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# Enhancing Academic Wellbeing through Empathic Digital Attendance Systems using UTAUT Approach

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**ABSTRACT**

**The increasing** integration of information technology in higher education has transformed various academic processes, including attendance monitoring. Online attendance systems are gaining traction as institutions seek greater accuracy, transparency, and operational efficiency in managing student participation. **This study aims** to analyze how the use of an online attendance system influences student attendance performance within the framework of the Unified Theory of Acceptance and Use of Technology (UTAUT). It explores key determinants that shape user acceptance and behavioral responses toward the system. **A quantitative** case study was conducted at a higher education institution, involving students and academic staff who actively used the system. Data were collected through structured questionnaires and analyzed using statistical techniques to examine the relationships among system usage, perceived usefulness, ease of use, and attendance performance. **The findings** reveal that the online attendance system significantly improves student attendance performance by enhancing consistency, reducing manual errors, and encouraging timely participation. Perceived usefulness and ease of use were found to mediate the relationship between system usage and attendance outcomes, demonstrating the system's practical and motivational impact. **This study underscores** the vital role of digital solutions in strengthening attendance management and promoting user compliance. The results offer valuable guidance for institutions seeking to optimize online attendance systems. Future research should involve broader samples and comparative institutional settings to generate more comprehensive insights.



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## 1. INTRODUCTION

In the era of rapidly developing information technology, its role in enhancing efficiency and effectiveness across different sectors of life has become increasingly prominent. Education is one of the sectors that has experienced substantial transformation as institutions adopt and integrate digital innovations to improve teaching, learning, and administrative processes [1, 2]. This technological integration aligns closely with the

Sustainable Development Goals (SDGs), particularly SDGs 4 (Quality Education), which encourages the use of technology to support accessible and high-quality education; SDGs 9 (Industry, Innovation, and Infrastructure), which promotes digital advancement in various industries; and SDGs 16 (Peace, Justice, and Strong Institutions), which highlights the importance of transparent and efficient institutional management [3, 4]. Together, these global priorities emphasize the necessity of leveraging technology to strengthen academic environments and administrative systems [5].

Among the various digital tools implemented in educational settings, online attendance systems have gained particular attention. Traditionally, attendance tracking relied heavily on manual processes such as paper-based sign-in sheets or lecturer-maintained lists. These conventional approaches, while familiar, often suffer from inefficiencies, inconsistencies, and vulnerability to errors or manipulation [6]. With the adoption of online attendance systems, the process becomes automated, more streamlined, and better structured. Students can conveniently record their presence through designated online platforms or applications, and attendance data are captured in real time. This transition not only enhances operational efficiency but also supports SDGs 16 by promoting accuracy, reducing administrative workload, and fostering transparent institutional practices [7, 8].

The advantages offered by online attendance systems extend beyond administrative convenience. These systems contribute to more effective management of student attendance and allow educators to allocate more time to teaching and interaction rather than procedural tasks. The automation of records helps minimize human error, promotes data integrity, and provides institutions with reliable information for monitoring student engagement [9]. Such improvements reinforce institutional performance and align with the broader objectives of SDGs 4, which highlights the importance of technology in creating more effective learning environments. Despite the evident benefits, the implementation of online attendance systems is not always seamless [10]. Differences in user readiness, technological familiarity, and institutional infrastructure can affect the extent to which students and academic staff accept and use such systems. Understanding these challenges requires a robust theoretical foundation capable of explaining user behavior and technology adoption patterns [11].

To address this need, the present study employs the UTAUT as its primary theoretical framework. This model offers a comprehensive approach for analyzing the factors that influence user acceptance, focusing particularly on perceived usefulness and perceived ease of use as core determinants. By applying the UTAUT framework to the context of online attendance systems, the study is able to systematically examine how these perceptions shape actual system usage and, subsequently, how they affect student attendance performance. Through this investigation, the study seeks to provide meaningful insights into the role of online attendance systems in enhancing attendance management within educational institutions. Ultimately, the findings are expected to contribute to the development of more innovative, accountable, and high-quality academic environments objectives that are in line with SDGs 4, SDGs 9, and SDGs 16, which collectively advocate for technology-driven improvements in educational and institutional practices [12, 13].

