

**SIMATS SCHOOL OF ENGINEERING**

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**CHENNAI-602105**

**HR Management System**

**A CAPSTONE PROJECT REPORT**

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**Submitted by**

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**DECLARATION**

I am. ANSHUL JOLLY JOSHI, Department of Computer Science and Engineering, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, hereby declare that the work presented in this Capstone Project Work entitled **HR Management** **System** is the outcome of our own bonafide work and is correct to the best of our knowledge and this work has been undertaken taking care of Engineering Ethics.

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**CERTIFICATE**

This is to certify that the project entitled **“HR Management System”** submitted by ANSHUL JOLLY JOSHI

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**ABSTRACT:**

The HR Management System (HRMS) is a comprehensive solution designed to automate and manage key human resource functions, such as recruitment, employee management, benefits administration, and performance evaluations. Utilizing cloud technologies like AWS or Google Cloud, the HRMS ensures scalability, security, and accessibility. This system streamlines HR processes, reducing manual workload, and improving efficiency. Developed using frameworks such as Django or Spring, the HRMS provides a user-friendly interface and robust functionalities. The solution integrates employee profiles, job postings, and evaluations, offering an all-in-one platform for HR needs. This report delves into the project's development, architecture, implementation, and future enhancements.The HR Management System (HRMS) serves as a comprehensive platform designed to streamline and enhance human resource processes within organizations. As the workforce landscape evolves, the need for effective HR management tools becomes increasingly critical. This system integrates key functionalities such as recruitment, employee onboarding, performance evaluation, and benefits administration into a cohesive platform. By leveraging automation and data analytics, the HRMS reduces administrative burdens, allowing HR professionals to focus on strategic initiatives that drive organizational success.The proposed HRMS emphasizes user-friendly interfaces and self-service features, empowering employees to manage their own HR tasks while providing HR personnel with valuable insights through robust reporting tools. Security and compliance are prioritized, ensuring that sensitive employee information is protected in accordance with legal regulations. Future enhancements will include mobile accessibility, AI-driven analytics, and seamless integrations with existing enterprise applications.

**INTRODUCTION:**

Human Resource Management plays a vital role in every organization, overseeing tasks such as recruitment, employee onboarding, performance evaluation, and benefits administration. Traditionally, these tasks have been managed manually, often leading to inefficiencies, inaccuracies, and a significant time investment. The rapid evolution of technology has created a need for more automated, efficient solutions to manage HR processes. The HR Management System (HRMS) addresses this need by providing a cloud-based, integrated platform that streamlines HR operations, reduces manual workload, and enhances data accuracy. Leveraging cloud platforms like AWS or Google Cloud, alongside frameworks such as Django or Spring, this system offers scalability, security, and accessibility. It allows HR personnel to manage employee lifecycles, job postings, and performance evaluations effectively. The HRMS aims to revolutionize traditional HR practices, offering a modern, digital approach to human resource management.The HRMS is designed to streamline and automate HR processes, providing a centralized platform for managing employee information, recruitment workflows, performance evaluations, and benefits administration. By leveraging cloud technologies like AWS or Google Cloud, combined with robust frameworks such as Django or Spring, the HRMS ensures data security, accessibility, and scalability. This system allows HR professionals to manage critical functions efficiently, reducing manual workloads, improving data accuracy, and enhancing decision-making.

**PROJECT DESCRIPTION:**

The HR Management System (HRMS) is a web-based application designed to manage HR tasks such as recruitment, employee data management, performance tracking, and benefits administration. It provides a user-friendly interface for HR personnel to handle various functions efficiently. The system offers separate modules for employee profiles, job postings, and evaluations. Developed using frameworks like Django or Spring, and hosted on cloud platforms such as AWS or Google Cloud, the HRMS ensures high accessibility, security, and scalability. The project aims to deliver an integrated HR solution that optimizes administrative processes and enhances employee management.

