American Journal of Innovation in Science and Engineering (AJISE)

ISSN: 2158-7205 (ONLINE)

VOLUME 4 ISSUE 1 (2025)

PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

American Journal of Innovation in Science and Engineering (AJISE)

Volume 4 Issue 1, Year 2025
ISSN: 2158-7205 (Online)
DOI: https://doi.org/10.54536/ajise.v4i1.3947
https://journals.e-palli.com/home/index.php/ajise

Integration of IoT-Knowledge-Based Architecture in the Development of the Daily Time Records System for the Ministry of Science and Technology, Philippines

Mansur L. Panalangin[1*], Jonathan M. Mantikayan[2], Montadzah A. Abdulgani[3], Haron A. Mohamad[4]

Article Information

Received: October 24, 2024
Accepted: November 29, 2024
Published: December 21, 2024

Keywords

Daily Time Records System, Daily Time Records, Digital Attendance Systems, Integration of IoT, Knowledge-based Architecture, Technology Acceptance, Timekeeping Automation

ABSTRACT

This study investigates the effectiveness and acceptance of the Daily Time Records System (DTRS) in the Ministry of Science and Technology. Most employees reported challenges with the existing manual system in accomplishing their Daily Time Records (DTR), highlighting a critical need for an automated and streamlined system. The DTRS was evaluated for its perceived usability, perceived ease of use, system quality, and fit, with findings suggesting substantial benefits in job performance, productivity, and daily time records management. Respondents perceived DTRS as user-friendly and accessible, describing the system as a high-quality tool that effectively meets their needs and expectations. Statistical analysis reveals significant correlations between perceived usability, ease of use, system quality, fit, and user intention to use and satisfaction. It has also been determined that while there is a high significant relationship with the other three dimensions and intention to use and user satisfaction, there is only a moderately significant relationship in terms of perceived usefulness. This can be attributed with the fact that DTRS is not a system directly used in the performance of the respondents' jobs.

INTRODUCTION

In February 2018, Republic Act 11032, also known as the "Ease of Doing Business and Efficient Government Service Delivery Act of 2018 was signed into law by President Rodrigo Roa Duterte. Department of Information and Communications Technology (DICT). This law amended the Anti-Red-Tape Act of 2007 and mandates the reengineering of systems and procedures in all government offices and agencies, including local government units (LGUs), government-owned or controlled corporations, and other government instrumentalities. It covers services provided for both business and non-business-related transactions, whether located in the Philippines or abroad.

In January 2019, the transition to the Bangsamoro Government commenced following the ratification of RA 11054, the Organic Law for the Bangsamoro Autonomous Region in Muslim Mindanao. This law established interim cabinets, including the Ministry of Science and Technology, as provided for in Section 8, Article XVI. Pursuant to Section IX, Article IX of the same law, the Ministry of Science and Technology (MOST) is mandated to set the direction and leadership in science, research, inventions, technology education, and their development. It also ensures the full and effective participation of all sectors in the planning, programming, coordination, and implementation of scientific and technological research.

Article 201 of the Bangsamoro Civil Service Code (BAA 17) stipulates the requirements for recording attendance. It states that all BARMM officers and employees shall record their daily attendance on the proper form or, whenever possible, have them registered on the Bundy clock or Biometric Attendance Monitoring System (BAMS). Other means of recording attendance may be allowed, provided their respective names, signatures, and the time of their actual arrival and departure from the office are indicated, subject to verification. This includes those serving in the field or on board a vessel as their usual place of work. The Record of Attendance shall be kept in a conspicuous place and shall be in the custody of a responsible officer who shall monitor the arrival and departure of officials and employees.

With the moral governance that the Bangsamoro Government aims to achieve during the transition and beyond, a reliable system for the recording and managing employee attendance is crucial. It is essential to produce a record that is free from manipulation and collusion among the employees. Therefore, the recording of the Daily Time Records (DTR) must be supported by equipment to ensure real-time monitoring, allowing provincial offices be monitored from the Regional Office. This study evaluates a new system that would improve manual recording of attendance and hopefully contribute to the efforts of the Ministry to improve systems and provide quality services.

Research Questions

The following are the research questions that this research study intends to address:

[1] Ministry of Science and Technology, Philippines
[2] Bangsamoro Information and Communications Technology Office, Cotabato City, Philippines
[3] Cotabato State University, Philippines
[4] Talitay National High School, DepEd, Philippines
[*] Corresponding author's e-mail: mhansur@gmail.com

1. What challenges or limitations do the users encounter within the current Ministry of Science and Technology-BARMM's daily time record system development process?

2. To what extent is the implementation of the MOST DTRS perceived by the MOST employees in terms of Perceived Usability, Perceived Ease of Use, System Quality, and fit?

3. To what extent is the implementation of the MOST DTRS perceived by the MOST employees in terms of intention to use and user satisfaction?

4. Is there a significant relationship between the four dimensions considered and the employees' intention to use and satisfaction?

MATERIALS AND METHODS

Research Design

This research utilized quantitative research. Quantitative research designs involve collecting and analyzing numerical data to test hypotheses and make statistical inferences. Quantitative methods used in this IS research include interviews, surveys, and statistical modeling techniques to determine general information and relationships. The research involved the following processes:
Formulating Research Questions or Hypotheses: several research questions

Locale of the Study

The study, through its prototype is tested and used by the stakeholders, particularly the MOST Regional office in Bangsamoro Government Center, Governor Gutierrez Avenue. This includes the Special Geographic Area (SGA) office in Midsayap, North Cotabato; the Cotabato City Office in ND Village; and the Maguindanao office and Laboratory. The prototype system is evaluated by experts identified by the researcher including one from the university.

Research Participants

The evaluators of the DTRS, who are the respondents in the survey, are composed of the employees from the Ministry of Science and Technology from the MOST Regional Office, MOST Special Geographic Area (SGA) Office, MOST Cotabato City Office, MOST Maguindanao Provincial Office, MOST Laboratory, MIS Section, totaling ninety (90) individuals.