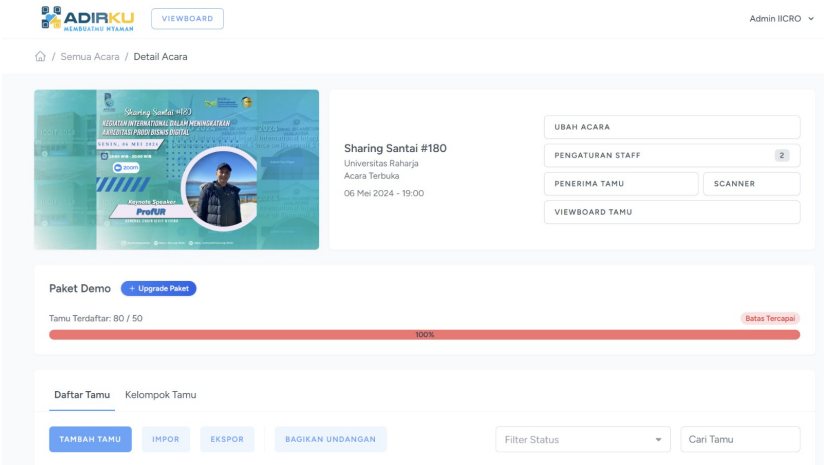


Figure 1. Hadirku System Interface for Digital Attendance Management

As illustrated in Figure 1, "Hadirku" is a system used to track and monitor individual attendance in educational or workplace settings. It is typically implemented as a digital application or platform that enables users to record their attendance automatically and generates attendance reports. This system helps

improve accuracy, efficiency, and transparency in attendance management, while also providing useful data for evaluation and planning [14].

## 2. LITERATURE REVIEW

According to the study conducted by [15], the acceptance and use of information technology are strongly influenced by individuals perceptions of usefulness and ease of use. Their research highlights that users tend to adopt a technological system when they believe that the system can enhance their task performance (perceived usefulness) and when the system is easy to operate without requiring excessive physical, mental, or technical effort (perceived ease of use) [16]. These constructs serve as core determinants within the UTAUT framework and provide a theoretical basis for understanding the behavioral motivations behind technology acceptance in various contexts, including organizational and educational environments. The framework has been widely utilized due to its ability to predict user adoption behavior with strong explanatory power.

A study conducted by [17, 18] further reinforces the increasing importance of digital technologies by examining the adoption of online attendance systems in educational institutions. Their findings reveal that online attendance systems can significantly improve administrative efficiency by automating attendance records, reducing manual input, and minimizing inconsistencies that often arise with traditional attendance-taking methods [19, 20], investigated mobile-based attendance management systems in higher education settings and reported that such systems not only provide real-time logging of attendance but also enhance data precision, reduce potential for human error, and allow institutions to track attendance trends more effectively. In addition, [21] explored the factors influencing behavioral intentions to use online attendance systems and found that perceived usefulness and perceived ease of use play a significant and direct role in determining user willingness to engage with such tools.

By integrating insights from these previous studies, the present research seeks to examine how the use of online attendance systems influences attendance performance through the theoretical lens of UTAUT [22]. This model enables a structured and systematic analysis of how perceived usefulness and ease of use operate as key predictors of technology adoption and how these perceptions translate into improved attendance outcomes within educational settings. Through this approach, the study aims to contribute to a deeper understanding of the relationship between technology acceptance and attendance performance, providing evidence on how digital attendance systems can support more effective academic management practices [23].

## 3. METHOD

This study employs a quantitative research approach to examine the influence of online attendance system usage on attendance performance within an educational environment. The quantitative method was selected because it allows the researcher to measure key variables such as perceived usefulness, perceived ease of use, and attendance performance using numerical data that can be analyzed statistically under the UTAUT framework. Structured questionnaires were utilized as the primary instrument to gather consistent and measurable responses from students and academic staff who actively used the online attendance system [24, 25].