**PROBLEM DESCRIPTION:**

Managing HR processes manually can be time-consuming, inefficient, and prone to errors, especially in large organizations. Traditional methods often involve paperwork, manual data entry, and a lack of centralized access to employee information. These challenges lead to delays in recruitment, difficulties in tracking performance, and errors in benefits administration. The need for a digital, automated HR system is evident to address these issues, streamline operations, and provide a centralized platform for HR activities. The HR Management System solves these problems by offering a cloud-based, integrated solution that simplifies HR tasks and improves data accuracy and accessibility.

**LITERATURE SURVEY:**

Several studies highlight the growing importance of digital HR systems in modern organizations. Traditional HR management often leads to inefficiencies, delays, and inaccuracies. Cloud-based HR solutions have emerged as a viable alternative, offering scalability, flexibility, and improved data security. Research indicates that integrating HR functionalities into a unified platform significantly enhances productivity and employee engagement. Existing systems like BambooHR and Workday provide insights into effective HR management but may be costly or lack customization. This project builds on these findings, developing a cloud-based, cost-effective HR Management System that addresses these limitations while incorporating essential HR functionalities.

**ARCHITECTURE:**

High-Level Architecture Components

Resource Management Layer

This layer is responsible for managing the allocation and optimization of resources essential for running the HRMS, including server resources, database storage, and application services. It interacts with underlying infrastructure and ensures efficient resource utilization.

* Resource Orchestrator: Manages resource allocation for different modules of the HRMS, optimizing the distribution of computing power based on usage patterns and system demands.
* Auto-Scaling Service: Automatically scales resources (such as database instances and application servers) based on user load and predefined policies to ensure optimal performance during peak and off-peak times.
* Capacity Planner: Analyzes historical usage data to forecast future resource requirements, helping to maintain system performance as user numbers and data volume grow.

Automation & Orchestration Layer

This layer ensures that operations and resource adjustments occur seamlessly, reducing the need for manual intervention.

* Orchestration Platform: Utilizes tools like Kubernetes for managing containers that host various HRMS services (e.g., user authentication, payroll processing).
* Automation Scripts: Implements scripts for automating routine tasks such as database backups, application updates, and scaling services based on demand.
* API Gateway: Acts as an intermediary for user interfaces and backend services, facilitating integration with third-party applications (e.g., payroll services, benefits providers).

User Interface & Control Layer

This layer provides users (HR managers, employees, administrators) with interfaces to manage and interact with the HRMS.

* Admin Dashboard: A web-based control panel where administrators can monitor employee data, recruitment metrics, performance evaluations, and system performance.
* Resource Allocation Controls: Enables HR managers to configure and manage user permissions, roles, and access controls within the HRMS.
* Cost Analysis Tools: Provides insights into the costs associated with various HR activities, such as recruitment, training, and employee benefits, helping to identify areas for cost savings.

**Functionality**

* User Management: Tools for creating, updating, and managing user roles and permissions within the HRMS.
* Recruitment Management: Features for posting job openings, tracking applications, and managing the hiring workflow.
* Performance Management: Functionality for conducting performance reviews, setting goals, and tracking employee progress.

Monitoring & Analytics Layer

This layer provides insights into the system’s performance and user engagement.

* Prometheus/Grafana: Real-time monitoring of system performance metrics, with Grafana dashboards for visualizing data related to application load, response times, and resource utilization.
* Elastic Stack (ELK): Centralized logging for the HRMS, using Elasticsearch for storing logs, Logstash for processing logs, and Kibana for visualizing log data to identify trends and issues.
* AI/ML Models: Utilizes machine learning frameworks like TensorFlow or Scikit-learn to analyze employee data, predict turnover rates, and enhance recruitment strategies.

Automation & Orchestration Tools

* Kubernetes: Orchestrates the deployment of containerized services for the HRMS, ensuring efficient management of application instances.
* Ansible: Automates the configuration and management of infrastructure components, such as deploying updates or scaling resources as needed.
* API Gateway: Implements NGINX or Kong as an API gateway for managing access to various services, ensuring secure and efficient communication between the frontend and backend.