Research Instruments

The following instruments are utilized to analyze and assess the DTR system integrating IoT knowledge-based architecture. These instruments are categorized into hardware and software components:

Hardware Components

RFID Sensor

The RFID sensor retrieves information from the server of the users once it is read by the system;

Fingerprint Sensor

This serves as the input device to capture the biometric information of the users and validates the information provided by the RFID;

Microcontroller

This will process inputs generated by the sensors; Computer- The computer shall serve as a frontend/ dashboard which displays the gathered and validated information;

Router

The router shall provide connectivity to the cloud server so that the information can be transferred; Cloud Server- The cloud server is the storage of all information inputted to and processed by the system.

Software Components

C#

The programming language used in the frontend/ dashboard;

Linux

The operating system used in the cloud server;

PHP

The programming language used in the online frontend;

MySQL

The database system used for backend;

C++

The programming language used in the microcontroller.

Evaluation of the System Effectiveness

To evaluate the effectiveness of the system in terms of perceived usability, perceived ease of use, system quality, and fit, the researcher used a survey questionnaire.
To measure system quality, the researcher has considered the measures of software quality as provided by ISO/ IEC 25010. To simplify, the respondents' perception on the system quality will be the basis that will affect their intention to use and user satisfaction. The following are the dimensions of system quality for this research study which were culled out from the nine quality characteristics in ISO ISO/IEC 25010:

Usability

Appropriateness Recognizability

How well the system provides functions that can be recognized by users as useful.

Learnability

The ease with which users can learn to use the system.

Operability

How easy the system is to operate and control.

User Error Protection

The system's ability to prevent user errors or minimize their impact.

User Interface Aesthetics
The visual appeal of the user interface, which can influence user satisfaction.

User Assistance
Ensuring that the system is usable by people with a wide range of characteristics and capabilities to achieve specified goals in a specified context of use.

Functional Suitability
Functional Completeness
The degree to which the set of functions covers all the specified tasks and user objectives.

Functional Correctness
The ability of the system to provide correct results with the needed degree of precision.

Functional Appropriateness
How appropriate the functions are for the specified tasks and user objectives.

Performance Efficiency
Time Behavior
Response and processing times and throughput rates.

Resource Utilization
The quantities and types of resources used by the software when performing its functions.

Capacity
The maximum limit of the software's capacity.

Reliability
Faultlessnes
The system's freedom from faults in normal operation.

Fault Tolerance
The system's ability to operate under predefined conditions despite the presence of hardware or software faults.

Recoverability
The capability to re-establish a specified level of performance and recover data in case of failure.

Security
Confidentiality
Ensuring that data are accessible only to those authorized to have access.

Integrity
Guarding against unauthorized data modification.

Authenticity
Verification that the identities of subjects or resources are genuine.

Data Gathering Procedure
To gather data and answer the research questions presented. The researchers underwent several procedures. Firstly, an assessment of the current system was conducted, to identify the issues experienced by the respondents. A study of the model incorporating the operations of MOST, and appropriate IoT equipment and the ability of the system to provide data and other factors was checked. After a model had been completed, it was used as a basis for the design of the DTR system which integrated IoT Knowledge-Based Architecture. After completing the design, the prototype was completed, and an initial test was made. After this, the research participants conducted the testing of the prototype, and their expert assessment was gathered by using a questionnaire to objectively produce the results of the system assessment.

Data Analysis
The researchers used of data gathered for the research questions presented. To determine specific challenges or limitations that the users encounter within the current Ministry of Science and Technology-BARMM's daily time record system construction process, the researcher employed qualitative analysis which involves categorization of the responses into common themes or thematic areas. With these, qualitative insights derived from the responses have been reviewed to gain a deeper understanding of the users' perspectives, experiences, and specific challenges they encountered.
In determining the extent of the implementation of the DTRS as perceived by MOST employees in terms of Perceived Usability, Perceived Ease of Use, System Quality, and fit, the researcher used purposive random sampling to determine the appropriate respondents.
The researchers has tabulated the data gathered emanating from the survey and treated them through descriptive statistics using Mean.
The statistical measure used to determine if there is a significant relationship between the four dimensions considered and the employees' intention to use and satisfaction is the Pearson correlation coefficient (r). The Pearson correlation coefficient measures the strength and direction of the linear relationship between two continuous variables. It ranges from -1 to 1, where: A correlation coefficient of 1 indicates a perfect positive linear relationship, a correlation coefficient of -1 indicates a perfect negative linear relationship, and a correlation coefficient of 0 indicates no linear relationship between the variables. The researcher organized the results of the survey using the Kobo Collect application and a statistician was employed to conduct statistical computations and provide interpretation of the results thereof.

RESULTS AND DISCUSSION
This chapter elucidates the findings derived from tabulated data and visual representations, stemming from responses collected through the data collection

instrument. The responses are systematically analyzed in accordance with the respondents' answers.

General Demographic Profile of the Respondents

To provide data on the profile of the respondents, the following information is presented. The survey results show that there are thirty-two (32) or thirty-six percent (36%) female respondents and fifty-eight (58) or sixty-four percent (64%) male respondents. In terms of hierarchical position in the ministry, about forty-four percent (44%) are under contract of service or from non-plantilla positions or consultants, thirty-six percent (36%) are first-level positions, nineteen percent (19%) are from the second level and only one percent (1%) are from the third level position.

The following sections will now present the important information that will provide the results of the data gathering for this study:

The Specific Challenges or Limitations that Users Encounter within the Current Ministry of Science and Technology-BARMM's Daily Time Record System Construction Process

As part of the initial identification of the system and software requirements, and eventually as inputs in the Analysis Phase, following the Waterfall Method, the researcher has gathered information from the stakeholders who are all employees of MOST. This information collection included a questionnaire designed to provide background on the challenges and limitations in constructing DTRs without employing an IoT-knowledge-based architecture. Through descriptive analysis, it can be observed that the responses relate to five (5) common themes, which are presented in the following table.

Table 1: Top 6 Challenges or Limitations that Users Encounter Within the Current Ministry of Science and Technology-BARMM's Daily Time Record System Development Process

Rank	Challenges or Limitations Encountered
1	Technological Modernization
2	Data Integrity and Accuracy
3	Real-Time Monitoring and Analytics
4	Ethical Standards and Compliance
5	Increased Administrative Burden
6	Limited Data Security and Privacy

The responses evolved around six thematic areas. Firstly, the employees identified a challenge in technological modernization, noting a lack of an appropriate system to manage employees' daily time records efficiently. They perceived that adopting timekeeping systems that automate and streamline the recording and management process could significantly improve the efficiency.