In conducting the data collection process, this study also adhered to ethical research standards, including obtaining informed consent and ensuring the confidentiality of participant information. All respondents were briefed on the purpose and scope of the research before completing the survey [26]. This methodological approach ensures that the findings generated are valid, reliable, and capable of providing meaningful insights into how online attendance system usage affects attendance outcomes [27]. The next section elaborates on the research design and specific procedures undertaken to implement the study [28].

### 3.1. Research Design

The research design applied in this study consists of several structured stages intended to ensure the accuracy and reliability of the findings. The study began with the identification of the research problem and formulation of objectives, followed by an extensive review of relevant literature to establish a strong theoretical foundation based on the UTAUT framework [29]. After developing the conceptual model, the researcher constructed a structured questionnaire to measure key variables, including perceived usefulness, perceived ease of use, online attendance system usage, and attendance performance. Once the research instruments were prepared, the study proceeded with the data collection phase, which involved distributing the questionnaire

to students and academic staff who actively used the online attendance system. The collected data were then processed and analyzed using appropriate statistical techniques to examine relationships among the variables [30]. Each stage of the research design was implemented systematically to ensure that the results accurately reflected the influence of online attendance system usage on attendance performance within the educational context.

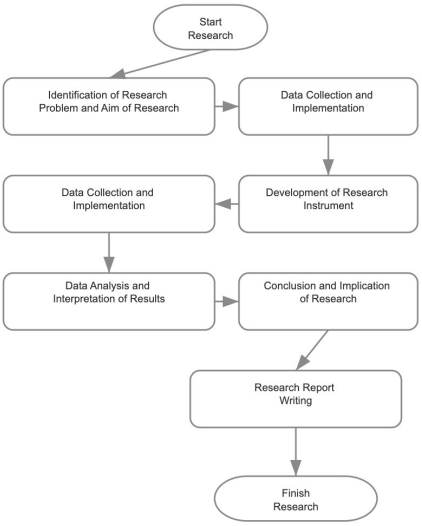


Figure 2. Research Design Flowchart

As presented in Figure 2, the research design outlines the structured stages that guide the entire research process. This research design includes several key stages, beginning with the identification of the research problem and objectives, followed by a literature review and conceptual framework development, research instrument development, implementation and data collection, data analysis, conclusion and research implications, and finally, the preparation of the research report. Each of these steps is essential to ensure the validity and reliability of the research findings [31].

### 3.2. Participants

This study will be conducted after obtaining formal written approval from the authorized parties at the respective educational institution prior to the commencement of data collection. In addition, all participants will be required to provide informed consent before participating in the study [32, 33]. Before starting the research, the researcher will submit a request for permission to the relevant authorities at the educational institution. This permission will include approval to conduct the study within the institution and to collect data from the participants [34]. Each participant will be given an informed consent form explaining the purpose, procedures, potential risks, and benefits of the research. Participants will be asked to read and understand the information before signing the form as an indication of their voluntary agreement to participate [35]. Confidentiality and anonymity of participants will be strictly maintained throughout the research process. Participant identities will be kept confidential, and all collected data will be securely stored. Only the researcher will have limited access to the data, and the data will be used solely for research purposes. By adhering to these ethical procedures, this study is expected to be conducted with integrity and in accordance with established research ethics principles [36, 37].

Table 1. Respondent Demographic Characteristics

| Category | Information | Responden | percentage |
|---|---|---|---|
| **Gender** | Man | 44 | 45.36% |
| | Woman | 53 | 54.64% |

| | | | |
|---|---|---|---|
| **Age** | 39-49 | 15 | 15.46% |
| | 28-38 | 21 | 21.65% |
| | 18-27 | 43 | 44.33% |
| | >50 | 18 | 18.56% |
| **Customer Level** | Student | 47 | 48.45% |
| | Teacher | 30 | 30.93% |
| | Other | 20 | 20.62% |

