddlers and the elderly (Noviana & Marpaung, 2023; Hasanbasri et al., 2024). The toddler weight growth monitoring system in Indonesia still applies a conventional system, and it cannot be denied that there are several weaknesses that often occur in the field, such as data accuracy due to manual recording and calculation. Nutritional status monitoring is carried out using the Health Card or *Kartu Menuju Sehat (KMS)* in Indonesia, this process has limited storage and is prone to loss and damage. Recording body weight and height is also done manually using KMS and data processing is done manually as well. This process can be said to be less efficient because it requires considerable time and energy (Permana et al., 2021). The child information collected from the program still uses paper documents. The document is called *Kartu Menuju Sehat (KMS)* as a tool for parents to know their child's development from time to time graphically. Monitoring growth and facilitating healthy growth are fundamental aspects of primary health care for children under five. The most common or main reason mothers come to the *Posyandu* is to monitor their child's growth from time to time, according to the scheduled activities (Nazri et al., 2016). Growth monitoring involves consistent evaluation of a child's weight, height and head circumference. Regular growth monitoring of children under five can be an

How to Cite:
Wulandari, F. A., Wedashwara, W., & Wijayanto, H. (2025). Analyzing the Acceptance of IoT-Based Toddler Scales Among Health Workers Using the Technology Acceptance Model (TAM). *Jurnal Penelitian Pendidikan IPA*, *11*(7), 645–652. https://doi.org/10.29303/jppipa.v11i7.11442

important effort in preventing and addressing stunting. By conducting regular monitoring, health workers can easily detect toddlers or children who are experiencing growth disorders and immediately provide appropriate treatment. In this case, *Posyandu* has a significant part in efforts to monitor the growth of toddlers. Through *Posyandu*, health workers can provide basic health services to support community nutrition, especially toddlers (Picauly et al., 2023). This weakness requires technological system updates or innovations that can be used as solutions.

One application of IoT in *Posyandu* can be in the form of IoT-based baby scales. Where measurements and records can be done automatically in digital storage. Starting from the baby's biodata along with parents or guardians, development records every month, and equipped with automatic baby growth charts contained in the application so as to facilitate real-time monitoring of the growth of each baby. Data storage and data communication systems like this can be integrated into E-KMS for data digitization. In the paper on the survey of IoT research in the health sector, it is explained that IoT devices are very useful, can speed up time and save energy for health practitioners and then be able to analyze and provide fast and appropriate treatment to patients earlier or earlier (Singh et al., 2023; Dauda et al., 2024; Rodrigues et al., 2018; Ettiyan & Geetha, 2023).

Based on the points described above, the adoption or acceptance of technology in the form of IoT-based baby scales in the world of health promises various benefits. Even so, the successful application of this technology is highly dependent on user acceptance, which in this case is cadres and *Posyandu* health workers (Venkatesh & Davis, 2000). Acceptance of technology by users can be influenced by many factors. To identify what factors affect the use of this baby scale IoT system can be accepted by cadres and *Posyandu* medical professionals employing the TAM method, with key factors such as simplicity of use and benefits perceived by users which can later impact the continuous usage of this IoT technology (Nurfaizal & Wahyudi, 2022). Of the many studies that use TAM, most show good or good results so that the use of TAM in measuring the acceptance of a system can be used as a reference. So it is concluded that TAM is considered the best model in terms of interpreting the behavior of users of the latest information system-based technology not only in the health sector but in other fields as well such as education, public services, agricultural transportation, and so on (Mulyani et al., 2023; Nyoman et al., 2022, Anam et al., 2023; Hu et al., 2025; Sulistiani et al., 2023).

The current research gap is the absence of research analyzing the acceptance of IoT technology in the context of *Posyandu*. Most previous studies focus on technology design as a health facility, while the dynamics of technology acceptance at the *Posyandu* level involving community cadres are still not widely explored. This research fills the gap by analyzing how the factors in TAM play a role in the acceptance of IoT-based baby scale technology in *Posyandu*. The research conducted by Inayah et al. (2024) discussed and developed an Web-based health monitoring system powered by the Internet of Things. The system is designed to display real-time patient health data, such as body temperature, oxygen saturation in the blood. The results of this study explain that IoT technology and web interface can be an effective solution in health data management, with advantages in ease of use, data security, and integration of medical sensors. The research conducted by Dijaya et al. (2019) discusses the design of an IoT-based *Posyandu* information system for the health of mothers and children in monitoring and recording health data for babies, toddlers, and pregnant women using sensors for medical applications to measure body temperature, weight, and heart rate of mothers and children. The data in this study is stored in an IoT-based server and accessed through web and mobile applications. The data is visualized using graphs that can help health workers in determining policies and delivering information related to handling from monitoring results. The research conducted by Paputungan et al. (2019) discusses the development of the e-KMS system in improving child health monitoring in Indonesia. This system was created with the aim of replacing paper-based documents used in *Posyandu* such as KMS in order to minimize the occurrence of lost documents, difficulty in reading handwriting in accessing toddler health data. This research concludes that e-KMS integrated with technologies such as IoT and artificial intelligence (AI), can be a solution and alternative in facilitating health access for toddlers by health workers.