The second thematic area addresses data integrity and accuracy. Employees often have inaccurate entries in their DTRs facing challenges in ensuring the correctness and reliability of data. Without a system that records actual time data, employees struggle to remember their exact time-in and time-out. Additionally, logging time records in a physical logbook poses difficulties. Logbook can sometimes go missing, and with only one available, employees must queue to refer to their records, which are often illegible due to manual entry. Manual compilation of DTRs is prone to to human errors such as miscalculations, incorrect entries, or omissions, contributing to inaccuracies.

Another theme is the challenge of real-time monitoring and analytics. Information on the daily time-in and time-out, including official travel, leave, and official business during office hours, cannot be monitored effectively by the concerned administrative officials and supervisors. This lack of real-time insights into employee attendance and work hours makes it difficult for officials to make informed decisions promptly and ensure compliance with work schedules.

Ethical standards and compliance present another challenge. Manual DTR system are prone to time theft and tampering affecting the integrity and transparency of time management. Without automated systems, practices like time theft (arriving late or leaving early but still recording a full shift or reporting more hours than worked) or buddy punching (logging-in for a colleague) become easier, leading to financial losses and undermining workplace morale and trust. Misrepresentations in manual timekeeping can result in disputes over pay and hours worked, negatively impacting employee morale. Moreover, compliance with Civil Service Commission regulations is compromised without a proper system to ensure employees work the mandated eight hours.

The increased administrative burden is also a significant issue. Manual timekeeping requires substantial administrative effort, with HR personnel spending considerable time collecting, verifying, and processing time records. As the number of employees grows, managing DTR manually becomes increasingly unsustainable, especially with MOST's various field offices across the BARMM region. Delay in data processing impede timely decision-making regarding workforce management, resource allocation, and other operational aspects.

Lastly, limited data security and privacy are concerns in the information era.. Manual record-keeping systems are more susceptible to security breaches and privacy violations. Paper-based records can be easily accessed, lost, or damaged, leading to potential data breaches and loss of confidential employee information. Security breaches could occur if these documents are stolen from the office or left unsecured, resulting in identity theft or financial fraud against employees. Employees worry that manually stored data may be exposed to unauthorized personnel either through accidental exposure in public areas or insufficient security measures. An employee could accidentally leave sensitive information in a public or easily accessible location, such as on a desk or a printer, where it can be viewed or taken by someone without the proper clearance.

The integration of an IoT knowledge-based DTR system addresses these issues. This approach, developed through consultation with stakeholders and adapting to the shift from the manual to a digital system, integrates biometric and knowledge-based software specifications to enhance efficiency, accuracy, and security in managing daily time records.

The Extent of the Implementation of the DTRS as Perceived by MOST Employees in Terms of Perceived Usability, Perceived Ease of Use, System Quality, and Fit

As provided in the conceptual framework of this study, the elements shaping users' decisions to adopt and employ technology across different settings as elucidated in the Technology Acceptance Model (TAM) which was initially proposed by Fred Davis (1986). The TAM suggests that the perceived usefulness (PU) and perceived ease of use (PEU) of a technology influence users' attitudes and intentions to use it. In addition to PU and PEU, the researcher integrated one of the elements of the Delone and McLean Information Systems Success Model (D&M IS Success Model) which is a theoretical framework developed by William H. DeLone and Ephraim R. McLean in the early 1990s. The dimensions of "Intention to Use" and "User Satisfaction" are closely related and play significant roles in determining the success of an information system. One of the elements in this theory used by the researcher is System Quality (SQ), This dimension refers to the technical quality of the information system itself, including aspects such as reliability, flexibility, usability, and performance. Lastly, the researcher used fit (F) as postulated in the "Task-Technology Fit" (TTF) theory developed by Goodhue and Thompson (1990), which focuses on the alignment between the tasks individuals perform and the technology they use to accomplish those tasks. The Fit (F) construct in Task-Technology Fit (TTF) theory emphasizes the importance of aligning technology with users' tasks to enhance both intentions to use and user satisfaction. Using the above dimensions which were integrated into the survey questionnaire, the following are the results and analyses.

Perceived Usability

The following table presents the Extent of the Implementation of the DTRS as Perceived by MOST Employees in Terms of Perceived Usability. It shows that the respondents have rated that they agree that DTRS would enhance their job performance or make it easier with a grand mean of 4.34.

Table 2: Mean Rating on the Extent of the Implementation of the DTRS as Perceived by the MOST Employees In terms of Perceived Usability n=90

Perceived Usability	**Mean**	**Description**
The use of DTRS has increased my job performance	2.57	Neither agree nor disagree
Using DTRS allows me to accomplish more work than would otherwise be possible	4.78	Strongly Agree
Using DTRS enhances the effectiveness of managing daily time records management	4.68	Strongly Agree
Using DTRS makes daily time records management easier	4.84	Strongly Agree
Overall, I find the DTRS useful in my job	4.87	Strongly Agree
Grand Mean	**4.34**	**Agree**

Range of Means
4.50-5.00 Strongly Agree
3.50-4.49 Agree
2.50-3.49 Neither agree nor disagree
1.50-2.49 Disagree
1.00-1.49 Strongly Disagree

The table indicates that the employees' perceptions of the usability of the Daily Time Records System (DTRS) are predominantly positive, as reflected in the mean ratings. The statement "Using DTRS makes daily time records management easier" received the highest mean score of 4.84, indicating that employees strongly agree that the system simplifies the management of daily time records. Similarly, the statement "Overall, I find the DTRS useful in my job" was rated very highly, with a mean of 4.87, showing that employees consider the system highly beneficial in their work.

However, the lowest mean score of 2.57 was given to "The use of DTRS has increased my job performance," suggesting a neutral stance where employees neither agree nor disagree that the DTRS directly boosts their job performance. This could indicate that while the system is seen as useful and effective in managing time records, it may not be perceived as significantly impacting overall job performance.

Other aspects of usability received strong positive ratings, such as "Using DTRS allows me to accomplish more work than would otherwise be possible" with a mean of 4.78 and "Using DTRS enhances the effectiveness of managing daily time records management" with a mean of 4.68. These ratings indicate that employees strongly agree that the DTRS enables them to complete more work and improves the effectiveness of time records management.

