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**Human Resource Management System with Data Analytics  
and Decision Support System**

A Thesis Presented to the Faculty of the Computer Science

Taguig City University, General Santos Avenue

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In Partial Fulfilment of the Requirements for the Degree of  
Bachelor of Science in Computer Science

By:

Arago, Daniel A.

Espiritu, Mark John Rey V.

Gabayoyo, Glen Michael E.

Lactuan, Ariel John D.

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## **CHAPTER I**

### **INTRODUCTION**

#### **Project Context**

Individuals' lives and the practice of every part of the business have been transformed by technological advancements during the previous two decades. The changes are speeding up, giving the educated and elite more authority over knowledge. The act of digesting information is both inferred and required. At this time, humans perform the majority of the essential knowledge processing operations and execute the processes deftly. In this chapter, we'll look at how future generations of knowledge machines will take over human intelligence and use it in the same way that humans do now.

The Human Resource Management System will handle Employee Performance Automation in terms of what is seen on them. The peculiarities of the project on which they are engaged would govern their performance. Employee performance is currently inadequately examined and tracked before, during, and after each period of employment. Although HR departments will examine them, they must complete each employee evaluation regularly to update their performance and job quality.



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The current issue in the existing human resource management system is first and foremost Leadership Development because HR specialists are supposed to provide the necessary structures operations, techniques, and points of view to make the best possible selection and development of future leaders for an organization's future leaders. Hr managers must handle human resource practices strategically. Next is the HR Effectiveness Measurement, HR is a profession that must be able to monitor outcomes in terms of transaction management and the beneficial impact on the bottom line, says Dr. John O'Hare. HR's role as a strategic partner within the firm should be changed, he says. The use of metrics to measure effectiveness marks the beginning of a move from an administrative role to a truly strategic partner. Human capital is defined as the monetary value of a person's knowledge, skill, and abilities to a corporation. Human capital management is vital because when key employees leave a company, they take their human capital with them. The ability of a corporation to retain and manage its people resources is becoming increasingly crucial. To maximize efficiency, human resources departments are under growing pressure to decrease costs while improving output. Human resources, like all other functional divisions, is required to demonstrate financial performance. When it comes to reducing human costs, the HR department is in a pickle. Recruitment is a function that requires a business perspective, skill, and the ability to select and match the ideal candidate for the firm. The labor



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market has evolved drastically in recent years in terms of technology, market competitiveness, and other aspects. To locate the best suitable candidates, human resource managers must encounter and overcome several hurdles.

The practice of gathering and analyzing Human Resource (HR) data to improve an organization's workforce performance is known as HR analytics. This concept is defined by analytical terms such as talent, workplace, and people. This data analysis method compares HR and organizational objectives to commonly acquired HR data. This gives quantifiable evidence of how HR efforts contribute to the organization's goals and strategies.

The advancement of information technology applications in today's arena makes it an imperative responsibility for decision-makers to consistently make the finest selections in the shortest amount of time. A Decision Support System is software that helps HR in making choices with the use of data and framework. Allow managerial decision-makers to make timely and accurate selections in moderately and unstructured scenarios.



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## **Purpose and Description of the Study**

The purpose of this research is to provide a system that can handle the information of the employees and the activities that they do every day. To automatically automate many of these tasks, Businesses began to use a specific human resource management system to eliminate the manual labor involved with these administrative procedures. An HRMS, or human resources management system, is a set of software programs used to manage human resources and related operations throughout an employee's career. An HRMS allows a company to acquire a complete image of its personnel while staying in compliance with changing tax and labor rules. Human resource leaders and staff are the most frequent users because they are in control of day-to-day workforce operations as well as compliance and performance reporting. This is beneficial to more than just human resources. Self-service for routine procedures can empower managers and employees, which is an important selling point for new hiring. Given that human resource costs are among the most significant of a company's spending, finance departments must integrate HRMS with the accounting system. To help a company extract more financial insights from HR data, leading providers will go above and beyond basic accounting.



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A data science system sorts and analyzes large amounts of data, producing complete information that may be utilized to solve problems and make decisions. Goal or expected revenue, sales numbers or historical data from various periods, and other inventory and operations-related data are examples of standard data in a Decision Support System. Data science refers to computerized software that assists in the formulation of decisions, judgments, and courses of action. A strong human resource decision support system has a substantial impact on the running of an organization, resulting in significant cultural change. The Human Resource Management System's functions are largely limited to day-to-day activities. It can no longer be called a data store because of the dynamic environment in which today's enterprises work. It must-have capabilities that allow the company to make judgments about things like performance evaluation and training requirements.