This study aims to analyze the acceptance of *Posyandu* cadres and health workers of the flow of data storage and communication on IoT-based baby scale technology using the TAM model. Evaluation of these acceptance factors is expected to provide critical insights for policy makers and *Posyandu* managers, especially in identifying barriers between intention and actual use. Thus, it is important to conduct this research so that it can be the basis for developing strategies to optimize the application of technology that has been proven to be useful theoretically but is still limited to implementation in the field. It should be noted that the novelty of this research is that until now there has been no previous research that specifically examines the acceptance of IoT-based baby scale technology in the *Posyandu* environment. Therefore, this study not only contributes to the development of literature on technology adoption in the health context, but also offers a practical overview of the application of IoT in the medical field, opening up opportunities for innovation and improvement of the healthcare system at the basic level.

Method

This study uses a cross-sectional survey design and a quantitative methodology, which is a type of observational research that analyses variable data collected at a certain point in time across a selected sample or subset population. The advantage of quantitative research is that it can test conjectures or hypotheses made by providing definitive assessments of research findings using statistical tests so that the results of these research findings can explain the magnitude of the influence between variables (Sandi et al., 2020). This method is to test the TAM model in the context of acceptance of IoT-based baby scales in *Posyandu*, then use SmartPLS 4 as a tool to understand the acceptance of IoT-based baby scale technology with an analytical research design. The data in this study were acquired via a questionnaire to be completed by cadres and *Posyandu* health professionals (Kurrotaa'yun et al., 2024).

The population of this study were all cadres and *Posyandu* health workers in Pagesangan urban village, Mataram city, West Nusa Tenggara, totaling 50 people from different *Posyandu*. This study involved 45 female respondents and 5 male respondents with an age range between 25 years and 60 years. Most occupations of *Posyandu* cadres are as housewives, the rest are employees and entrepreneurs. This study was conducted in Pagesangan urban village, Mataram city, West Nusa Tenggara with 7 *Posyandu* points named Melati 1 to Melati 7 with the number of cadres *Posyandu* varying between 5 to 7 cadres *Posyandu*. Purposive sampling was employed in the sampling procedure. Criteria for inclusion or samples desired by researchers based on the research objectives are *Posyandu* cadres and *Posyandu* health workers. In this study, data were obtained by a questionnaire utilizing a 5-point Likert scale with a score of 1 indicates significant disagreement, 2 disagreement, 3 neutrality, and 4 agreement, and 5 strongly agree, according to the TAM framework, which includes: Perceived usefulness (PU). The perceived usefulness of IoT weighing technology, Perceived Ease of Use (PEOU) is user impression of the ease of use of IoT weighing technology (Li et al., 2024), Attitude Toward Using (ATU) user attitude towards making use of IoT weighing technology in the form of acceptance or rejection, Behavioral Intention to Use (BI) user intention to use IoT weighing technology on an ongoing basis, Actual Use (AU) real use behavior (Alhasan et al., 2022).

The questionnaire was filled out by directly visiting each *Posyandu* in Pagesangan by bringing tools and IoT-based baby scale applications and used directly by cadres and *Posyandu* health workers during the *Posyandu* activity process. *Posyandu* activities run from 08.00 WITA to 11.00 WITA. At the end of the *Posyandu* activity, the researcher monitored and guided the respondents in filling out the questionnaire and ensured that the respondents were not confused and really understood the questions in the questionnaire that the researcher distributed so that the respondents interacted directly with the researcher to ask questions related to things that had not been understood as a form of building good to sustainable interactions through the WhatsApp private channel as a place to exchange information related to the researcher's research. With good and continuous interaction between researchers and respondents, this two-way communication will be maintained and enable effective and responsive information exchange. Broadly speaking, this research involves *Posyandu* cadres as research respondents, providing their assessment and views on the use of IoT technology in the health sector, especially in *Posyandu* in the form of baby scales. It will be expected that this study will provide a better being aware of how IoT technology is integrated into the health sector and what factors influence their acceptance or adoption of IoT-based baby scales using the TAM framework. It should be underlined that no previous research has conducted research or analysis related to the acceptance of this IoT-based baby scale technology.