The grand mean of 4.34 suggests that, overall, employees agree that the DTRS is usable and beneficial in their roles, with particular strengths in making time management easier and enhancing their ability to accomplish more tasks. Despite some neutral views on its impact on job performance, the overall perception is that the DTRS is a valuable tool in the workplace.

Results conform with the Davis (1989), who proposed a six-item measurement tool in his study of Perceived Usefulness (PU). The six items include the four items most commonly used:

(1) Using (application) increases my productivity;
(2) Using (application) increases my job performance;
(3) Using (application) enhances my effectiveness on the job; and
(4) Overall, I find the (application) useful in my job.

As shown in above, it can be observed that somehow the respondents viewed that in terms of job performance, neither strongly agree nor disagree. This is because the DTRS is a system not directly related to their jobs. While the DTRS may allow them to accomplish more because of the efficiency in the time records management and compliance with the construction and submission, it is not directly relevant to their jobs, except for the employees who are assigned in the HR Section.

In all other aspects such as allowing them to accomplish more work than would otherwise be possible, enhancing the effectiveness of managing daily time records management, easier daily time records management, and overall usefulness in the job, the respondents do strongly agree. As found in the study (2001), PU was 50% more influential than ease of use in determining system usage. Since respondents perceive the DTRS is useful and efficient, they are likely to use the system. This is in addition to the need to comply with the requirements set by the Civil Service Commission (CSC). Thus, respondents are more likely to be compliant when there are readily available mechanisms that facilitate it. A study by Moon (2002) on e-government initiatives found that digital platforms streamline bureaucratic procedures, making it easier for public servants to comply with regulations by providing clear, step-by-step processes and reducing administrative burdens.

Perceived Ease of Use

In terms of Perceived Ease of Use, the respondents rated that they strongly agree that using DTRS has been free of effort with a grand mean of 4.77. The following table depicts the overall perception of the respondents on the extent of the Implementation of the MOST DTRS on Perceived Ease of Use.

Table 3: Mean Rating on the Extent of the Implementation of the DTRS as Perceived by the MOST Employees In terms of Perceived Ease of Use n=90

Perceived Ease of Use	**Mean**	**Description**
My interaction with the DTRS is clear and understandable	4.81	Strongly Agree
Learning to operate the DTRS is easy for me	4.76	Strongly Agree
I find it easy to remember how to perform tasks using DTRS	4.82	Strongly Agree
I find it easy to get the DTRS to do what I want to do	4.76	Strongly Agree
Overall, I find the DTRS easy to use	4.71	Strongly Agree
Grand Mean	**4.77**	**Strongly Agree**

Range of Means
4.50-5.00 Strongly Agree
3.50-4.49 Agree
2.50-3.49 Neither agree nor disagree
1.50-2.49 Disagree
1.00-1.49 Strongly Disagree

In terms of Perceived Ease of Use, the respondents rated their interaction with the Daily Time Records System (DTRS) very positively. The highest mean score, 4.82, was given to the statement "I find it easy to remember how to perform tasks using DTRS," indicating that respondents find the system intuitive and easy to navigate. The lowest mean score, 4.71, was for "Overall, I find the DTRS easy to use," but even this lower score still falls within the "Strongly Agree" category, demonstrating high overall satisfaction with the system's ease of use. The grand mean of 4.77 reinforces that respondents generally perceive the DTRS as very user-friendly and straightforward to operate. There is almost a unanimous answer from the respondents. This is in comparison with the hand-written DTR that they used to do. Venkatesh, Morris *et al.* (2003) highlight that digital systems generally improve user satisfaction and efficiency compared to manual systems. They argue that ease of use and perceived usefulness are critical factors driving the adoption of digital systems. Thus, the employees strongly agree that it is easier to use the DTRS than to manually construct their DTRs.

It was mentioned that one of the challenges experienced by the respondents is the difficulty in recalling the time in and out, especially when the logbook is not available or they forgot to log in or out. This circumstance increases the difficulty in preparing the DTR manually and makes the DTR contain unreliable information.

In the study of Abdullah *et al.* (2016) the best predictor of students' PEOU of the e-portfolio is experience, followed by enjoyment, self-efficacy, and subjective Norm. Thus, when the respondents compare the difficulty they experiences versus the experience using the DTRS, their intention to use it would be enhanced.

Overall, the respondents find the DTRS easy to use. PEOU relates to assessments of the intrinsic characteristics of IT, such as the ease of use, ease of learning, flexibility, and clarity of its interface according to Gefen and Straub, (2000). With the increased use of the DTRS, the employees become easily acquainted with the interface. Davis (1989) demonstrated that perceived ease of use increases with continued use of the system, as users become more familiar with the interface and

functionalities. As users gain experience, their comfort level and efficiency improve, leading to higher acceptance and ease of use over time.

System Quality

With regards to the extent of the implementation of the DTRS as perceived by MOST Employees in terms of System Quality, the grand mean is 4.76 which provides that they strongly agree. The following table describes the perception of the respondents and the measures that contribute to the system quality of the DTRS.

Table 4: Mean Rating on the Extent of the Implementation of the DTRS as Perceived by the MOST Employees In terms of System Quality n=90

System Quality	Mean	Description
The interaction capability of the DTRS is easy to operate and control	4.90	Strongly Agree
The functions of the DTRS are suitable for the requirements	4.76	Strongly Agree
The DTRS performs efficiently during use	4.80	Strongly Agree
I can rely on the DTRS functions without fault under normal operation	4.70	Strongly Agree
The information entered and processed by the DTRS is secure and can only be accessed by authorized persons	4.66	Strongly Agree
Grand Mean	**4.76**	**Strongly Agree**

Range of Means
4.50-5.00 Strongly Agree
3.50-4.49 Agree
2.50-3.49 Neither agree nor disagree
1.50-2.49 Disagree
1.00-1.49 Strongly Disagree

In terms of System Quality, the data indicates that the MOST employees perceive the implementation of the Daily Time Records System (DTRS) very positively, with all aspects receiving "Strongly Agree" ratings. The highest mean score of 4.90 was given to the statement "The interaction capability of the DTRS is easy to operate and control," suggesting that employees find the system extremely user-friendly and easy to manage. On the other hand, the lowest mean score of 4.66 was for "The information entered and processed by the DTRS is secure and can only be accessed by authorized persons." While this still indicates strong agreement, it reflects the relatively lowest level of satisfaction concerning the security and restricted access of the system. The grand mean of 4.76 shows a consistent and strong overall satisfaction with the system's quality, indicating that employees generally find the DTRS to be reliable, efficient, suitable for their needs, and secure. Overall, the high ratings across all aspects of System Quality demonstrate that the implementation of the DTRS is perceived as highly effective and beneficial by the MOST employees.