The practice of gathering and analyzing Human Resource (HR) data to improve an organization's workforce performance is known as HR analytics. Talent, people, and workforce analytics are all terms used to trace this concept. This data analysis



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ties commonly collected HR data to HR and organizational goals. This gives quantifiable evidence of how HR efforts contribute to the organization's goals and strategies.

The advancement of information technology applications in today's arena makes it an imperative responsibility for decision-makers to consistently make the finest selections in the shortest amount of time. A decision support system is a piece of software that helps a company or organization make decisions, make judgments, and plan courses of action. A data processing system filters and analyzes large volumes of data to produce precise information that may be utilized to aid decision-making. The researchers opted to incorporate this decision support system into a human resource management system, together with data analytics.

### **Objectives of the Study**

- **General Objective**



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- The major purpose of this paper is to give Data Analytics and a Decision Support System to administrators to reduce their efforts in tracking everyday occurrences such as information, employee performance, and employees.

- **Specific Objectives**

Specifically, the study aims to:

1. To make a web platform for the organization.
2. To create events for the employee to interact with the admin and other employees.
3. To create a connection among employee and management using chatbot.
4. To create an employee information, attendance, Salary, etc.
5. To develop a HRMS which collects and update employees' information and records.
6. To integrate data analytics in the Human Resource Management System.
7. To embed Decision Support System in Human Resource Management System.
8. To evaluate the developed Human Resource Management System with Data Analytics and Decision Support System using ISO/IEC 25010.

### **Scope and Limitations of the Project**





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An HRMS is a component of the HR Department's overall system. It is a system that automates the process of evaluating and managing the daily performance of all employees. It was used to track an employee's performance to see if he or she was doing his or her duties in a timely and efficient manner. This also acts as a base of information for the department to determine whether or not a specific employee was qualified for Bonuses or promotions.

The Scope of this system was listed below:

1. Employees Performances Appraisal
2. Caters the Salary bonuses of Employee
3. Hold the Promotion of a certain Employee
4. List of Seminars needed by the Employee

## **Chapter II**

**Integrating multiple data sources for learning analytics (2019)**



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According to Chatti et al. (2017), data can be stored in a variety of formats, at a variety of organizational levels, and from a variety of sources. When data from several sources is collected and mixed when data is integrated, it may be feasible to more correctly reflect learners' dispersed actions than when each data source is used alone. When data from several sources are collected and combined, it may be feasible to more correctly reflect learners' dispersed behaviors than when each data source is used alone.

Furthermore, because most LA approaches include large-scale and occasionally heterogeneous data, data integration can lead to more meaningful analysis. According to Cooper and Hoel (2015), one component that contributes to the scaling of LA is data integration. Organizational hierarchy, managerial structures, policy, and legislation, among other things, are critical. Data integration and interoperability are inextricably linked on technological, semantic, legal, and organizational levels. The semantic level is concerned with the data format, as well as the preservation and comprehension of meaning. On a technological level, services for data interchange and data integration are covered. At the legal level, issues such as facilitating collaboration despite differing legal frameworks and organizational laws are addressed. The protection of users' privacy is a critical problem at this level of interoperability. Finally, The term "organizational interoperability" refers to procedures that are aligned to achieve common organizational goals while also meeting user expectations and needs.



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Obtaining and synthesizing data from multiple sources in an educational setting can help generate insights that have consequences for areas such as learning, instruction, retention, and curriculum design. The data collected are often activity data. As stated by Chatti et al. (2017), interoperability requires the usage of universally recognized specifications. xAPI and IMS Caliper Analytics are two well-known educational data requirements in education and LA.

Only a few data sources are routinely integrated for data analysis in the context of LA in higher education. Existing LA projects addressing data integration challenges primarily concentrate on technological compatibility. Legal and organizational concerns are addressed to a considerable extent in the new EU general data protection law. Semantic interoperability, which enables shared data meaning, is frequently disregarded, although it might aid data merging by utilizing common data specifications. While all levels of interoperability are necessary for data integration, this analysis focuses on the semantic and technological levels.

### **A decision support system for software technology selection**



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Companies that make software confront the problem of incorporating new technology, such as cloud computing and database management systems, into their products. Because software architects and senior developers are not experts in this field, they must seek advice from outside experts or educate themselves. As a result, software development is an appropriate domain in which to install decision support systems that intelligently assist these decision-makers in selecting the best technology for their product. We give a decision-making tool to help selection to choose the best database management systems.

