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TOWARD AN EVIDENCE-BASED ADVANCEMENT SYSTEM: A COMPREHENSIVE FRAMEWORK FOR CAREER PROGRESSION

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ABSTRACT
This study developed the Comprehensive Career Progression Framework, a web-based Human Resource Development (HRD) system for the Department of Education, Division of Ozamiz City. The system addresses challenges in participant selection, attendance monitoring, and report generation by replacing manual, paper-based processes with an integrated digital workflow. It features a participant selection module using a Rule-Based Filtering Algorithm with Boolean Retrieval, an OTP-based attendance verification system, and an automated reporting module consolidating training records and personnel profiles. Developed using Agile methodology, the system incorporated continuous feedback from HRD staff. Evaluation showed 100% consistency in participant selection, accurate attendance logs, and validated report outputs, with HRD staff reporting high acceptability and ease of use. These results indicate that rule-based eligibility checks, secure digital authentication, and automated reporting significantly improve administrative efficiency, fairness, and transparency. The framework is also scalable, allowing adaptation to other DepEd divisions to support broader digital transformation initiatives.

Keywords:
Human Resource Development, Career Progression Framework, Rule-Based Filtering, Boolean Retrieval, Participant Selection, Agile Development, DepEd Ozamiz City

INTRODUCTION

Educational institutions worldwide have increasingly adopted digital management systems to support administrative and human resource functions, particularly in environments where large and diverse groups of staff require continuous monitoring for training, professional development, attendance, and reporting. Traditional practices such as maintaining handwritten participant lists, attendance sheets, and personnel records remain common in many institutions. However, these methods are inefficient, error-prone, and highly susceptible to data loss and inconsistency.

Manual record-keeping complicates staff management processes by reducing transparency and equity, increasing the complexity of seminar and workshop scheduling, and limiting the accuracy of tracking employee development. Moreover, the reliance on paper-based records often results in delays in report generation, which negatively affects timely and informed decision-making. These challenges highlight the need for integrated digital platforms that can efficiently manage staff data and administrative processes within educational institutions (Octaviany & Unm, 2024).

Recent studies indicate that cloud-based educational Management Information Systems (MIS) can effectively address many of these issues. For example, a web-based Academic Management System (AMS) implemented in a school setting demonstrated improvements in administrative efficiency and data accuracy in staff and student management, attendance monitoring, and academic reporting (Idroes et al., 2024). More broadly, research on educational management system adoption shows that these platforms reduce administrative workload, streamline data handling, and enable faster, real-time access to institutional and human resource data. As a result, institutions benefit from improved oversight, enhanced decision-making, equitable staff development, and more effective resource allocation (OECD, 2023).

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Secondary, vocational, and higher education institutions have successfully implemented integrated management systems, demonstrating their scalability and adaptability across different organizational structures and administrative functions (Idroes et al., 2024). In contrast, within the Philippine context particularly in the Department of Education (DepEd), Division of Ozamiz City several Human Resource Development (HRD) functions remain manual and paper-based. This situation hampers the timely generation and monitoring of participant selection, attendance, report creation, and accurate personnel data, ultimately affecting the efficiency of secondary and vocational education and training institutions.

The primary research problem addressed in this study is the absence of an automated and integrated system for participant selection, attendance monitoring, and report generation within HRD processes. To address this gap, the study proposes the development of the Comprehensive Career Progression Framework, a web-based platform designed for the Department of Education, Division of Ozamiz City. The system provides structured mechanisms for participant selection, paperless attendance monitoring, and automated reporting, thereby enhancing administrative efficiency, equity, and transparency.

Specifically, the objectives of the study are to develop the framework through system scoping and feature planning, gather stakeholder requirements, design the system architecture and user interface, and implement core functionalities such as participant selection, attendance tracking, and report generation.

LITERATURE REVIEW

Recent studies consistently emphasize the role of Human Resource Information Systems (HRIS) in enhancing administrative efficiency, data quality, and decision-making within educational institutions, particularly those managing large workforces that require structured professional development and monitoring. Prior research identifies information quality, technological readiness, and organizational preparedness as critical factors influencing successful HRIS adoption (Widiatmo et al., 2025; Siddique et al., 2025; Nematollahi et al., 2024). Collectively, these studies establish that digital HRM practices support more accurate reporting, integrated work processes, and strategic human resource planning (Idroes et al., 2024; Octaviany & Unm, 2024; OECD, 2023; Mascarinas Jr. et al., 2025).