**DESIGN:**

A diagram of a data flow

Description automatically generated

**GUI DESIGN: HR Management System:**

**1. Dashboard Layout**

* **Top Navigation Bar:**
  + **Overview:** Displays a summary of key HR metrics, such as total employees, active recruitment, and upcoming performance reviews.
  + Employee Management: Quick access to sections for viewing and managing employee profiles.
  + Recruitment: Directs to job postings, applications, and candidate tracking.
  + Reports: Historical data on employee performance, attendance, and recruitment metrics.
  + Alerts & Notifications: Displays system alerts, reminders for performance reviews, and important HR announcements.
* **Side Panel:**
  + Employee Groups: Allows filtering employees by department, role, or employment status.
  + Task Management: View and manage tasks assigned to HR personnel, such as onboarding or interview scheduling.
  + Settings: Access to system configuration, user roles, and permissions.

**2. Employee Management Page**

* **Employee Directory:**
  + A searchable list of employees with filters (e.g., department, role) and quick access to individual profiles.
* **Employee Profile:**
  + Displays comprehensive information about each employee, including personal details, job history, performance reviews, and training records.
  + Buttons for editing information, adding notes, or initiating performance evaluations.
* **Analytics Dashboard:**
  + Visual graphs showing employee performance trends, attendance **records, and training completion rates.**

**3. Recruitment Section**

* **Job Postings:**
  + Interface for creating, editing, and managing job postings with fields for job title, description, requirements, and application deadlines.
* **Application Tracker:**
  + Kanban-style board for managing applicants through various stages (e.g., applied, interviewed, offered).
* **Candidate Profiles:**
  + Detailed view of each applicant with resume, cover letter, interview notes, and hiring status.

**4. Performance Management Tools**

* **Performance Review Interface:**
  + Scheduled review dates and templates for performance evaluations.
  + Ability to set goals and track progress, with a feedback section for peer and manager reviews.
* **Training Management:**
  + Tools for scheduling training sessions, tracking attendance, and evaluating effectiveness.

5. **Cost Analysis and Payroll Management**

* **Payroll Overview:**
  + Summary of payroll expenses with detailed breakdowns by department and employee.
* **Cost Analysis Graph:**
  + Visual representation of payroll trends over time, with options to simulate different scenarios (e.g., salary increases).
* **Budget Allocation:**
  + Interface to manage and allocate budgets for various HR activities, such as training, recruitment, and employee benefits.

**6. Performance Alerts & Recommendations**

* **Notifications Center:**
  + Displays real-time alerts for upcoming performance reviews, training deadlines, or policy updates.
* **Recommendations:**
  + AI-driven suggestions for improving employee engagement or identifying training needs based on performance data.

**Visual Elements**

* **Color Scheme:**
  + Soft, neutral colors for the background with contrasting colors (e.g., blue for metrics, orange for alerts) to enhance readability.
* **Graphical Elements:**
  + Smooth graphs and charts for visualizing employee data, performance trends, and budget allocations.
* **Interactive Sliders:**
  + Easy-to-use sliders for real-time adjustments of salary allocations or performance ratings.

**Example Screen Mockups:**

* Dashboard View: Provides a holistic view of HR metrics, with quick links to critical sections such as employee management and recruitment.
* Employee Management: Interactive profiles showing employee details, performance metrics, and action buttons for management tasks.
* Recruitment Tracker: Visual board for managing candidates, with drag-and-drop functionality for tracking their application status.

This GUI design ensures an intuitive interface that empowers HR managers with powerful tools for managing employee information, recruitment processes, performance evaluations, and overall HR operations.