This paper presents a Decision Support System to assist decision-makers with MCDM difficulties like selecting a database management system. The DSS is a tool that may be utilized throughout the life cycle and can co-evolve its recommendations in response to changing requirements. According to Majumder (2015), the DSS constructs maintainable and evolvable decision models for MCDM situations using a six-step decision-making process, boosting the reliability and trustworthiness of knowledge acquisition. The sets of criteria and alternatives, as well as their relationships, for an MCDM problem, can be updated and altered frequently without affecting the validity of the decision model.

The technology selection process can be represented as an MCDM problem that involves constructing, planning, and solving a problem based on a set of criteria: (1)



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Identifying the goal, (2) defining the characteristics, (3) deciding on the alternatives, (4) choosing on a weighing procedure, and (5) applying the aggregation method (6) Making decisions based on the outcomes of the aggregate.

As Majumder (2015) stated that, this work presents a DSS for creating maintainable and evolvable decision models for MCDM situations that employ a six-step decision-making method. Consider a collection of market options (technologies). Furthermore, each supports a subset of the set of domain features, which includes the alternatives' most prominent technical and non-technical domain features. In other words, the goal is to find an acceptable alternative that supports a collection of required domain properties, alternative and is the best option for meeting domain feature criteria and satisfying the decision preferences. maker's In most cases, a single optimal solution for an MCDM problem does not exist, hence a decision-maker preference must be used to distinguish amongst solutions (Majumder, 2015).

A conventional DSS's Inference Engine infers solutions rather than relying on knowledge base facts and rules, thus it can work independently of the other components. According to MoSCoW, the Dialog Generation management system feeds the Inference Engine domain feature requirements and their priority. The algorithm then searches a collection of models in the Model-Base management system for the most applicable rules. Based on data from a database management system, the Expert System makes choices.



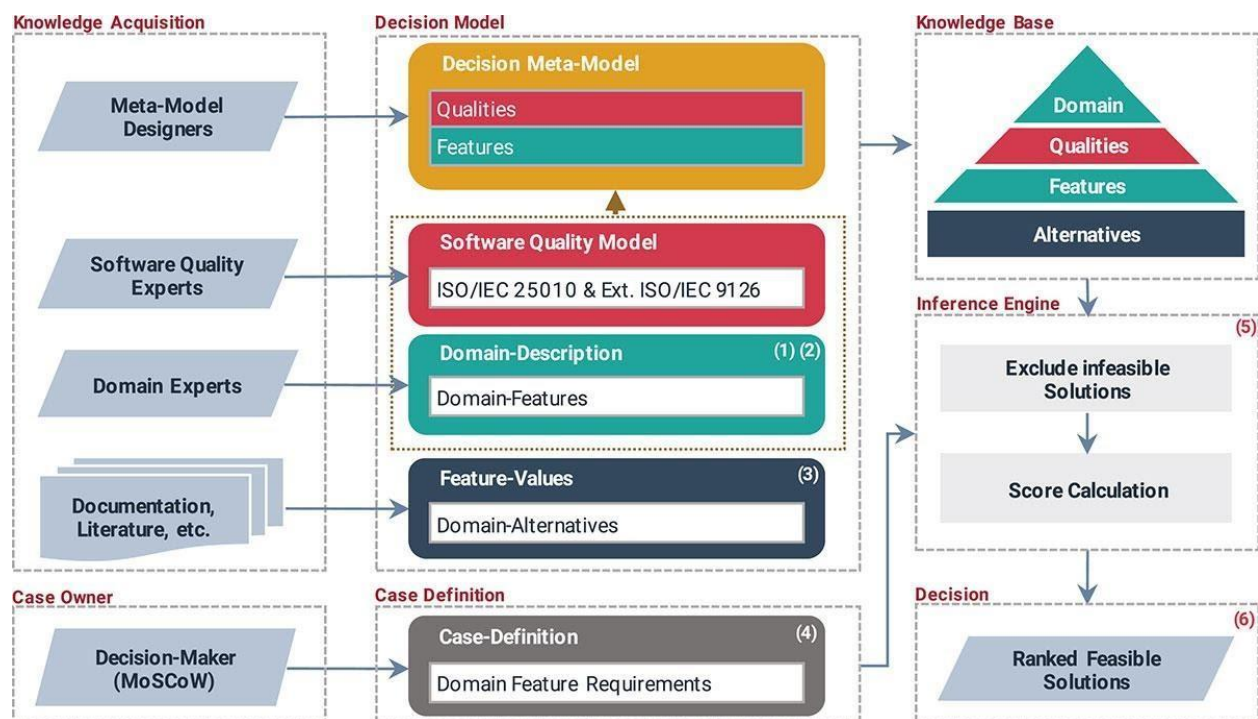
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Finally, it provides suitable solutions that have been rated to the Dialog Generation management system.