Beyond administrative efficiency, HRIS-supported environments contribute to employee performance and career development. Lucumay (2024) demonstrated that structured career planning enabled by HRIS improves professional growth, while Okafor et al. (2025) highlighted that HRD initiatives such as training, mentoring, and performance management are more equitable and effective when supported by technological infrastructures. Similarly, Shahreki (2024) reported that high-performance work systems integrated with HRIS strengthen HR efficiency and strategic alignment. Studies in educational digitalization further reveal that tools such as e-portfolios, learning management systems, and personnel information systems enhance transparency, evaluation processes, and career advancement among educators (Bhrarun & Asrani, 2024). Evidence from government and educational institutions likewise confirms improvements in administrative turnaround time, data accuracy, and compliance through digital HR processes (Moreno & Delos Santos-Suñga, 2024; Reyes, 2025).

Despite these benefits, HRIS implementation faces notable challenges. Common barriers include inconsistent data entry practices, insufficient user training, and resistance to digital transition (Sikira & Mishael, 2024). Attendance management technologies present similar concerns. While biometric systems are widely used, they are often constrained by environmental and infrastructural limitations (Cabrillas et al., 2021). In response, alternative attendance solutions such as OTP-based and hardware-free systems have emerged, addressing many of these constraints (Adeniyi et al., 2024; Irwin et al., 2025). Empirical findings further suggest that digital attendance systems improve punctuality, accountability, and discipline—key elements in effective HRD operations (Fauzan et al., 2024).

Literature on professional development underscores the importance of systematic tracking and evaluation of training activities. Perez and Ortega-Dela Cruz (2024) found that well-organized seminars lead to measurable improvements in teaching performance, reinforcing the need for reliable systems to monitor participation and outcomes. However, Guiraldo-Tutinia and Castro (2025) noted that educators pursuing higher studies encounter challenges related to cost, workload, and connectivity, suggesting that institutional support mechanisms remain insufficient without integrated HRD systems.

To address persistent issues in personnel selection, documentation consistency, and verification, recent studies highlight the integration of rule-based algorithms, Boolean retrieval models, and automated decision-support systems within HRD platforms. Rule-based systems, characterized by transparent “if–then” logic, promote fairness, verifiability, and policy alignment (Alsbakhi et al., 2025). Information retrieval studies further demonstrate that Boolean logic combined with natural language processing improves precision in filtering and

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ranking data (Moulton & Ng, 2024; Wang et al., 2023). In HR decision-making contexts, algorithmic approaches such as decision trees have been shown to effectively classify personnel based on qualifications and performance metrics (Sipayung et al., 2024; Lucero et al., 2025). These findings collectively support the development of HRD platforms that integrate rule-based eligibility criteria, Boolean filtering, OTP-based attendance authentication, and automated reporting to address administrative inefficiencies and support evidence-based career progression.

System / Study	Participant Selection	Attendance Monitoring	Decision Support	Automated Reporting	Career Progression Focus
Idroes et al. (2024)	Partial (criteria-based)	Yes (digital attendance logs)	No	Yes	No
Lucumay (2024)	No	No	Partial (HRIS-supported planning)	No	Yes
Adeniyi et al. (2024)	No	Yes (OTP-based attendance)	No	No	No
Sipayung et al. (2024)	Yes (rule-based / C4.5)	No	Yes (rule-based DSS)	No	Partial
Fauzan et al. (2024)	No	Yes (biometric fingerprint)	No	No	No
Cabrillas et al. (2021)	No	Yes (face recognition)	No	Yes	No
Lucero et al. (2025)	Yes (predictive analytics)	No	Yes (predictive DSS)	Partial	Yes
Moreno & Delos Santos-Suñga (2024)	No	No	Partial (administrative DSS)	Yes	No
Baharun & Asrani (2024)	Partial (digital personnel records)	No	Partial	Yes	Yes
Proposed Framework	**Yes (rule-based)**	**Yes (OTP-based)**	**Yes (Boolean & rules)**	**Yes**	**Yes**

Table 1. Comparison of Existing HRIS Solutions and the Proposed Framework.

METHODOLOGY

Development Approach

Using the Agile approach, the Comprehensive Career Progression Framework is developed focusing on collaborative stakeholder engagement, continuous improvement, and gradual growth. The project is segmented into multiple sprints, each comprising steps of planning, designing, implementing, and reviewing. Because of the iterative nature of this approach, staff in the HRD could provide constant feedback. This provided the opportunity to address the unresolved staffing, training, attendance management, reporting, and other issues.