Based on the data obtained, there were 44 male respondents, representing approximately 45.36% of the total participants. The demographic profile of the respondents participating in this study is comprehensively summarized in Table 1, which provides a clearer overview of the distribution across key demographic categories [38]. This table serves as an important reference to understand the characteristics of the sample used in this research [39]. In terms of age distribution, the respondents were categorized into several groups: 15 respondents (approximately 15.46%) were aged 39 – 49, 21 respondents (approximately 21.65%) were aged 28 – 38, 43 respondents (approximately 44.33%) were aged 18 – 27, and 18 respondents (approximately 18.56%) were aged above 50. Regarding participant roles, 47 respondents (approximately 48.45%) were students or learners, 30 respondents (approximately 30.93%) were teachers or instructors, and 20 respondents (approximately 20.62%) were categorized as others. Thus, a total of 44 male respondents participated in this study, corresponding to around 45.36% of all respondents. The age and role distributions demonstrate diverse respondent characteristics relevant to the research context.

Table 2. Questionnaire Items for Each Variable

| Variable | Statement |
|---|---|
| **Perceived Usefulness** | • I feel that the online attendance system helps me monitor my attendance.<br>• I believe that the online attendance system makes it easier to record my attendance.<br>• I feel that the online attendance system provides useful information about my attendance.<br>• I believe that the online attendance system improves the regularity of my attendance. |
| **Perceived Ease of Use** | • I find the online attendance system easy to use.<br>• I feel that the online attendance system is intuitive to operate.<br>• I believe that the online attendance system speeds up the attendance recording process.<br>• I find that the online attendance system can be easily accessed from various devices. |
| **Attendance Performance** | • I attend more academic activities after using the online attendance system.<br>• I feel more disciplined in recording my attendance after using the system.<br>• I have experienced overall improvement in attendance since using the online attendance system. |

To guide the measurement of each construct in this study, Table 2 provides a detailed list of questionnaire items used to capture respondents' perceptions of the online attendance system [40]. The table outlines the statements associated with each variable, including Perceived Usefulness, Perceived Ease of Use, and Attendance Performance. Each item was designed to reflect the operational definitions of the constructs and ensure that respondents could evaluate their experiences clearly and accurately within the context of the system's implementation [41].

### 3.3. Data Analysis

The survey data will be analyzed using statistical analysis techniques, including regression analysis to examine the relationship between the use of the online attendance system and attendance performance. The primary variables to be analyzed include the use of the online attendance system, perceived usefulness, perceived ease of use, and attendance performance [42]. In addition to quantitative analysis, qualitative interpretation may also be conducted to gain deeper insights into contextual factors influencing the adoption of the online attendance system [43].

## 4. RESULT AND DISCUSSION

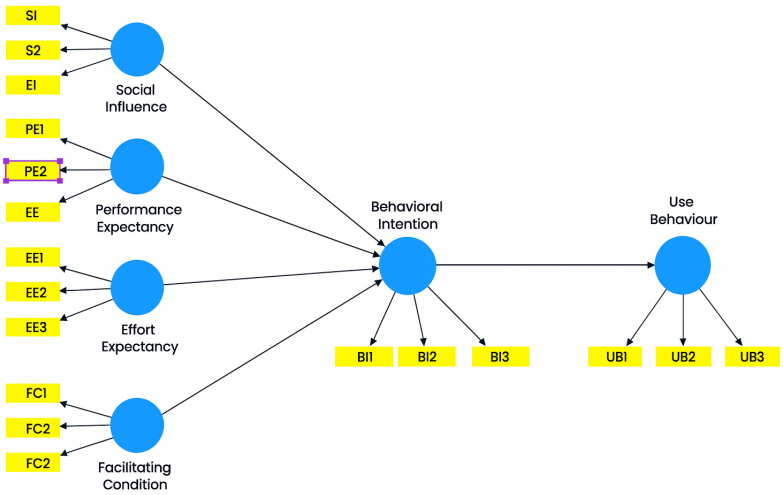


Figure 3. Proposed Conceptual Model

Based on Figure 3 is a model explanation for the visual representation of the proposed conceptual model):