Figure 1 depicts the DSS, which is made up of basic DSS components.



## THE PRACTICE OF HUMAN RESOURCE MANAGEMENT

Human resource management (HRM, or HR for short) is concerned with all elements of how people are hired and managed in businesses. The term HRM has essentially replaced the phrase personnel management, which had previously been used to refer to labor or welfare management. Some scholars began to think about people in



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organizations from a different perspective in the 1980s, against the backdrop of economic hardship and greater pressures on enterprises due to globalization and the accelerated pace of change brought about by technical innovations. HRM is the outcome of combining these ideas. According to Panic et al. (2016), HRM refers to a wide variety of concepts and techniques. In the literature, authors typically utilize two meanings: one to describe management activity, and the other to suggest a certain approach to people management. Human resource management (HRM) encompasses a wide range of management responsibilities that include providing, developing, maintaining, directing, and employing human resources by organizational goals while respecting individual needs and ambitions. Human Resources are the organization's complete knowledge, skills, abilities, creative opportunities, and employee motivation.

According to Lajsic (2019), HRM strategies and planning are critical for firms to function efficiently and effectively in the free market. Human Resource Planning is a continual process of generating strategies that enable firms to connect the number of quality employees with profitability to meet business needs.

According to Sojka (2016) Because of advances in information technology, globalization tendencies, and the free market, modern society is defined by rapid changes. As a result, the business must adapt to the new developments and changes. Growing competitiveness, international business management, technology



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breakthroughs, new legislation, union actions, new business ethics, and interpersonal relations are all new trends that have a big impact on HRM.

According to Zheng (2017) As a result, HRM is constantly devising new tactics to improve its efficiency and effectiveness. In today's enterprises, information technology plays a critical role in transforming traditional HRM methods. The amount of data and information in HRM is continuously expanding as a result of rapid development, necessitating the creation of innovative ways and methods of processing and collecting data.

## **CHAPTER III**

### **TECHNICAL BACKGROUND**

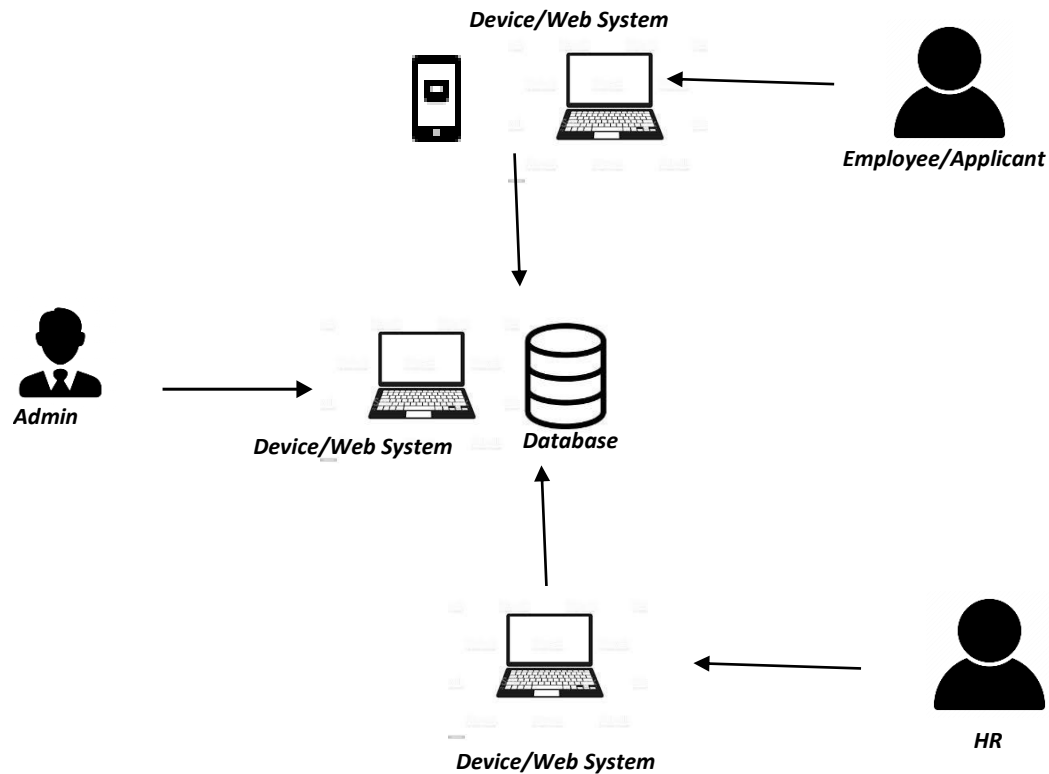
This chapter examines the technical aspects of the project, including a description of its kind and operation. It also specifies the project's application development type.