Figure 1. Agile Model.

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Requirement Gathering

The system requirements were gathered through semi-structured interviews and discussions with six (6) stakeholders from the Human Resource Development (HRD) unit of the Schools Division of Ozamiz City. The participants included HRD officers and staff directly involved in participant selection, attendance monitoring, and report generation. The interviews focused on identifying current challenges related to manual processes, particularly in selecting training participants, tracking attendance, and preparing reports.

Information gathered from these sessions was used to define the system's functional requirements, database schema, and user interface design. This approach ensured that the developed system aligned with actual operational needs and supported the intended users effectively.

System Design

The system has different functional modules that work together to support the full Human Resource Development (HRD) workflow for the Schools Division of Ozamiz City. The system has more than just the basic features that are based on algorithms. It also has tools for keeping track of employee information, making training materials, suggesting workflows, checking attendance, and making reports on their own. With this unified design, you can have clear selection, verified participation tracking, and career development navigation all in one place.

A. Training Creation and Participant Recommendation

Users within HRD will have the ability to create training offerings by entering the event name, purpose, date and time, location and the attendee list/ invitees. The users will be able to make use of a defined recommendation work flow embedded within the solution to assist the official or supervisor to find and recommend subordinates whose work profiles are compatible with the training objectives. This characteristic enhances the "career navigation" functionality of the system by providing a means to ensure equitable access to the same educational and developmental resources required by individuals. This is the type of module required to implement strategic HRD planning and strengthen the design of developmental pathways.

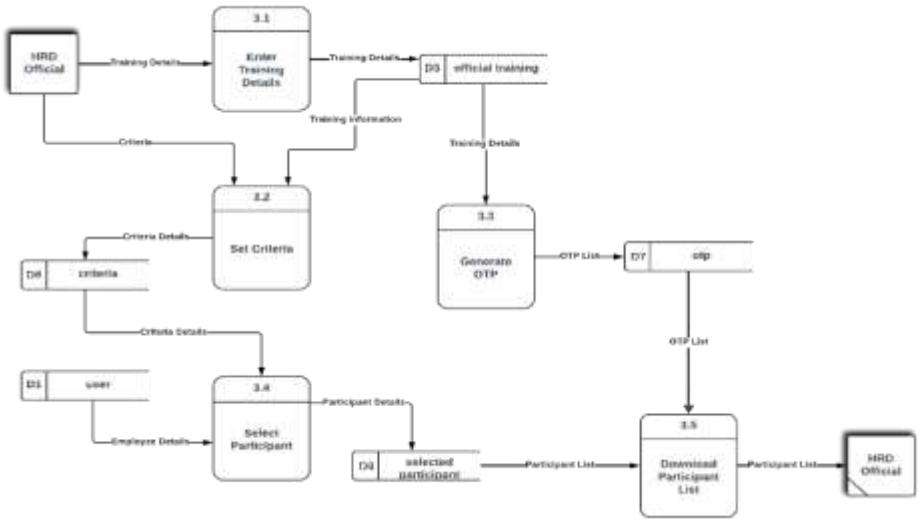

Figure 2. Level 1 Data Flow Diagram of Training Creation.

This figure illustrates the process of creating training programs, including data input, validation, and storage within the system.

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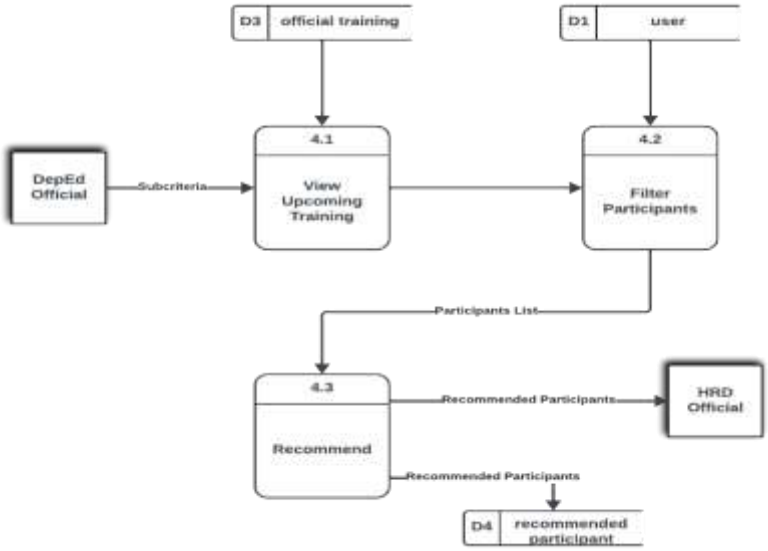

Figure 3. Level 1 Data Flow Diagram of Participant Recommendation.