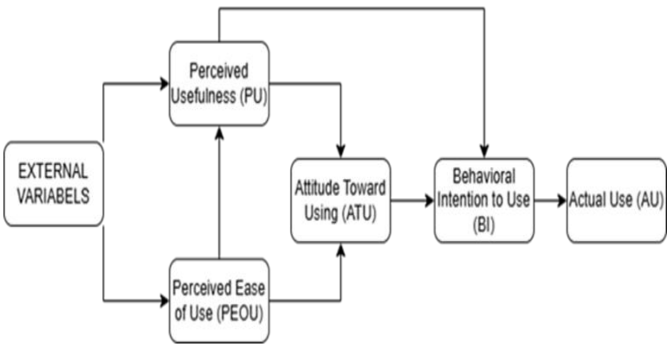

Figure 1. The Research framework

Hypothesis:
H1: Perceived usefulness (PU) has a positive effect on attitude towards use (ATU).
H2: Perceived Ease of Use (PEOU) has a positive effect on Attitude Toward Using (ATU).
H3: Perceived Ease of Use (PEOU) has a positive effect on Perceived Usefulness (PU).
H4: Attitude Toward Using (ATU) has a positive effect on Behavioral Intention to Use (BI).
H5: Perceived Usefulness (PU) has a positive effect on Behavioral Intention to Use (BI).
H6: Behavioral Intention to Use (BI) has a positive effect on Actual Use (AU).

Result and Discussion

Figure 2 is an activity in the field or *Posyandu* where IoT-based scales are used directly by cadres and *Posyandu* health workers who are there, which after being used directly can provide views related to the acceptance of this technology in the form of filling out a questionnaire. The results and discussion of this study include two stages, specifically, there are two types of model evaluation: outer model and inner model. The outer model tries to quantify or evaluate the relationship among latent variables (constructs) and current indicators to confirm that these indicators properly represent the constructs under consideration (Rahima et al., 2024).

Figure 2. Use of the IoT scales by *Posyandu* cadres

Table 1. Loading Factor

	ATU	AU	BI	PEOU	PU
ATU 1	0.90				
ATU 2	0.93				
ATU 3	0.88				
ATU 4	0.94				
AU 1		0.94			
AU 2		0.91			
AU 3		0.95			
AU 4		0.95			
BI 1			0.90		
BI 2			0.92		
BI 3			0.91		
BI 4			0.89		
PEOU 1				0.84	
PEOU 2				0.82	
PEOU 3				0.86	
PEOU 4				0.85	
PEOU 5				0.87	
PU 1					0.85
PU 2					0.87
PU 3					0.77
PU 4					0.89
PU 5					0.87

Table 2. Value of AVE

	Average variance extracted (AVE)
ATU	0.83
AU	0.88
BI	0.82
PEOU	0.72
PU	0.73

Convergent, discriminant, and reliability tests are used to evaluate the outer model results. The convergent validity test includes the loading factor value described in Table 1. The loading factor value of each indicator is considered to be good if it is above 0.7, then the next is the AVE value which is described in Table 2. The AVE value is said to be good if the value exceeds 0.5. Based on the data results in Table 1, it can be concluded that the loading coefficient value for each indicator is greater than 0.7 and Table 2. The AVE value presented shows an AVE value greater than 0.5, meaning that every indicators meet convergent validity.

Discriminant validity relates to the measurement value of different constructs. The discriminant validity test assesses the cross loading value of each variable with the best value greater than 0.7. An indicator is considered valid if the indicator has the highest factor loading value compared to the factor loading value of other indicators (Saragih et al., 2023). Table 3 displays the cross loading value.