System quality refers to the technical and functional attributes of an information system DeLone and McLean (2003). To learn the extent of the implementation of the DTRS, the respondents were asked about the characteristics of the DTRS in terms of operation and control, function, efficiency, reliance, and security. In all these items, the response is strongly agree. The overall package of the DTRS has been essentially enough with the personal standards of the respondents. One factor of the DTRS is it's being personalized. All employees are provided with individual accounts and only they can access the information aside from the authorized officials. Xu *et al.* (2013) examined how personalization in e-commerce systems affects system quality and user satisfaction. They found that personalized systems, which adapt to users' preferences and behaviors, significantly enhance perceived system quality by making interactions more relevant and efficient.

The highest mean in the findings is that the interaction capability of the DTRS is easy to operate and control which garnered 4.90. This can be explained in the sense that the system is easy to operate. The users need no complicated processes in accessing and using the DTRS. All they have to do is tap their RFID and they are automatically logged-in in the system. Systems that are intuitive and easy to navigate enhance user satisfaction. Nielsen (1993) emphasizes that usability is a critical factor in system design, impacting user efficiency and satisfaction. Systems that integrate well with other tools and platforms, providing a seamless user experience, are rated higher in quality. Goodhue and Thompson (1995) highlight the significance of system compatibility and integration in perceived system quality.

FIT

Finally, the respondent's evaluation of the extent of the Implementation of MOST DTRS in terms of fit will be presented in the following section. It can be observed that with a grand mean of 4.78, the respondents strongly agree that the DTRS fits with the tasks that they have at hand. The following table presents the summary and details of the respondents' perceptions in terms of fit.

Table 5: Mean Rating on the Extent of the Implementation of the DTRS as Perceived by the MOST Employees In terms of System Quality n=90

FIT	Mean	Description

I am satisfied with using DTRS where my tasks can be easily and quickly done	4.78	Strongly Agree
I am satisfied with using DTRS which can provide me with accurate results	4.78	Strongly Agree
I am satisfied with using DTRS which can provide me with the latest information easily	4.79	Strongly Agree
I am satisfied with using DTRS where I can explore the system with little guidance easily	4.79	Strongly Agree
Overall, I am myself satisfied with using the DTRS	4.76	Strongly Agree
Grand Mean	**4.78**	**Strongly Agree**

Range of Means
4.50-5.00 Strongly Agree
3.50-4.49 Agree
2.50-3.49 Neither agree nor disagree
1.50-2.49 Disagree
1.00-1.49 Strongly Disagree

In terms of FIT, the respondents expressed a high level of satisfaction with the Daily Time Records System (DTRS). The highest mean scores, both 4.79, were given to the statements "I am satisfied with using DTRS which can provide me with the latest information easily" and "I am satisfied with using DTRS where I can explore the system with little guidance easily," indicating that the system is perceived as both current and user-friendly. The lowest mean score, 4.76, was for "Overall, I am myself satisfied with using the DTRS," but this score still falls within the "Strongly Agree" category, reflecting strong overall satisfaction. The grand mean of 4.78 confirms that respondents are very pleased with how well the DTRS fits their needs, enabling them to perform their tasks efficiently and accurately.

The grand mean score of 4.78 falls within the "Strongly Agree" range (4.50-5.00), indicating a consistently high level of agreement across all statements regarding fit perception.

Fit between technology and users' task is important. Fit is perceived to mean that the systems as working and reliable, easy to use, well trained to use the system, use the system for ambiguous tasks, and feel that the system positively impacts the students. Mantikayan and Ayu, (2013). The respondents strongly agree that the output that the system needs to produce is proportional to the requirements. This means that they can rely on the technology to deliver the needed output. Zigurs and Buckland (1998) argue that for systems to be effective, their outputs must be proportional to the requirements of the tasks they support.

The Extent of the Implementation of the DTRS as Perceived by the MOST Employees in Terms of Intention to Use and User Satisfaction

Intention to Use, as proposed in the TAM, is influenced by users' perceptions of the technology's usefulness and ease of use, which are shaped by factors such as system quality which we derived from the D&M IS Success Model. Additionally, TTF emphasizes the importance of aligning technology with users' tasks, enhancing the fit between technology features and task requirements, thus positively impacting users' intentions to adopt and use the technology.

User Satisfaction, on the other hand, as suggested by D&M IS Success Model, is influenced by various dimensions like system quality, which is interrelated with the fit between technology and tasks as emphasized by TTF. When users perceive that the technology effectively supports their tasks, provides relevant information, and offers an intuitive interface, they experience higher satisfaction with the system, which in turn reinforces their intention to continue using it.

In the following sections, the results of the survey from the direct users of the DTRS are presented in terms of their intention to use and satisfaction.

Intention to Use

Having summarized the results of the survey in terms of the extent of the implementation of the DTRS as perceived by the MOST employees in terms of their intention to use, the result shows that they strongly agree with the grand mean of 4.78. The table below shows the summary of the results.