This diagram shows how employee data and eligibility criteria are processed to generate recommended participants for training programs.

A. Participant Selection

In selecting of participants for training, the system uses a combination of Rule-Based Filtering and Boolean Retrieval to search for participants through the system who meet certain training criteria, such as their age, sex, educational level, personnel category, and the number of training sessions they have attended. To quickly narrow down the search, the Boolean Retrieval helped in the process, integrated with rule-based filters to make sure that all eligibility requirements are strictly followed. See Figure 4 to visualize the integrated algorithms.

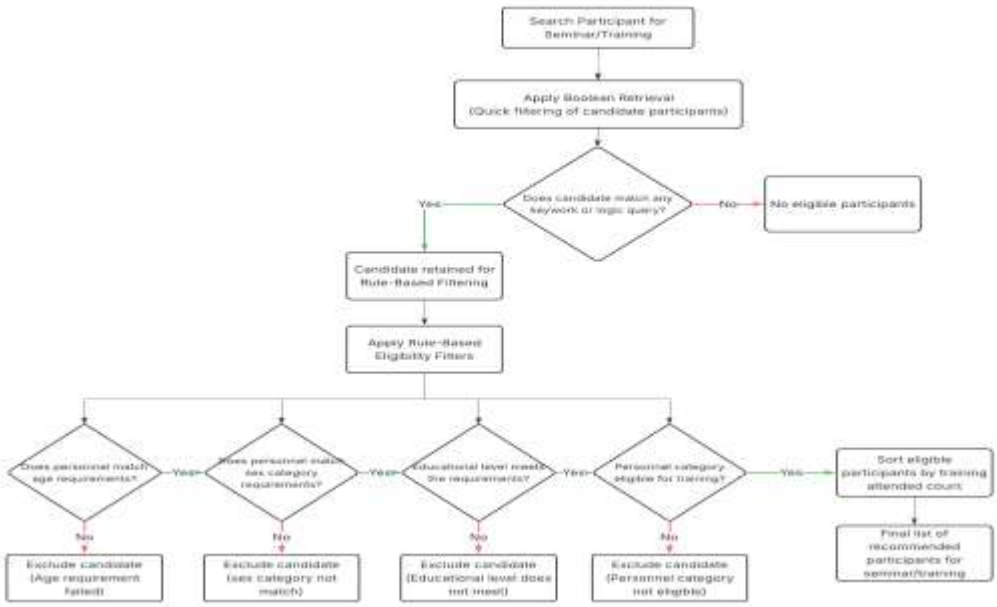

Figure 4. Decision Tree Diagram of the Rule-Based Algorithm with Boolean Retrieval for Participant Selection.

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This figure presents the integration of rule-based decision logic and Boolean filtering used to identify eligible training participants based on predefined criteria.

B. Attendance Verification (OTP-Based)

For attendance tracking, the researchers implemented a One Time Password (OTP). The OTP contains the training information conducted. HRD staff set up each training event in the system and select participants based on certain criteria. After, the system allows the HRD to generate one-time passwords (OTP) that will be given onsite. The participants will navigate the attendance portal that can be accessed by either manually searching the URL or scanning the QR code provided by the facilitators. On the portal, participants confirm their presence by entering their employee ID and a valid OTP received. When validated, it records their presence on the system. This functionality helps the HRD to easily keep track of participating employees.

Figure 5. Level 1 Data Flow Diagram of Attendance Submission Using OTP.

This diagram depicts the OTP-based attendance verification process, from OTP generation to participant validation and attendance recording.

C. Personnel Information and Training History Management

The system keeps all employee records in one main database. It stores simple details such as their job, specialization, position, sex, education level, and the trainings they have taken. Once an employee's attendance is checked, the system updates their training record on its own. This makes it easy to see how each employee is improving over time. Since everything is in one place, it avoids the usual problems you get when using Excel, like wrong or missing data. This also ensures the correctness and accuracy of the information needed for participant selection, serving as a decision support tool.