Table 3. Value of Cross Loading

	ATU	AU	BI	PEOU	PU
ATU 1	0.90	0.38	0.60	0.74	0.57
ATU 2	0.93	0.45	0.61	0.73	0.61
ATU 3	0.88	0.46	0.63	0.68	0.68
ATU 4	0.94	0.42	0.68	0.69	0.67
AU 1	0.48	0.94	0.45	0.46	0.41
AU 2	0.41	0.91	0.48	0.49	0.33
AU 3	0.44	0.95	0.50	0.53	0.47
AU 4	0.45	0.95	0.49	0.44	0.36
BI 1	0.68	0.49	0.90	0.78	0.64
BI 2	0.64	0.41	0.92	0.64	0.59
BI 3	0.60	0.41	0.91	0.58	0.54
BI 4	0.58	0.53	0.89	0.61	0.53
PEOU1	0.59	0.42	0.64	0.84	0.62
PEOU2	0.66	0.49	0.57	0.82	0.68
PEOU3	0.73	0.42	0.71	0.86	0.69
PEOU4	0.61	0.39	0.57	0.85	0.53
PEOU5	0.69	0.44	0.59	0.87	0.65
PU 1	0.54	0.37	0.44	0.52	0.85
PU 2	0.51	0.47	0.58	0.63	0.87
PU 3	0.53	0.24	0.48	0.59	0.77
PU 4	0.72	0.40	0.60	0.74	0.89
PU 5	0.65	0.30	0.60	0.69	0.87

From the cross loading value obtained, it can be seen that each indicator of a latent variable has a higher value than the value of the indicator that is parallel to it or the value of the indicator of another variable. Therefore, it may be said that discriminant validity of each latent variable is good, which indicates that the latent variable has a high correlation with other constructs.

In assessing construct reliability, there are two methods that can be used, namely Cronbach's Alpha and Composite Reliability. The test is carried out by ensuring that the reliability value obtained is at least 0.7 (Pamungkas & Sudiarno, 2022). The reliability test is presented in Table 4.

Table 4. Results of Reliability Test

	Cronbach's alpha	Composite reliability	Composite reliability
ATU	0.93	0.93	0.95
AU	0.95	0.95	0.97
BI	0.92	0.93	0.94
PEOU	0.90	0.90	0.92
PU	0.90	0.91	0.93

Cronbach's alpha, composite reliability, and composite reliability results show that the value obtained is greater than 0.7, leading to the conclusion that all constructs in this study are reliable.

Table 5. Path Coefficient Value

	Original sample	Sample mean	Standard deviation	T statistics	P values
ATU=>BI	0.48	0.49	0.12	4.00	0.000
BI=>AU	0.51	0.51	0.14	3.45	0.001
PEOU=> ATU	0.58	0.58	0.17	3.36	0.001
PEOU=>PU	0.75	0.76	0.06	11.82	0.000
PU=>ATU	0.25	0.25	0.18	1.41	0.158
PU=>BI	0.30	0.30	0.11	2.66	0.008

Next is the path coefficient value described in Table 5, where the results of the table state that the relationship between PEOU to PU is very significant with a p-value of 0.001, which indicates that the easier IoT-based weighing technology is used by cadres and health workers, the higher the benefits they feel from the technology. Furthermore, there is PEOU on ATU has a significant effect with a p-value of 0.001, this indicates that the ease of technology encourages a positive attitude towards its users, but PU has no significant effect on ATU, which implies that the easier the technology is to use, the more positive the user's attitude towards it. However, the direct effect of PU on ATU showed a low and insignificant coefficient value ($p > 0.05$). This finding indicates that while the benefits of technology are theoretically recognized, it is not enough to directly shape positive attitudes towards technology use in the field. This is an interesting finding according to the researcher, where even though technology is considered useful, this is not enough to influence user attitudes

The amount of effect that the independent variable has on the dependent variable is expressed by the R^2 value. The R^2 value is a number between 0 and 1, with values closer to 1 indicating that the model can better explain variations in the data. Simply put, the more accurately the model captures the factors affecting the data, the higher the **R^2** value (Bimantari et al., 2024). In Table 6, the R^2 values are displayed.

Table 6. Value of R^2

	R^2
ATU	0.637
AU	0.265
BI	0.531
PU	0.571

From Table 6, the R2 value presented, it can be seen that the R2 value of ATU is 0.637 or 63.7%, indicating that PU and PEOU can explain 63.7% of the ATU variable, this shows that the effect of ATU in the model is quite strong, so this variable plays an important role in explaining the phenomenon under study. The R2 value for the AU variable is 0.265 or 26.5% and is classified as low, this indicates that the AU variable can only explain a small part of the data variation. The R2 value of BI of 0.531 or 53.1% indicates that 53.1% of the BI variable can be explained by PU, PEOU and ATU, BI is a fairly informative variable even though its strength is not as high as ATU, but still makes a significant contribution to the model. PU's R2 value of 0.571 or 57.1% indicates that 57.1% of the variance in the PU variable is explained by the PEOU variable. PU is one of the important variables in the context of this research model.