Table 6: Mean Rating on the Extent of the Implementation of the DTRS as Perceived by the MOST Employees In terms of Intention to Use n=90

Intention to Use	**Mean**	**Description**
I use the DTRS because it is useful for completing my tasks (perceived usability)	4.81	Strongly Agree
I use the DTRS because it is easy to use and operate (perceived ease of use)	4.76	Strongly Agree
I use the DTRS because of its system quality (system quality)	4.79	Strongly Agree
I use DTRS because its functions are fit for the tasks that I need to complete (fit)	4.81	Strongly Agree
Overall, the factors that have contributed to my use of the DTRS are usability, ease of use, system quality, and fit	4.77	Strongly Agree
Grand Mean	**4.78**	**Strongly Agree**

Range of Means
4.50-5.00 Strongly Agree
3.50-4.49 Agree
2.50-3.49 Neither agree nor disagree
1.50-2.49 Disagree
1.00-1.49 Strongly Disagree

Regarding Intention to Use, respondents strongly agree on the usefulness of the Daily Time Records System (DTRS) across multiple dimensions. The highest mean scores, both 4.81, were given to "I use the DTRS because it is useful for completing my tasks (perceived usability)" and "I use DTRS because its functions are fit for the tasks that I need to complete (fit)," indicating that the system is highly regarded for its practical applicability and task suitability. The lowest mean score, 4.76, was for "I use the DTRS because it is easy to use and operate (perceived ease of use)," which still falls in the "Strongly Agree" category, reflecting the system's user-friendly nature. The overall mean of 4.78 shows that usability, ease of use, system quality, and fit significantly contribute to the respondents' intention to use the DTRS.

In this particular question, we wanted to discover through the perception of the respondents if indeed the four dimensions such as PU, PEOU, system quality, and fit influence their use of the DTRS.

In all of the items, the responses can generalized as strongly agree. With the users experience in using the DTRS, with the existence of usability, ease of use, system quality and fit, they are more likely to be using it. Intention to use is influenced by the degree of fit between the technology and users' tasks. Davis (1989). Respondents strongly agree in this manner. Davis (1989) identified perceived usefulness as a primary determinant of user acceptance and usage behavior in his Technology Acceptance Model (TAM). Venkatesh and Davis (2000) extended TAM by demonstrating that PEOU significantly influences users' intentions to use a system, particularly during the early stages of adoption.

The respondents were likely to strongly agree that PU, PEOU, system quality, and fit influence their use of the DTRS because these factors directly impact their ability to perform tasks efficiently and effectively, reduce the effort required to use the system, provide a reliable and satisfactory user experience, and ensure that the system's capabilities align well with the requirements for the system. Indeed, their perceptions can be empirically grounded in well-established theories and models in the field of Information Systems, such as TAM and TTF, which have been the basis for the conduct of this study.

User Satisfaction

The summarized data in terms of user satisfaction in the extent of the implementation of the DTRS as perceived by the MOST employees is a grand mean of 4.81, which is described as strongly agree. The following table presents the summary of the perception of MOST employees on the extent of the implementation of the MOST DTRS in terms of satisfaction.

Table 7: Mean Rating on The Extent of the Implementation of the DTRS as Perceived by MOST Employees In terms of User Satisfaction n=90

User Satisfaction	**Mean**	**Description**
I am satisfied with the DTRS because of its usefulness (perceived usability)	4.84	Strongly Agree
I am satisfied with the DTRS because it is easy to use and operate (perceived ease of use)	4.86	Strongly Agree
I am satisfied with the DTRS because of its system quality (system quality)	4.83	Strongly Agree
I am satisfied with the DTRS because it is fit for the tasks that I need to complete (fit)	4.79	Strongly Agree
Overall, the factors that have contributed to my satisfaction with the DTRS are usability, ease of use, system quality, and fit	4.76	Strongly Agree
Grand Mean	**4.81**	**Strongly Agree**

Range of Means
4.50-5.00 Strongly Agree
3.50-4.49 Agree
2.50-3.49 Neither agree nor disagree
1.50-2.49 Disagree
1.00-1.49 Strongly Disagree

In terms of User Satisfaction, respondents strongly agree that the Daily Time Records System (DTRS) meets their expectations across various dimensions. The highest mean scores were given to "I am satisfied with the DTRS because it is easy to use and operate (perceived ease of use)" and "I am satisfied with the DTRS because of its usefulness (perceived usability)," both scoring 4.86 and 4.84 respectively. These ratings indicate that respondents find the system highly beneficial and user-friendly. The mean score for "I am satisfied with the DTRS because of its system quality (system quality)" was also high at 4.83, indicating satisfaction with the system's performance and reliability. The lowest mean score, 4.79, was for "I am satisfied with the DTRS because it is fit for the tasks that I need to complete (fit)," still reflecting strong agreement. The overall mean of 4.81 indicates that respondents are highly satisfied with the DTRS, attributing their satisfaction to its usability, ease of use, system quality, and fit.

It is also one of the problems of this study to determine if the four dimensions PU, PEOU, system quality, and fit affect the respondents' satisfaction with the DTRS. In all four items, they responded that they strongly agree. User satisfaction is often examined as a critical dependent variable that reflects the effectiveness and acceptance of a system by its users, Davis (1989). User satisfaction is influenced by information quality, system quality,

and service quality, and it directly impacts individual performance and system use (DeLone & McLean, 1992, 2003). It is the sum of one's feelings or attitudes toward a variety of factors affecting that situation as explained by (Bailey & Pearson, 1983).

The respondents strongly agree that they are likely to be satisfied with the DTRS since most of the items that are asked of them relate to the four dimensions, their responses as computed as an overall mean also strongly agree. Thus, we can derive through this information that for the DTRS to be satisfactory to the respondents it has to be useful, easy to use, quality, and it should fit with the requirements that need to be accomplished.

The Relationship between the Four Dimensions Considered and the Employees' Intention to Use and Satisfaction

As presented in the conceptual framework of this study, the four dimensions that were considered to contribute to the user's intention to use and satisfaction are perceived usability, perceived ease of use, system quality, and fit. It is also hypothesized that there is no significant relationship between these factors or dimensions and the user intention to use and satisfaction. The following are the perceptions of MOST employees on the relationship between the four dimensions considered and the employees' intention to use and satisfaction with the DTRS. The table below depicts the results of the survey.