D. Automated Reporting Module

The reporting part creates the outputs that HRD needs for its work. The reports cover things like who joined each training, what trainings each employee has finished, who works under each official, and short summaries based on staff records and attendance. All the reports come right from the database, so the information stays correct and you do not have to check or combine files by hand. This helps make the work quicker and easier for everyone. This module also helps HRD planning because officials can track who joins the trainings, see gaps in staff development, and check if training is fair for all employees.

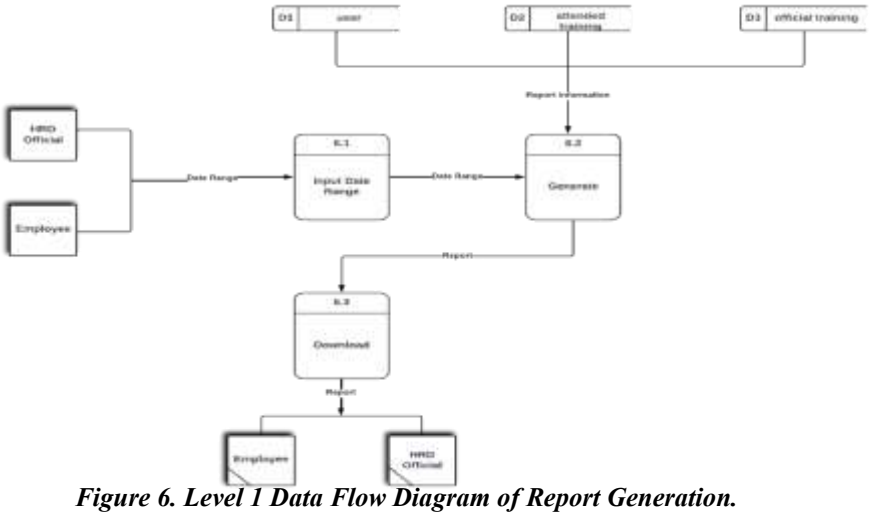

Figure 6. Level 1 Data Flow Diagram of Report Generation.

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This figure illustrates the automated generation of HRD reports using stored personnel, training, and attendance data.

Data Security and Access Control

To ensure the confidentiality, integrity, and security of personnel and training data, the system incorporates role-based access control and secure authentication mechanisms. User access is restricted according to assigned roles, such as HRD administrators and authorized personnel, ensuring that only permitted users can view, modify, or generate sensitive records. All user actions, including participant selection, attendance validation, and report generation, are logged to support accountability and traceability.

The system stores data in a centralized MySQL database protected through server-side validation and controlled database access. Sensitive operations, such as attendance verification using One-Time Passwords (OTP), are designed to prevent unauthorized access and data manipulation. These measures ensure compliance with institutional data protection policies and support secure management of human resource information.

System Implementation

The researcher used a mix of old and new web tools to build the system. PHP was the main backend language because it is popular and works well for web development. HTML and CSS were used to create and style the interface so it would be clear and easy to use. JavaScript made the interface interactive and allowed content to update without refreshing the page.

Bootstrap was used to make the interface responsive, thus it is compatible with different devices. A PHP framework, Laravel, was used to develop the parts of the system that can extend and vary in the future in a more efficient way. Livewire was added so some features could update in real time without using too much JavaScript. Users can access the system from tablets, laptops, or mobile phones as long as they have an internet connection.

The researcher used MySQL as their relational database management system because it was reliable, flexible, and good at handling big, complicated datasets. We used MySQL Workbench to design the schema, write queries, and keep the database running. It made it easy to use data and let the system grow.

Current Technology Used

Most of the time the Human Resource Division of the Schools Division of Ozamiz City use documents printed on paper and Excel spreadsheet programs to manage filed employee documents, screen participations, monitor attendance and tabulate reports. Since there is no single central data repository, the employee records are hand entered and captured across different files in an inconsistent way. Attendance records are captured in printed worksheets or attendance sheets, which are then entered again manually into spreadsheet programs. There is a high probability that data can be lost or duplicated or entered in a different way than intended. The dependence on manual consolidation is also the reason why the office does not have the capacity to gain timely real-time data consolidation and report preparation on the dashboards. This Division is in high need of an IT system that would eventually ease the burden of the processes of the administrators in the office.