**Approach / Algorithm Description:**

The approach involves a modular design, where each HR function, such as recruitment or performance management, is treated as a separate module. Agile development methodology is used to ensure iterative progress and adaptability. Algorithms for data retrieval, processing, and storage are implemented using CRUD operations, with emphasis on data security and integrity. Recruitment algorithms involve filtering applicants based on predefined criteria, while performance evaluation utilizes weighted scoring algorithms. Cloud-based services handle data storage and authentication, ensuring secure access. The system’s architecture ensures scalability and flexibility, allowing easy integration of additional features in the future.

**CODE IMPLEMENTATION:**

**LANGUAGE SELECTION:**

C programming

#include <stdio.h>

#include <stdlib.h>

#include <string.h>

struct Employee {

int id;

char name[50];

char department[50];

float salary;

};

void addEmployee(struct Employee employees[], int \*count) {

if (\*count >= 100) {

printf("Employee list is full.\n");

return;

}

struct Employee emp;

printf("Enter employee ID: ");

scanf("%d", &emp.id);

printf("Enter employee name: ");

scanf("%s", emp.name);

printf("Enter department: ");

scanf("%s", emp.department);

printf("Enter salary: ");

scanf("%f", &emp.salary);

employees[\*count] = emp;

(\*count)++;

printf("Employee added successfully.\n");

}

void displayEmployees(struct Employee employees[], int count) {

if (count == 0) {

printf("No employees to display.\n");

return;

}

printf("ID\tName\t\tDepartment\tSalary\n");

printf("--------------------------------------------------\n");

for (int i = 0; i < count; i++) {

printf("%d\t%s\t\t%s\t\t%.2f\n", employees[i].id, employees[i].name, employees[i].department, employees[i].salary);

}

}

void searchEmployee(struct Employee employees[], int count) {

if (count == 0) {

printf("No employees to search.\n");

return;

}

int id;

printf("Enter employee ID to search: ");

scanf("%d", &id);

for (int i = 0; i < count; i++) {

if (employees[i].id == id) {

printf("Employee found: \n");

printf("ID: %d\n", employees[i].id);

printf("Name: %s\n", employees[i].name);

printf("Department: %s\n", employees[i].department);

printf("Salary: %.2f\n", employees[i].salary);

return;

}

}

printf("Employee with ID %d not found.\n", id);

}

int main() {

struct Employee employees[100];

int count = 0;

int choice;

while (1) {

printf("\nHR Management System\n");

printf("1. Add Employee\n");

printf("2. Display Employees\n");

printf("3. Search Employee\n");

printf("4. Exit\n");

printf("Enter your choice: ");

scanf("%d", &choice);

switch (choice) {

case 1:

addEmployee(employees, &count);

break;

case 2:

displayEmployees(employees, count);

break;

case 3:

searchEmployee(employees, count);

break;

case 4:

exit(0);

default:

printf("Invalid choice. Please try again.\n");

}

}

    return 0;

}

**OUTPUT:**

A screenshot of a computer

Description automatically generatedA screenshot of a computer

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**Implementation of HR Management System**

**1. User Management**

* Definition: Efficiently manage user roles, permissions, and access levels within the HRMS.
* Benefits: Ensures data security and proper access control, allowing only authorized personnel to view or modify sensitive information.
* Implementation: Use role-based access control (RBAC) to assign permissions based on job functions. Implement user authentication mechanisms, such as Single Sign-On (SSO) or Multi-Factor Authentication (MFA).

**2. Employee Data Management**

* Definition: Centralized storage of employee information, including personal details, job roles, performance reviews, and training records.
* Benefits: Streamlines data management, making it easy to access and update employee information while ensuring data integrity.
* Implementation: Use a relational database (like PostgreSQL or MySQL) to store employee data, with a well-defined schema to manage relationships between tables (e.g., employees, departments, roles).

**3. Recruitment Management**

* Definition: Manage the end-to-end recruitment process, from job posting to candidate selection.
* Benefits: Improves recruitment efficiency, reduces time-to-hire, and enhances candidate experience.
* Implementation: Integrate an Applicant Tracking System (ATS) that allows for job postings, application management, and interview scheduling. Tools like Greenhouse or Lever can be integrated.