Table 8: Correlation Analysis between the Four Dimensions Considered and the Employees' Intention to Use and Satisfaction

Factors	Intention to Use		User Satisfaction		Overall Attainment	
	r	Sig	r	Sig	r	Sig
Perceived Usability	.592**	.000	.507**	.000	.573**	.000
Perceived Ease of Use	.765**	.000	.749**	.000	.787**	.000
System Quality	.725**	.000	.702**	.000	.742**	.000
Fit	.733**	.000	.753**	.000	.772**	.000

***. Correlation is significant at the 0.01 level (Highly Significant)*

**. Correlation is significant at the 0.05 level*

The correlation analysis reveals significant relationships between the factors of Perceived Usability, Perceived Ease of Use, System Quality, and Fit with both Intention to Use and User Satisfaction. For Intention to Use, all factors show strong positive correlations, with Perceived Ease of Use demonstrating the highest correlation at 0.765, followed closely by Fit at 0.733, System Quality at 0.725, and Perceived Usability at 0.592. These correlations indicate that as perceptions of usability, ease of use, system quality, and fit increase, the intention to use the DTRS also increases significantly. Similarly, for User Satisfaction, all factors also exhibit strong positive correlations, with Perceived Ease of Use showing the highest correlation at 0.749, followed closely by Fit at 0.753, System Quality at 0.702, and Perceived Usability at 0.507. These correlations suggest that as perceptions of usability, ease of use, system quality, and fit improve, user satisfaction with the DTRS also increases significantly. Overall, the analysis indicates that Perceived Ease of Use, System Quality, and Fit have the strongest correlations with both Intention to Use and User Satisfaction, highlighting their importance in determining users' attitudes and behaviors towards the DTRS.

Findings

Employing the research methodology, the following major findings emerged from the data interpretation and analysis. The general thematic areas identified from the responses of the users, when asked about the challenges or limitations that they encounter within the current Ministry of Science and Technology-BARMM's Daily Time Record System development process, include challenges on technological modernization, data integrity and accuracy, real-time monitoring and analytics, ethical standards, and compliance, increased administrative burden, and limited data security and privacy.

The results on the extent of the implementation of the DTRS as perceived by MOST employees in terms of Perceived Usability, majority of the mean scores fall within the "Agree" range (3.50-4.49). This suggests that respondents generally agree with the statements regarding the usability and effectiveness of DTRS in their jobs. In terms of Perceived Ease of Use, the grand mean score of 4.77 falls within the "Strongly Agree" range (4.50-5.00), indicating a consistently high level of agreement across all statements regarding the ease of use of DTRS. For System Quality, the grand mean score of 4.76 falls within the "Strongly Agree" range (4.50-5.00), indicating a consistently high level of agreement across all statements regarding system quality. And on fit the grand mean score of 4.78 falls within the "Strongly Agree" range (4.50-5.00), indicating a consistently high level of agreement across all statements regarding fit perception.

In the extent of the implementation of the DTRS as perceived by MOST employees in terms of intention to use the grand mean score is 4.78 which falls within the "Strongly Agree" range (4.50-5.00), which indicates a consistently high level of agreement across all statements regarding intention to use DTRS. In terms of user satisfaction, the grand mean score is 4.81, which falls within the "Strongly Agree" range (4.50-5.00), indicating a consistently high level of agreement across all statements regarding user satisfaction with the DTRS.

The data shows significant relationship between the four dimensions considered and the employees' intention to use and satisfaction. It shows that the correlation coefficient between intention to use and perceived usability is 0.592**, indicating a moderately strong positive relationship. The correlation coefficient between intention to use and perceived ease of use is 0.765**, indicating a strong positive relationship. The correlation coefficient between the intention to use and system quality is 0.725** , indicating a strong positive relationship. The correlation coefficient between intention to use and fit is 0.733** indicating a strong positive relationship.

In terms of user satisfaction, the data shows a correlation coefficient of 0.507**, indicating a moderately strong positive relationship between perceived usability and user satisfaction. The correlation coefficient between the perceived ease of use and user satisfaction is 0.749**, indicating a strong positive relationship. The correlation coefficient between system quality and user satisfaction is 0.702**, indicating a strong positive relationship, and the correlation coefficient between fit and user satisfaction is 0.753** indicating a strong positive relationship.

In terms of user satisfaction, the data shows correlation coefficients of 0.507**, 0.749**, 0.702**, and 0.753** for perceived usability, perceived ease of use, system quality, and fit, respectively, indicating strong positive relationships

CONCLUSION

It can be concluded that with the perceived challenges and limitations that MOST employees encountered within the current system in the construction of their DTR, there is an encompassing need for the adoption of an advanced timekeeping system that automates and streamlines its recording and management process. The identified challenges will be addressed and drastically improve accuracy and efficiency.

It can be concluded further that the DTRS is perceived as highly usable and beneficial for job performance, productivity, and daily time records management by the respondents, the system is perceived as user-friendly and accessible, users perceive DTRS as a high-quality system that effectively meets their needs and expectations, and they perceive DTRS as a suitable and satisfying tool for their work requirements. In conclusion, the data reflects a strong intention among respondents to continue using DTRS, driven by factors such as perceived usability, ease of use, system quality, and fit. Users find DTRS useful, easy to use, of high quality, and well-suited for their tasks, contributing to their positive intention to use the system in the future. There is also a high level of satisfaction among respondents with DTRS, driven by factors such as perceived usefulness, ease of use, system quality, and fit. Users find DTRS valuable, easy to use, of high quality, and well-suited for their tasks, contributing to their overall satisfaction with the system.

Moreover, the correlations highlight the importance of perceived usability, perceived ease of use, system quality, and fit in influencing both intentions to use and user satisfaction with the system. As these factors improve, users are more likely to intend to use the system and be satisfied with its performance.

Recommendations

In consideration of the findings of this study, the following recommendations are hereby made:

The Ministry of Science and Technology (MOST) may share the DTRS with other Bangsamoro ministries, offices, and agencies that do not have a system in the management of DTRS. As shown in the study, the respondents have shown high intention to use and satisfaction with the system. Thus, it can provide efficiency and cost-cutting for procurement or development of their own DTRS. It is also recommended that other researchers may continue other versions that would improve the status of the DTRS and its design to integrate other HR requirements. Implement policies that advocate for a user-centered design approach in the development of digital systems. Require developers to involve end-users in the design process, conduct usability testing, and gather user feedback to ensure that systems meet user needs effectively. Establish policies mandating the provision of comprehensive user training and support resources for new digital systems. Require organizations to develop user-friendly documentation, tutorials, and training programs to help users navigate and utilize the systems efficiently. Enforce policies that prioritize system quality assurance measures throughout the development life-cycle. Conduct regular quality assessments, address reported issues promptly, and implement continuous improvement practices to maintain high standards of system quality. Establish formal mechanisms for collecting and acting upon user feedback regarding digital systems. Mandate the implementation of surveys, feedback forms, and user satisfaction assessments to gather insights for system improvement. Advocate for policies that promote accessibility and inclusivity in digital system design. Require organizations to adhere to accessibility standards and guidelines to ensure that systems are usable by individuals with diverse abilities and needs. Implement policies mandating the regular evaluation of system performance, user satisfaction, and intention to use. Require organizations to measure key performance indicators (KPIs) related to system usability, effectiveness, and user satisfaction, and use the findings to inform decision-making and improvement efforts. Establish stringent policies governing data security and privacy practices in digital systems.