Hardware Requirements

The Comprehensive Career Progression Framework can be used on any computer, tablet, or smartphone with a modern web browser. For the best performance, you should have a device with at least 2GB of RAM, a processor that runs at 1.8 GHz or faster, and a stable internet connection. It doesn't need any special hardware, so it can be used in existing institutional ICT infrastructures without costing a lot of money.

Software Requirements

The system works best with web browsers like Google Chrome, Mozilla Firefox, or Microsoft Edge so that all the interface features show up properly. Behind the scenes, it runs on a server that supports PHP, which is needed for Laravel and Livewire to work. The database is managed with MySQL, and MySQL Workbench makes it easier to organize the data, create structures, and keep everything updated. This setup was chosen because it is stable, free, and fits the institution’s IT rules, which makes the system easy to set up, expand, and maintain over time.

Database Design

The researchers created an Entity-Relationship Diagram (ERD) to illustrate how the main database is structured. It brings together elements like employees, training programs, attendance records, and reports, showing how everything connects. By combining thoughtful database design with the right algorithms, the system becomes smooth to use, speeds up administrative tasks, and supports decision-making based on accurate data.

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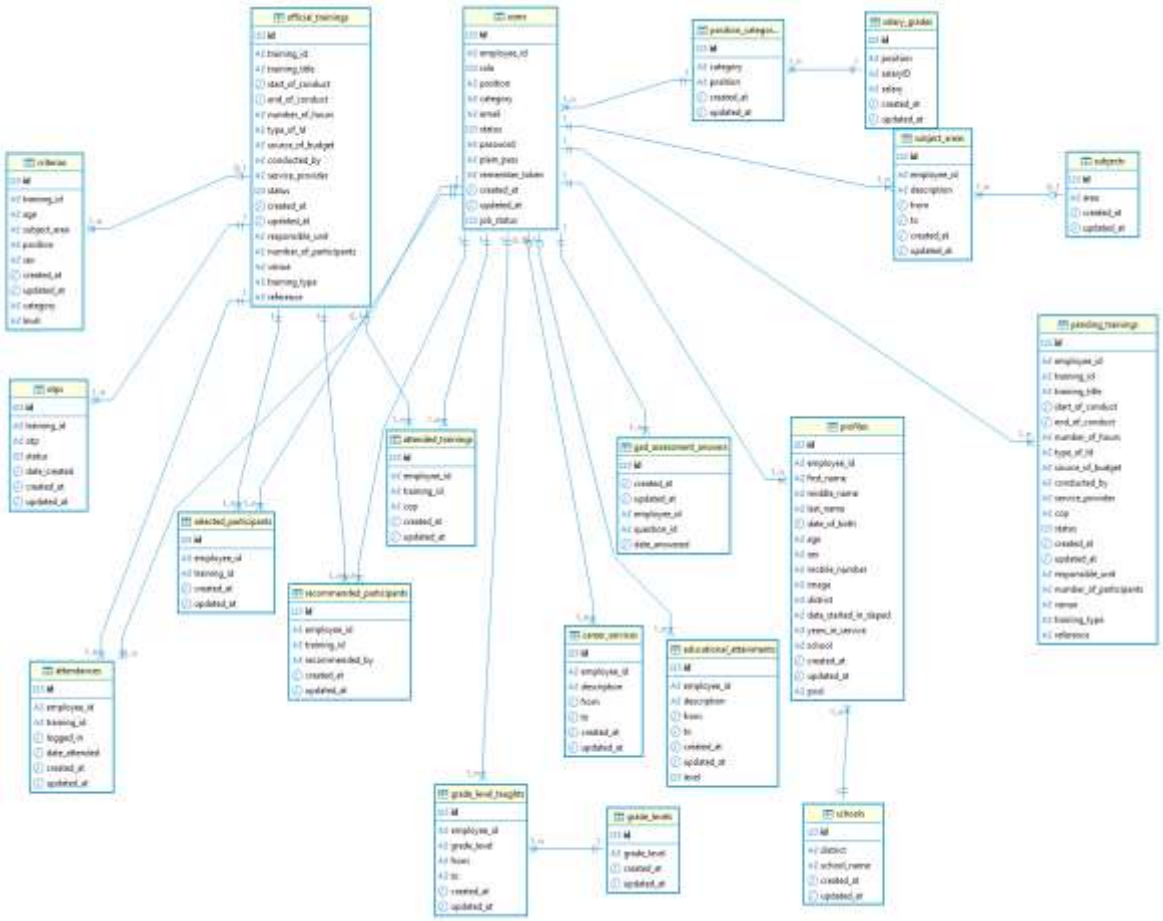

Figure 7. Entity Relationship Diagram of Comprehensive Framework for Career Progression

RESULTS AND DISCUSSION

The Participant Selection module consistently generated outputs that fully aligned with DepEd eligibility policies. The combined rule-based and Boolean retrieval mechanisms produced consistent results across all test cases, ensuring objective and repeatable identification of qualified participants. By consolidating eligibility criteria into a unified algorithmic framework, the system eliminated subjective decision-making and ensured procedural fairness and transparency in participant selection.