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## SOFTWARE

**JavaScript** - is a popular programming language for web development. This was built by Netscape to allow developers to access visual and interactive features to their



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websites. While JavaScript is influenced by Java, its syntax is more similar to C and is based on ECMAScript, a Sun Microsystems scripting language.

**FIGURE 2**





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**PHP** - A commonly used scripting language for building dynamic Web pages. PHP code is inserted within HTML pages for server-side execution, combining syntax from the C, Java, and Perl languages. It is widely used to extract data from a Web server database and display it on a Web page.



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**FIGURE 3**





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**XAMPP** - It allows you to install a WordPress site on your PC's local web server. The “cross-platform” component refers to the fact that this simple and lightweight solution works on Windows, Linux, and Mac.

**FIGURE 4**



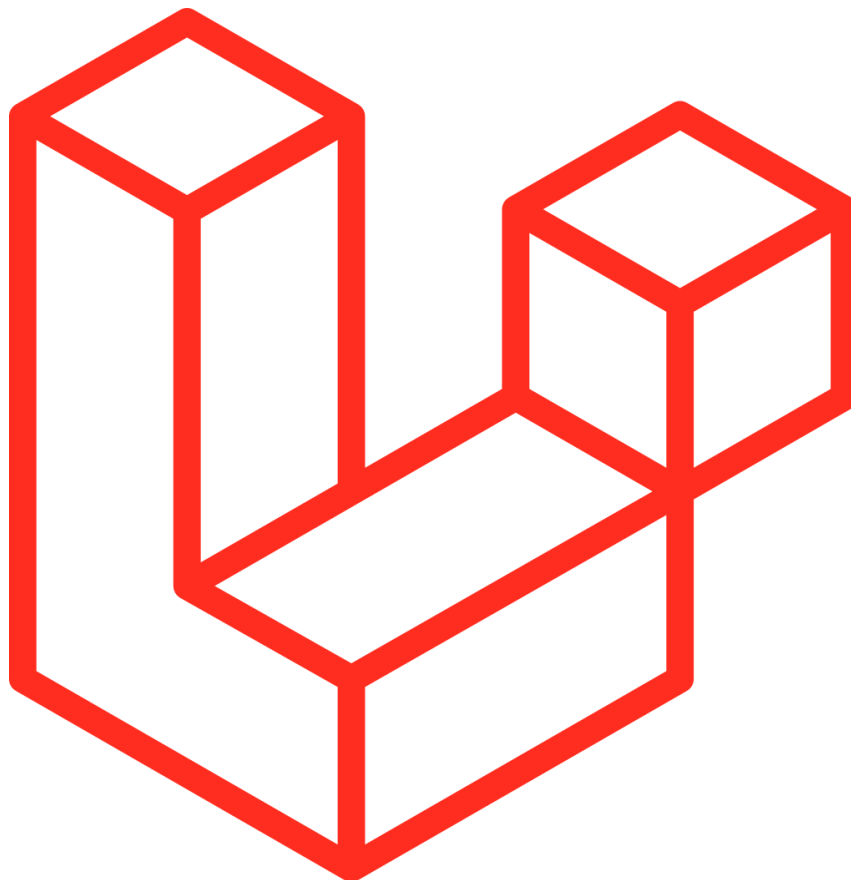


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**Laravel** - is a free, open-source<sup>1</sup> PHP web framework, created by Taylor Otwell and intended for the development of web applications following the model–view–controller (MVC) architectural pattern and based on Symfony. Some of the features of Laravel are a modular packaging system with a dedicated dependency manager, different ways for accessing relational databases, utilities that aid in application deployment and maintenance, and its orientation toward syntactic sugar.





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**CSS** - is a style sheet tool that is used to specify how a page written in a mark-up language such as HTML should be displayed. CSS, like HTML and JavaScript, is an important part of the World Wide Web.



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**CSS**







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**Bootstrap - Bootstrap** is a free and open-source CSS framework directed at responsive, mobile-first front-end web development. It contains CSS- and (optionally) JavaScript-based design templates for typography, forms, buttons, navigation, and other interface components.





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## **HARDWARE**

**COMPUTER** - A computer is a pre-programmed electrical device that accepts data, conducts specified mathematical and logical processes fast, and provides results. Computers come in many shapes and sizes, including mainframes, desktop and laptop computers, tablets, and cellphones. Analog and digital computers are compared and contrasted.