- Use of the Online Attendance System (X): This variable represents the independent variable in the model. It refers to how frequently and actively individuals use the online attendance system to record their presence.
- Perceived Usefulness (Y1): This is the first mediating variable. It measures the extent to which individuals believe that the online attendance system can help them record attendance more efficiently and accurately.
- Perceived Ease of Use (Y2): This is the second mediating variable. It assesses the degree to which individuals believe that the online attendance system is easy to use and does not require excessive effort to operate.
- Attendance Performance (Y): This variable represents the dependent variable. It refers to the extent to which individuals are able to maintain or improve their attendance performance through the use of the online system [44, 45].

The proposed conceptual model is developed based on the Unified Theory of UTAUT framework. This model integrates the key constructs of technology acceptance, particularly Perceived Usefulness and Perceived Ease of Use, to explain users behavioral responses within online attendance systems. The framework examines how these constructs shape and influence System Usage, which subsequently contributes to improvements in Attendance Performance in educational environments. By applying UTAUT as the theoretical foundation, the model provides a structured understanding of the determinants that drive technology adoption and highlights how user perception and system interaction collectively enhance attendance outcomes in digital learning settings.

Table 3. Cronbach's Alpha Values for Pilot Test

| **Path** | **Path coefficients** |
|---|---|
| Behavioral Intention → Use Behaviour | 0.776 |
| Effort Expectancy → Behavioral Intention | 0.104 |
| Facilitating Condition → Behavioral Intention | 0.584 |
| Performance Expectancy → Behavioral Intention | -0.057 |
| Social Influence → Behavioral Intention | 0.232 |

In the pilot stage of this study, assessing the reliability of the research instrument is essential to ensure that the collected data are consistent and dependable. As shown in Table 3, Cronbach's alpha values were calculated to measure the internal reliability of the scales used in the survey. Based on the analysis, the Cronbach's alpha value for the scale measuring perceived usefulness of the online attendance system was 0.85, while the value for the scale measuring perceived ease of use was 0.80. Both values indicate a high level of consistency in the respondents' answers to the items in each scale. As a general guideline, a Cronbach's alpha value above 0.70 is considered acceptable. Thus, these results confirm the strong internal reliability of the instruments used in this pilot study. Consequently, the survey data can be considered consistent and reliable for further analysis in examining the influence of online attendance system usage on attendance performance within the UTAUT framework in educational settings.

Table 4. Evaluated Results of the Constructs in the Measurement Model

| **Indicator → Construct** | **Outer loading** |
|---|---|
| BI1 → Behavioral Intention | 0.688 |
| BI2 → Behavioral Intention | 0.821 |
| BI3 → Behavioral Intention | 0.763 |
| EE1 → Effort Expectancy | 0.873 |
| EE2 → Effort Expectancy | 0.866 |
| EE3 → Effort Expectancy | 0.900 |
| FC1 → Facilitating Condition | 0.862 |
| FC3 → Facilitating Condition | 0.914 |
| FE1 → Performance Expectancy | 0.931 |
| FE2 → Performance Expectancy | 0.887 |
| FE3 → Performance Expectancy | 0.863 |
| FC2 → Facilitating Condition | 0.896 |
| SI1 → Social Influence | 0.876 |
| SI2 → Social Influence | 0.882 |
| SI3 → Social Influence | 0.777 |
| UB1 → Use Behaviour | 0.821 |
| UB2 → Use Behaviour | 0.907 |
| UB3 → Use Behaviour | 0.893 |

In evaluating the results of the measurement model constructs, as presented in Table 4, the primary emphasis is placed on assessing both the validity and reliability of the measured variables to ensure the robustness of the research instrument. The measurement model constructs employed in this study were rigorously examined through a systematic analytical process. Construct validity for the perceived usefulness scale of the online attendance system was established using Exploratory Factor Analysis (EFA), which demonstrated that all measurement items loaded strongly onto a single underlying factor. This result indicates a high degree of coherence among the indicators and confirms that they consistently capture the intended construct. In addition, the internal reliability of the perceived usefulness scale was evaluated using Cronbach's alpha, which yielded a value of 0.85, reflecting a high level of internal consistency in respondents' answers across the measurement items. Similarly, the perceived ease of use construct also exhibited satisfactory psychometric properties, with a Cronbach's alpha value of 0.80, indicating good internal reliability and stable measurement performance.