Discussion

Based on the findings of the analysis using the Technology Acceptance Model in this study, researchers managed to find several significant and insignificant findings. The most significant finding is that the PEOU variable has a significant and positive value on PU of 0.756, which means that the greater the ease of a technology used, the greater the benefits obtained by users from using the technology. In this study, the ease of use by cadres and *Posyandu* health workers in using this IoT-based baby scale is very large, they feel that this IoT-based scale is easy for them to use in *Posyandu* activities, because the magnitude of the perceived ease also has an impact on the benefits felt by users, they feel that the use of this IoT-based scale technology able to make their work more effective, they feel that the use of IoT-based scales in *Posyandu* activities facilitates their work and overall the use of IoT-based scales is very useful in their work. The second finding is the insignificant value of the PU variable in ATU of 0.258, which means that even though users feel the great benefits of using this technology, it is not enough to influence user attitudes towards using this technology. In this study, *Posyandu* cadres and health workers felt great benefits from the use of IoT-based baby scale technology in the form of increasing work effectiveness, making work easier and overall the use of IoT-based scales was very beneficial in their work but did not show a significant value on the attitude of its users because of this insignificant value the researcher immediately discussed this with *Posyandu* cadres and health workers, After extracting further information, this insignificant influence is caused by other factors in the form of work culture or *Posyandu* work procedures called the five table system consisting of table 1 registration, table 2 weighing toddlers, table 3 recording the results of weighing toddlers, table 4 individual counseling, and table 5 providing additional food (Miranda et al., 2023; Sandra & Choiriyah, 2024). This affects user attitudes despite the perceived benefits. Cadres still want to use the old procedure without reducing the number of cadres, because if using IoT weighing technology, only 1 or 2 cadres are needed per *Posyandu*. This is supported and proven by Robbins et al. (2009) theory of change resistance where people with a high need for security tend to resist change because it threatens their feelings of security, causing feelings of possible job loss and job insecurity and those who remain also feel unsafe to do work done by two or three people. The results of this study add to the development of the theory as it shows that the application of IoT technology in healthcare requires adaptation, not only to the technology itself but also to the work ecosystem where the technology will be used or applied.

The effect of PU on BI is still significant. This shows that technological benefits play a role in shaping user intentions and behavior, but in this study it is classified as weak with a value of 0.304 due to considering the unique findings in the field at the time of research in the form of an old system that wants to be maintained. The effect of ATU on BI has a significant relationship. This study shows that users' tendency to use this technology is driven by their attitudes. This happens if users believe that using this technology is a good idea. Finally, the effect of BI on AU has a significant and positive value of 0.514. This supports the concept that a strong intention to use technology increases the likelihood of actual use. PEOU has a significant influence on PU, with an R^2 value of 0.571, which indicates that the easier a technology is to use, the higher the benefits perceived by users. However, the findings also indicated that PU did not significantly influence ATU, although the R^2 value of 0.259 indicated a moderate relationship. This reveals that simply knowing the benefits of a technology is not enough to form a positive attitude towards adopting it. One of the most important results in this study is the low R^2 value on AU of 0.265, which indicates that only 26.5% of the variability in actual use can be explained by the variables in the TAM model. This indicates a significant gap between users' intention to adopt the technology and implementation in the field, which can be influenced by various external factors.

This study underlines that even though technology is considered useful, and very helpful, this is not enough to influence user attitudes and intentions in its use. Work culture or *Posyandu* work procedures are a factor even though technology is considered useful, and very helpful, this is not enough to influence user attitudes and intentions in its use. Cadres still want to use the old procedure without cutting the number of cadres, because if using IoT weighing technology, only 1 or 2 cadres are needed in each *Posyandu*. This phenomenon is explained by Robbins et al. (2009) on change resistance where people with a high need for security tend to resist change because it threatens their feelings of security thus creating feelings of possible job loss and job insecurity and those who remain also feel unsafe to do the work of two or three people.

Conclusion

Overall, this study found that although health workers and *Posyandu* cadres understand and recognize the benefits and ease of use of IoT-based toddler scales, implementation in the field is still hampered by external factors, mainly due to resistance to change. e These findings not only enrich the theory of technology adoption in the health sector, but also open up opportunities to further explore how organizational roles and work culture affect the successful implementation of innovations.

Acknowledgements
We would like to thank to the Faculty of Engineering, University of Mataram.

Author Contributions
Conceptualization, methodology, formal analysis, investigation, data curation, writing-preparation of initial draft F.A.W.; validation, resourcing W.W., H.W.; writing-review and editing W.W.; visualization H.W.

Funding
Researchers independently funded this research.

Conflicts of Interest
The authors declare no conflict of interest.

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