REFERENCES

Abdullah, F., Ward, R., & Ahmed, E. (2016). Investigating the influence of the most commonly used external variables of TAM on students' perceived ease of use (PEOU) and perceived usefulness (PU) of e-portfolios. *Computers in Human Behavior, 63,* 75-90. https://doi.org/10.1016/j.chb.2016.05.014

Ahmad, R., Mohamad, H., & Alim, T. (2024). The English adaptation level of BSED-English call center agents. *Psychology and Education: A Multidisciplinary Journal, 25*(5), 631-648. https://doi.org/10.5281/zenodo.13822768

Ansari, A. N., Navada, A., Agarwal, S., & Sonkamble, B. A. (2011). Automation of attendance system using RFID, biometrics, GSM modem with .NET framework. *Academia.edu.* https://www.academia.edu/28226816

Cohn, M. L., Sim, S. E., & Lee, C. P. (2009). What counts as software process? Negotiating the boundary of software work through artifacts and conversation. *Computer Supported Cooperative Work, 18*(4), 401–443. https://doi.org/10.1007/s10606-009-9100-4

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9–30. https://doi.org/10.1080/07421222.2003.11045748

Forsgren, N., Durcikova, A., Clay, P. F., & Wang, X. (2016). The integrated user satisfaction model: Assessing information quality and system quality as second-order constructs in system administration. *Communications of the Association for Information Systems, 38,* 803–839. https://shorturl.at/TBzNx

Hayag, M. Jr. (2020, February 4). Zigbee technology utilization in gathering and transceiving data for intelligent building automation. *The Information Technologist - African Journal Online, 16*(2).

Hoff, K. A., Song, Q. C., Wee, C. J. M., Phan, W. M. J., & Rounds, J. (2020). Interest fit and job satisfaction: A systematic review and meta-analysis. *Journal of Vocational Behavior.* Advance online publication.

Kariapper, A. R., & Razeeth, S. (2019, May). RFID-based (IoT) automatic attendance system: A survey analysis. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.3372734

Kim, Y., & Lee, H. S. (2014). Quality, perceived usefulness, user satisfaction, and intention to use: An empirical study of ubiquitous personal robot service. *Asian Social Science, 10*(11). https://doi.org/10.5539/ass.v10n11p1

Maggay, J. (2018, August 18). Biometric attendance monitoring system of Cagayan State University – Lasam Campus, Philippines. *International Journal of Research - GRANTHAALAYAH, 5,* 67-79. https://doi.org/10.5281/zenodo.345444

Mangelen, B. J., Bawa, L. S., Untong, L. P., & Mohamad, H. A. (2023). Maguindanaon love songs as tool and springboard in teaching figurative language for Maguindanaon culture preservation. *Journal of Natural Language and Linguistics, 1*(1), 31-41. https://doi.org/10.54536/jnll.v1i1.2035

Mantikayan, J. M., & Ayu, M. A. (2013). Assessing audience response systems using task-technology fit. *In 2013 5th International Conference on Information and Communication Technology for the Muslim World (ICT4M),* Rabat, Morocco (pp. 1-6). https://doi.org/10.1109/ICT4M.2013.6518915

Mohamad, H., & Parcon, M. (2022). Unfolding stories of English teachers with multiple ancillary functions in Maguindanao-1 Division: A phenomenological study. *Psychology and Education: A Multidisciplinary Journal, 2*(6), 496-501. https://doi.org/10.5281/zenodo.6793527

Mokhsin, M., Shaffiei, Z. A., & Hamidi, S. (2011). Measurement of user's acceptance and perceptions towards campus management system (CMS) using technology acceptance model (TAM). *International Journal of Information Processing and Management, 2*(4), 34-46. https://doi.org/10.4156/ijipm.vol2.issue4.4

Ng, G., Banaria, M. C. M., Ang, E. J. W., & Majan, W. P. (2018). Developing a human resource information system through hybrid software engineering model. *ResearchGate.* https://researchgate.net/publication/327061977

Ong, A. K., Prasetyo, Y. T., Roque, R. A., Garbo, J. G., Robas, K. P., Persada, S. F., & Nadlifatin, R. (2021). Determining the factors affecting a career shifter's use of software testing tools amidst the COVID-19 crisis in the Philippines: TTF-TAM approach. *Sustainability, 14*(17), 11084. https://doi.org/10.3390/su141711084

Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: Models, dimensions, measures, and interrelationships. *European Journal of Information Systems, 17*(3), 236-263. https://doi.org/10.1057/ejis.2008.15

Pulindao, F. L., & Mohamad, H. A. (2023). Learners' view of English language learning through modular approach—a phenomenology. *American Journal of Interdisciplinary Research and Innovation, 2*(4), 20-35.

Reyes, F. M., Abdulgani, M., Aliuden, M. F., Mantikayan, J., Guiamalon, T., Dilna, S., Mohamad, H., & Nawal, S. Z. (2022). Event management system with SMS notification for Mindanao People's Care Foundation, Inc. *Psychology and Education: A Multidisciplinary Journal, 3*(7), 600-609.

Salah, H., Abdulgani, M., Aliuden, M. F., Mantikayan, J., Guiamalon, T., Dilna, S., … & Ferolino, M. F. (2022). Adopting human resource information system (HRIS)-enabled government transformation: Perspective of MBHTE employees. *Psychology and Education: A Multidisciplinary Journal, 3*(7), 610-615.

Sinsuat, D. R. R., Abdulgani, M., Mantikayan, J., & Mohamad, H. (2022). The effectiveness of augmented reality (AR) as a tool of office for the Ministry of Basic, Higher, and Technical Education in Bangsamoro Autonomous Region in Muslim Mindanao. *Psychology and Education: A Multidisciplinary Journal, 3*(5), 468-479.