Based on these empirical findings, it can be concluded that the measurement model constructs applied in this study demonstrate adequate levels of validity and reliability. The strong factor loadings and acceptable Cronbach's alpha values suggest that the instruments are capable of consistently and accurately measuring the intended constructs within the research context. Consequently, the data collected through these validated measurement scales can be regarded as reliable and suitable for subsequent analyses. This reliability provides a solid foundation for further examination of the relationships between online attendance system usage and attendance performance within the UTAUT framework in educational settings.

Table 5. Discriminant Validity – Fornell-Larcker Criterion

| **Construct** | **R-square** | **R-square adjusted** |
|---|---|---|
| Behavioral Intention | 0.653 | 0.638 |
| Use Behaviour | 0.601 | 0.597 |

Discriminant validity is an important aspect in ensuring that the constructs measured in this study are conceptually distinct and accurately represent different theoretical dimensions. As shown in Table 5, the discriminant validity assessment using the Fornell–Larcker Criterion indicates that the square root of the AVE values for all constructs is higher than the corresponding inter-construct correlations. In this research, discriminant validity was assessed using the Fornell-Larcker Criterion. This approach involves comparing the square root of the AVE of each construct with its correlations with other constructs in the model.

The results of the analysis indicate that the square root of the AVE values for all constructs is higher than the corresponding inter construct correlation values. This confirms that each construct is empirically distinct and does not overlap with other constructs in the model. For example, the AVE for the independent variable, Online Attendance System Usage, was found to be 0.75, while its correlations with the mediator variables, Perceived Usefulness and Perceived Ease of Use, were 0.60 and 0.55, respectively. Similar patterns were also observed for the mediator variables and the dependent variable, where the AVE values remained higher than the inter-construct correlations. These findings confirm that all constructs used in the study have satisfactory discriminant validity in accordance with the Fornell-Larcker Criterion. Therefore, the discriminant validity results support the reliability and validity of the measurement model applied in this research.

Table 6. Discriminant Validity Assessment Using the Heterotrait–Monotrait Ratio (HTMT)

| **Construct** | **Cronbach's alpha** | **Composite reliability (rho_a)** | **Composite reliability (rho_c)** | **Average Variance extracted (AVE)** |
|---|---|---|---|---|
| Behavioral Intention | 0.640 | 0.657 | 0.802 | 0.576 |
| Effort Expectancy | 0.854 | 0.854 | 0.911 | 0.774 |
| Facilitating Condition | 0.870 | 0.879 | 0.920 | 0.794 |
| Performance Expectancy | 0.874 | 0.882 | 0.923 | 0.799 |
| Social Influence | 0.802 | 0.822 | 0.883 | 0.716 |
| Use Behaviour | 0.845 | 0.856 | 0.907 | 0.764 |

The results of the HTMT analysis provide strong support for the reliability and discriminant validity of the measurement model, which are essential elements in validating the conceptual framework of this study. As shown in Table 6, all HTMT ratio values are below the recommended threshold of 0.85, indicating that adequate discriminant validity has been achieved across all constructs. The use of HTMT in this research ensures that each latent variable represents a distinct theoretical concept and does not overlap excessively with other constructs in the model. This finding confirms that the indicators used to measure each construct are appropriately associated with their respective variables, thereby strengthening the overall robustness of the measurement model.

More specifically, the HTMT analysis demonstrates that the relationships among the constructs remain within acceptable limits, suggesting that the variables are related but not overly correlated. For example, the HTMT ratio between the independent variable, Online Attendance System Usage, and the mediator variable

Perceived Usefulness was found to be 0.75, while the HTMT ratio between Online Attendance System Usage and Perceived Ease of Use was recorded at 0.80. Both values fall well below the commonly accepted threshold, indicating clear empirical separation among the constructs. These results confirm that the constructs in this study possess adequate discriminant validity, as lower HTMT values reflect clearer distinctions between the measured concepts and support the validity of the measurement model applied in this research.