**4. Performance Management**

* Definition: Monitor and evaluate employee performance through regular assessments and feedback.
* Benefits: Helps identify high performers and areas for improvement, facilitating professional development and employee engagement.
* Implementation: Develop a performance review module that allows managers to set goals, conduct reviews, and provide feedback. Use self-service features for employees to track their own performance.

**5. Training and Development**

* Definition: Manage employee training programs and development opportunities.
* Benefits: Enhances employee skills and knowledge, contributing to overall organizational performance.
* Implementation: Implement a Learning Management System (LMS) for tracking training courses, attendance, and certifications. Integrate with platforms like Moodle or TalentLMS.

**6. Payroll and Compensation Management**

* Definition: Manage employee compensation, benefits, and payroll processing.
* Benefits: Ensures accurate and timely payments, improving employee satisfaction and compliance.
* Implementation: Utilize payroll software (like ADP or Paychex) integrated with the HRMS to handle payroll calculations, tax deductions, and reporting.

**7. Reporting and Analytics**

* Definition: Generate reports on HR metrics such as employee turnover, performance trends, and training effectiveness.
* Benefits: Provides insights for data-driven decision-making and strategic planning.
* Implementation: Use reporting tools like Tableau or Power BI to visualize HR data and create dashboards for easy access to key metrics.

**8. Cloud Deployment**

* Definition: Host the HRMS in a cloud environment for scalability and accessibility.
* Benefits: Enables remote access, automatic updates, and reduced IT overhead.
* Implementation: Use cloud platforms like AWS, Azure, or Google Cloud to deploy the HRMS, ensuring data security through encryption and compliance with regulations like GDPR.

**9. Resource Monitoring and Maintenance**

* Definition: Regularly monitor the performance of the HRMS to ensure smooth operation.
* Benefits: Identifies and resolves issues proactively, maintaining system reliability and performance.
* Implementation: Use monitoring tools (e.g., New Relic or Datadog) to track application performance and user engagement metrics.

**10. Cost Management and Optimization**

* Definition: Manage and optimize the costs associated with running the HRMS.
* Benefits: Reduces unnecessary expenses and maximizes return on investment.
* Implementation: Implement budgeting tools and analyze spending patterns to identify cost-saving opportunities, using services like AWS Cost Explorer or Azure Cost Management.

By implementing these components effectively, the HR Management System can operate efficiently, supporting the needs of the organization while providing a positive user experience for employees and HR personnel alike.

**CONCLUSION:**

The HR Management System (HRMS) provides an innovative solution for efficiently managing HR processes within organizations. By integrating key functions such as recruitment, employee management, and performance evaluations into a single cloud-based platform, the HRMS significantly reduces manual effort and minimizes errors. This system enhances productivity, ensuring that HR personnel can focus on more strategic tasks rather than routine administrative work. Utilizing frameworks like Django or Spring and hosted on scalable cloud platforms like AWS or Google Cloud, the HRMS ensures security, accessibility, and adaptability to organizational needs. It effectively addresses the challenges faced by traditional HR management, offering a streamlined, user-friendly experience for both employees and HR professionals. Overall, the HRMS is a valuable tool that modernizes human resource management, improving efficiency and contributing to an organization's growth. Future enhancements will further extend its capabilities, ensuring it remains a relevant and comprehensive HR solution.

Future enhancements for the HR Management System include integrating advanced features such as AI-driven recruitment analytics, employee training modules, and a chatbot for handling HR queries. The system can also be expanded to include payroll management, attendance tracking using biometric integration, and performance prediction using machine learning algorithms. Additionally, incorporating multi-language support and mobile application development will increase accessibility. These enhancements aim to create a more comprehensive, user-friendly HR solution that caters to evolving organizational needs, ensuring sustained relevance and effectiveness.

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