These results are consistent with findings in existing literature. Sipayung et al. (2024) reported 75% model accuracy and 77.78% precision and recall using rule-based classification for lecturer status prediction, demonstrating the reliability of structured decision rules. Similarly, the decision support system evaluated by Lucero et al. (2025) achieved an accuracy rate of 80.21% with acceptable specificity (67.50%), confirming that algorithm-guided filtering improves administrative consistency. Supporting these findings, Widiatmo et al. (2025) showed through PLS-SEM analysis (n = 400) that information quality has a significant positive effect on HRIS usage and user satisfaction, while Nematollahi et al. (2024) demonstrated that digital HRM systems strengthen HRM effectiveness through perceived usefulness and ease of use. Unlike fragmented HRIS implementations noted by Mascarinas Jr. et al. (2025), the present system integrates all eligibility rules within a single framework, resulting in consistent and verifiable selection outcomes.

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Figure 8. Code Snippet of Laravel Eloquent Query in Filtering Participants.

Figure 9. Integration of Rule-Based Algorithm with Boolean Retrieval in Selection of Participants Module.

The OTP-based attendance module ensured that all attendance records were legitimate, accurate, and complete during system testing. No duplicate or falsified entries were recorded, and all attendance logs were correctly time-stamped, demonstrating robustness even in varying technological environments. These findings support Adeniyi et al. (2024), who observed significant reductions in record errors following the adoption of authenticated digital attendance systems. Compared with biometric attendance solutions examined by Cabrillas et al. (2021), which were affected by environmental and hardware constraints, the OTP-based approach offers a more flexible and reliable alternative. Additionally, Irwin et al. (2025) reported a 12.59% reduction in paper consumption after implementing digital attendance methods, highlighting both operational and resource efficiency gains. The accuracy of attendance records in this study further addresses concerns raised by Sikira and Mishael (2024), who found that HRIS record quality significantly correlates with institutional performance.

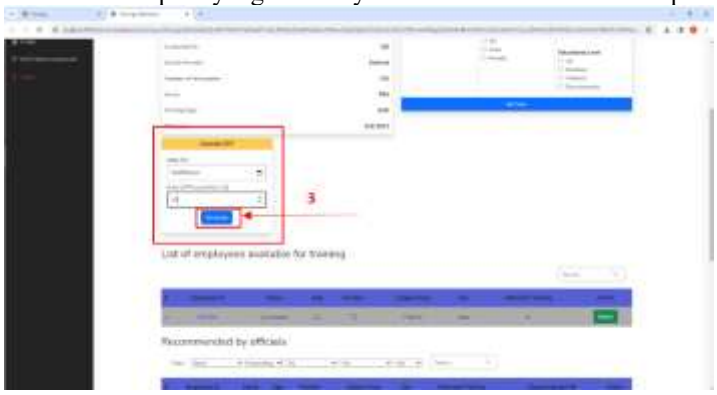

Figure 10. Generation of OTP Module

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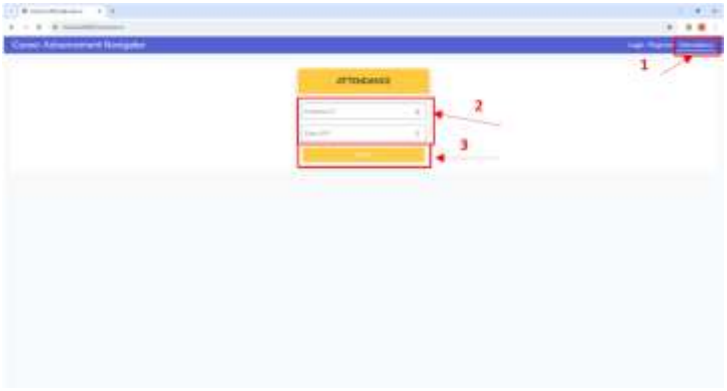