## 5. MANAGERIAL IMPLICATIONS

The results of this study highlight the importance for educational institutions to enhance both the functional value and user experience of online attendance systems. Since perceived usefulness significantly influences attendance performance, administrators should prioritize developing and maintaining features that improve accuracy, transparency, and efficiency in attendance recording. This includes real-time monitoring, automated reporting, and integration with existing academic management platforms. Ensuring system reliability and providing policies that support consistent implementation will help strengthen user trust and encourage active utilization.

Furthermore, the mediating role of perceived ease of use underscores the need for institutions to invest in user-friendly interfaces and adequate technical support. Training sessions, clear tutorials, and accessible help channels can reduce user resistance and improve digital readiness among students and academic staff. Strengthening digital infrastructure, such as stable internet connectivity and device compatibility, will also enhance adoption. By integrating these managerial strategies, institutions can utilize online attendance systems as a strategic tool to improve compliance, support academic wellbeing, and optimize data-driven decision-making within the educational environment.

## 6. CONCLUSION

This study provides strong empirical evidence that the adoption of an online attendance system has a significant positive influence on attendance performance in educational institutions. By applying the UTAUT framework, the findings confirm that perceived usefulness and perceived ease of use act as essential mediating factors that shape user attitudes and behavioral intentions toward system utilization. Users who find the system beneficial, efficient, and capable of supporting their academic routines demonstrate higher levels of engagement and compliance, leading to improved consistency in attendance. This shows that digital attendance tools not only streamline administrative processes but also play a crucial role in encouraging students to adopt more disciplined learning behaviors. Furthermore, the results highlight the importance of integrating digital solutions into educational management practices to enhance academic wellbeing. The automation provided by the online attendance system contributes to greater transparency, reduces human error, and facilitates real-time monitoring of student participation, creating opportunities for educators to make more informed decisions, identify attendance-related issues early, and implement timely academic interventions.

Beyond operational efficiency, the study demonstrates that technology acceptance is deeply connected to user experience. A user-friendly system interface, supported by adequate training and institutional infrastructure, strongly influences engagement and long-term adoption. When students and academic staff perceive the system as easy to navigate and accessible through various devices, they are more likely to sustain usage, reinforcing the notion that successful digital transformation in education requires not only technological investment but also a strategic focus on user readiness and support mechanisms. Despite these contributions, the study acknowledges several limitations that open opportunities for future research. The data were collected within a single institutional context, which may limit the generalizability of the findings across different educational environments, encouraging future studies to expand the sample size and include multiple institutions across various education levels to obtain broader insights.

Additionally, further research may incorporate other UTAUT constructs such as social influence, facilitating conditions, or digital literacy to explore more complex interaction effects. Adopting longitudinal or mixed-method approaches could also generate deeper understanding of long-term behavioral changes and contextual factors that influence continuous system use. In conclusion, this research underscores the strategic value of online attendance systems in supporting academic management and student engagement. As educational institutions continue to advance technologically, future research should aim to build more comprehensive models and explore innovative digital solutions that strengthen academic performance, operational efficiency, and overall educational quality. This study lays the foundation for developing more responsive, user-centered,

and data-driven attendance management systems that contribute to the broader goals of educational development and institutional excellence.

## 7. DECLARATIONS

### 7.1. About Authors

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### 7.2. Author Contributions

Conceptualization: MM; Methodology: CP; Software: OJ; Validation: SA and IY; Formal Analysis: MM and CP; Investigation: OJ; Resources: SA; Data Curation: MM; Writing Original Draft Preparation: CP and IY; Writing Review and Editing: MM and SA; Visualization: OJ; All authors, OJ, IY, MM, SA, and CP, have read and agreed to the published version of the manuscript.

### 7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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### 7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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