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**FIGURE 6**



**How the system will work?**



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Human Resource software makes it possible to employ information technology to manage a wide range of Human Resource tasks. An HRMS often includes the capabilities of a human capital management system and encompasses all aspects of an HRIS.

The HR manager will serve as the project's "functional lead" for human resources, offering input on people processes, KPIs(Key Performance Indicator), and needs for various HRMS services, such as recordkeeping, onboarding, training, payroll, performance management, and HR reports.

## **CHAPTER IV**

### **METHODOLOGY**

This chapter highlights the techniques and tools used in the proposed study. It includes the Operational Diagram, System Architecture, Use Case Diagram, Data Flow Diagram, Entity Relationship Diagram, Data Dictionary, Development Approach, and Event Scheduling Algorithm.

#### **Research Method Use**



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The researchers conducted the descriptive and developmental research that is required for the proposed project. The proposed project is a web-based system called Human Resource Management System with Data Analytics and Decision Support System.

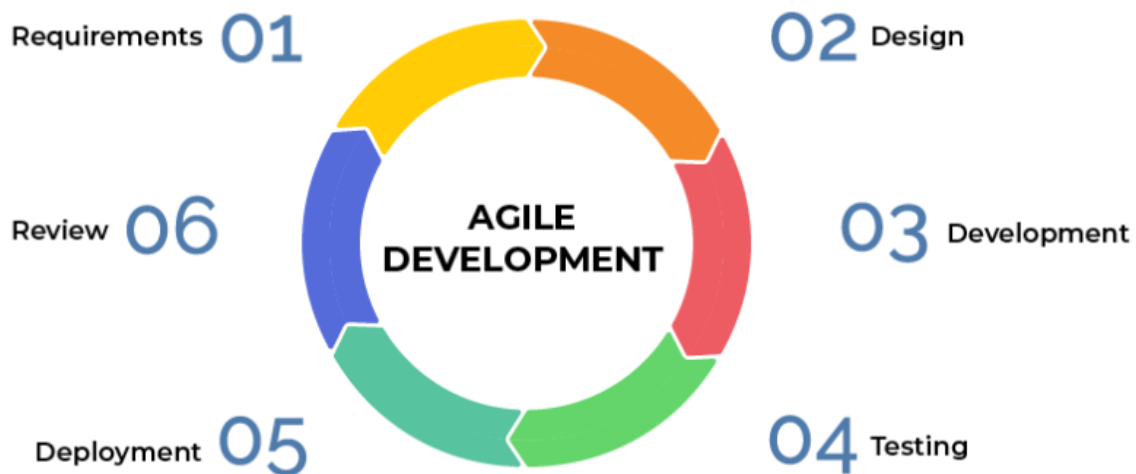
### **Development Approach**

The Human Resource Management System with Data Analytics and Decision Support System can also be developed using the Agile methodology. The Agile Software Development Life Cycle includes components such as requirements, design, development, testing, deployment, and review. With the number of meetings involved, it may appear wasteful. However, the agile approach saves a significant amount of time by optimizing development jobs and avoiding errors that can occur during the planning stages.



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The web system was constructed by the researcher utilizing the Agile development method. Agile has Six phases which are: Requirements, Design, Development, Testing, Deployment, and Review. The first step is Requirement, which is an estimate of the amount of work needed to finish the project. The second step is Design: The design methodologies used in the software development of this system are visual design and the



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architectural structure of the program. The third phase is Development which is the development of the software this phase consists entirely of writing code and translating design documents into actual software. This is the longest term because it serves as the foundation for the entire method. The fourth phase is Testing, after the developers finish programming software, the quality assurance will Test the system if there is an existing problem or error that might appear, then the quality assurance will be maintained until the software is bug-free and meets the criteria of the system. The next phase is Deployment, after testing the system and it is now bug-free and meets the criteria, the developers will deploy the system to be used by the user. The last phase is Review where the developers review the system if there are any issues that the user's encounter, the team shares their suggestions for resolving them.

## **1. Requirements**

The basic paperwork, as well as an estimate of the time and work required to complete the project, are specified in the first step.

- What is the project's result?
- What are the aspects that are worth pursuing in terms of technological and economic feasibility?
- Alternatively, the features will initially be incompatible.



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Everyone should understand the project's scope, budget, resources, and deadline, as well as any potential risks and quality assurance requirements, at this point.

## **2. Design**

Visual design and the architectural structure of the program are the two ways to employ visual design in software development.

### **Software Design**

- A description of the system's components. For example, the team may discuss how to approach requirements to attain the greatest results. What is a programming language, and frameworks?
- Implementation. In subsequent iterations, the developers include general information about the major stages of work required for project implementation.