Figure 11. OTP Attendance Submission Module

The automated reporting module consistently produced structured and complete summaries of attendance, training participation, and employee development histories. All reports followed predefined formats, eliminating inconsistencies commonly associated with manual report preparation. These results align with Moreno and Delos Santos-Suñga (2024), who reported substantial reductions in processing time and payroll errors following HRIS implementation. Similarly, Reyes (2025) found that digital HRM systems significantly reduce paperwork and strengthen compliance in educational institutions. The reliability and completeness of reports generated by the proposed system further support the findings of Siddique et al. (2025), who identified information quality and IT capability as key drivers of HRIS effectiveness.

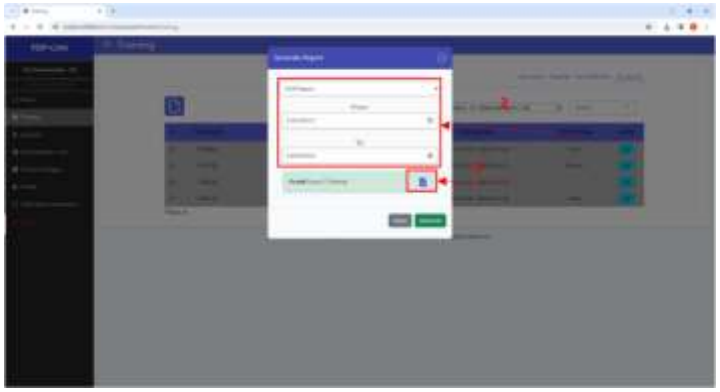

Figure 12. Generation of Report by Date Range.

Figure 13: Exportation of Report into Printable Format.

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Module	Evaluation Metric	Observed Result	Interpretation
Participant Selection	Eligibility consistency	100% match with DepEd policies	Eliminated subjective participant filtering
Participant Selection	Filtering accuracy	No false inclusions during testing	Reliable rule-based and Boolean logic
Attendance Monitoring (OTP)	Duplicate entries	0 recorded	Prevented falsified or repeated attendance
Attendance Monitoring (OTP)	Timestamp accuracy	100% valid timestamps	Reliable real-time attendance logging
Reporting Module	Report completeness	100% complete outputs	Eliminated missing or inconsistent fields
Reporting Module	Manual processing errors	Reduced to 0	Automated reporting improved accuracy

Table 2. Quantitative Summary of System Performance During Testing.

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CONCLUSION

This study developed and tested an integrated framework for career progression to enhance Human Resource Development processes in the Schools Division of Ozamiz City. The system demonstrated improved transparency in personnel selection through rule-based and Boolean-driven filtering, making it easier to identify eligible participants according to established policies. The OTP-based attendance module ensures data integrity and prevents fraudulent entries, providing a reliable alternative to hardware-dependent biometric systems. Automated report generation produces structured, complete summaries that reduce manual errors and facilitate administrative decision-making.

Overall, the system addresses longstanding challenges in participant selection, attendance tracking, and report preparation by combining clear rules, secure authentication, and real-time data updates, thereby improving efficiency, fairness, and reliability in HR operations. Furthermore, the framework is scalable and can be adapted to other DepEd divisions, enabling broader implementation of standardized, digital HR processes.

RECOMMENDATIONS

The study found that the Comprehensive Career Progression Framework effectively supports HRD in training participant selection, attendance tracking, report generation, and career progression monitoring. To maximize its benefits, the following recommendations are proposed:

- **Institutional Implementation and Capacity Building:**
  - Integrate the framework fully into HRD workflows to streamline document submission, attendance management, and reporting.
  - Conduct training and orientation sessions for HRD staff to ensure proper understanding, accurate data entry, and registered user management.
  - Encourage active use of the system to support smoother digital transformation.
- **Policy Alignment and System Governance:**
  - Regularly review eligibility rules, data structures, and reporting formats to align with the latest HRD guidelines, professional development frameworks, and DepEd memoranda.
  - Establish a governance team to maintain system accuracy, compliance, and alignment with institutional goals.
- **Future Analytics and Dashboard Insights:**
  - Develop interactive dashboards to provide real-time visualization of attendance, training participation, and staff development metrics.

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- Implement predictive analytics to identify training needs, forecast HR trends, and support evidence-based decision-making.

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