Aside from resource and technological information, don't forget about potential risks, how to avoid them, and how to recover the system in the event of a failure.

## **3. Software Development**





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Following that, the development phase consists entirely of writing code and translating design documents into actual software. It is the most lengthy because it serves as the foundation for the complete treatment.

- Distribute coding responsibilities across team members.
- Front-end developers work with both a user interface and servers.
- Database administrators input the required information into a database.
- In other words, developers write and implement code using a variety of tools.

#### **4. Testing**

After the development team finishes programming software, the quality assurance team validates that the code is clean and that the solution's business goals are satisfied.

Throughout the subsequent iterations of this SDLC stage, quality assurance is maintained until the software is bug-free and meets the criteria.

- Functional testing
- Performance testing
- Security testing
- Usability testing

#### **5. Deployment**



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Throughout the subsequent iterations of this SDLC stage, quality assurance is maintained until the software is bug-free and meets the criteria.

- The team collects user input.
- Developers will resolve any bugs that arise.

## **6. Review**

After all, the development team keeps track of how well the requirements are being met.

If there are any issues, the staff offers options to fix them.

## **Fishbone Diagram**



### Operational Diagram/Conceptual Diagram

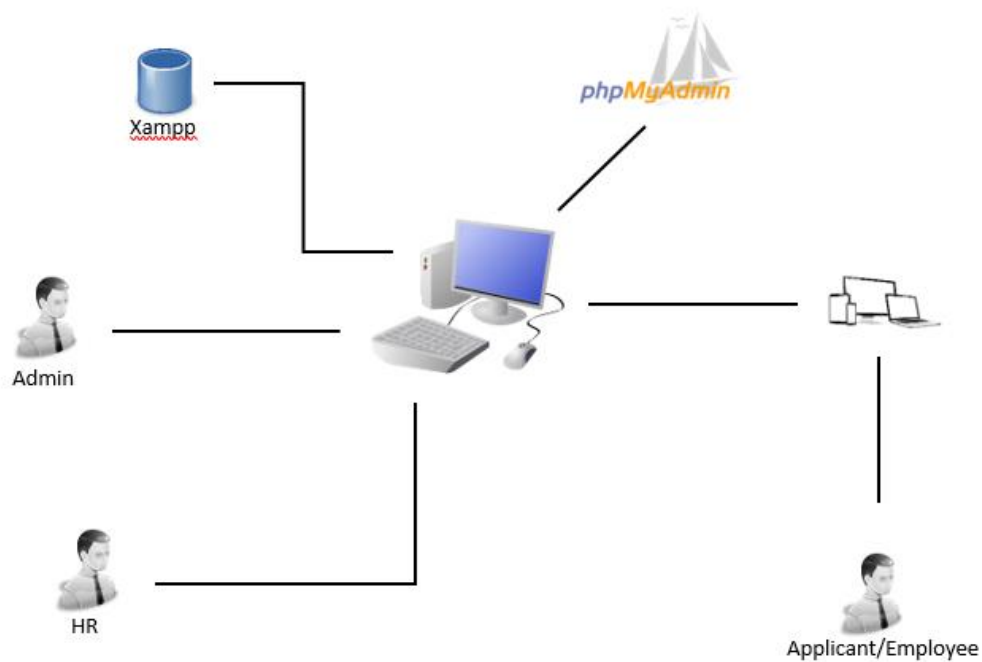


Figure 8 presents the overall process of the Human Resource Management System with Data Analytics and Decision Support System. The Admin will manage and monitor the database and maintenance of the web-based system and also the admin will



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generate the login credentials of HR and Employees. The HR will manage the overall task of the web-based system such as employee and applicant records and payroll process, etc. The employee will use the web-based system to monitor their records and to request leave, and bonuses, etc. The applicant will use the web-based system to create their account, fill up the job application form, upload a resume, and monitor their job application status.

### **Use Case Diagram**



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## Entity Relationship Diagrams



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## **Data Dictionary**

To further understand the data being saved in the database, the data dictionary helps to show the fields of the tables.

## **Feasibility/Schedule**

### **Chart of System Activities**

A project timeline and period must be developed. It assists throughout the planning, coordination, and monitoring of a particular entire project.

## **Budgetary and Cost Management**



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### Gantt chart

Preparing a cost and identifying every one of the software and hardware that'll be required to complete the project and it is important to create the project's objectives in a timely way.

Lists of hardware, software tools, and equipment.

#### HARDWARE

	QUANTITY	PRICE	TOTAL
DESKTOP	1	25000	25000
			T= 25000

#### SOFTWARE

	QUANTITY	PRICE	TOTAL
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JAVASCRIPT	1	0	0
PHP	1	0	0
XAMPP	1	0	0
NICEPAGE	1	0	0
CSS	1	0	0
VISUAL STUDIO CODE	1	0	0

**OTHER UTILITIES**

ITEM	VALUE
ELECTRICITY	1500
INTERNET	1500
FOOD	5000



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### **Population frame and Sampling scheme**

The researchers used sample procedures that were both convenient and deliberate in their investigation. Researchers can obtain data quickly and easily using a basic sampling strategy. Furthermore, respondents will only take part in the survey if it is convenient for them. This method allows researchers and responders to communicate with one another based on their individual needs and willingness. The researcher will survey a random sample of persons. Researchers will choose participants at random from a pool of people who have knowledge and experience relevant to the study. As a result, the purposive sampling method is used. The researchers will only use persons who have used the Human Resource Management System with Data Analytics and Decision Support System to test its reliability. The combination of these two sampling strategies allows the researchers to obtain a more useable and reliable set of data, It will be extremely advantageous to the study's and project's success.

### **Description of Respondents**

This study's respondents will comprise persons who use a Human Resource Management System with Data Analytics and a Decision Support System. This selected group of responders will provide information that will aid the study's progress. The



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project's usability, usefulness, portability, and maintainability will also be rated by respondents.

**Table 1**

**Frequency and Percentage**

**Distribution of the Respondents**

<b>Respondents</b>	<b>Sample Size</b>	<b>Percentage</b>
Male	25	50%
Female	25	50%
<b>Total</b>	<b>50</b>	<b>100%</b>



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Table 1 displays the frequency distributions of responders.

According to the preceding table, the majority of respondents are female, accounting for 25 to 50 percent of all respondents., While males got also the same total of respondents with 25 or 50%. The average response rate ranges between 50 and 100 percent.

### **Research Instrument**

In this experiment, a survey questionnaire was employed as the research method. This form of research instrument enables both researchers and respondents to acquire and provide data in a straightforward and timely manner without taking up too much of each other's time. This type of study instrument can also be disseminated online, making information transfer and communication easy for both parties. Online communication facilitates data collection since it saves time, particularly for respondents. The survey questionnaires will ask about the dependability of the Human Resource Management System with Data Analytics and Decision Support System, as well as the web-based system's functionality. The researchers will also ask about how useful the web-based system is and the benefits of utilizing it. The data for this investigation was gathered through the use of survey questions by the researchers. The questions were utilized as a tool by researchers.



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### **Validation of instruments**

Questionnaires for surveys will be evaluated by research professionals and IT instructors. The questionnaires for the surveys must be designed in such a way that respondents may readily comprehend and interpret them. The survey questionnaires will be open to suggestions and revision, resulting in a much more reliable and useful set of data. Following editing, the researchers will distribute the surveys to the responders through the internet.

### **Data Gathering Procedures**

The researchers obtain the necessary information from documents, files, and publications pertinent to the subject. The information was carefully read and synthesized, and it was discovered to contain thoughts and knowledge that may assist the researchers in developing this study. The researchers employed survey questionnaires to collect data from people, which will provide further information to the researchers, particularly in the functionality section of this study. Respondents will also review the web-based system to ensure that it performs the required activities and is dependable





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## **Statistical Treatment**

The researcher examined the acquired data using several tools. The researcher employed statistical approaches such as weighted mean, five-point rating scale, and percentage. These analyzing statistical techniques correlate to the description of the respondent's appraisal of the suggested system.

The researcher employed the following statistical tools:

### **1. Weighted Mean**

The researchers employ a weighted mean since the elements to be analyzed are abstract or continuous, such as Functional Suitability, Performance Efficiency, Usability, Reliability, Security, and System Maintainability.

Formula:

$$\text{Weighted Mean} = \frac{\sum fx}{n}$$

Where:



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$\Sigma$  = Summation Symbol

f = frequency

x = unit weight

n = total number of respondents

### Five-Point Rating Scale

Table 2 presents the five-point rating system's linguistic interpretations.

Weight	Mean Value	Verbal Interpretation
1	1.00-1.49	Strongly Agree
2	1.50-2.49	Disagree
3	2.50-3.49	Fair
4	3.50-4.49	Agree
5	4.50-5.00	Strongly Agree

The Proportion Formula will be used to calculate the percentage of total respondents who agreed with each question's response. This will be used primarily to increase the



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adoption of the Human Resource Management System with Data Analytics and Decision Support System.