DEVELOPMENT OF HUMAN RESOURCE HYBRID DESCRIPTIVE DATA ANALYTICS SYSTEM

A Dissertation

Presented to

The Faculty of the Graduate School

SAMAR STATE UNIVERSITY

Catbalogan City

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy (Ph.D.)

Major in Technology Management

ERVIN L. RODRIGUEZ

May 2020

APPROVAL SHEET

This dissertation entitled "**DEVELOPMENT OF HUMAN RESOURCE HYBRID DESCRIPTIVE DATA ANALYTICS SYSTEM**" has been prepared and submitted by **ERVIN L. RODRIGUEZ**, who have passed the comprehensive examination, is hereby recommended for the oral examination.

FELISA E. GOMBA, Ph.D.
Vice President for Academic Affairs
Adviser

Approved by the Committee on Oral Examination on May 4, 2020 with a rating of PASSED

ESTEBAN A. MALINDOG, JR., Ph.D.
Dean, Graduate School, SSU
Chairman

EMILIO H. CEBU, Ph.D.
Faculty, Graduate School
Member

FLORABELLE B. PATOSA, Ph.D.
Dean, College of Arts and Sciences
Member

GIL O. AMOYAN, Ph.D.
Director, Industrial Link and Development
Member

RONALD L. ORALE, Ph.D.
VP Research and Extension Services
Member

Accepted and approved in partial fulfillment of the requirements for the Degree in **Doctor of Philosophy (Ph.D.) major in Technology Management**.

May 4, 2020
Date of Oral Examination

ESTEBAN A. MALINDOG, JR., Ph.D.
Dean, Graduate School

ACKNOWLEDGMENT

The researcher would like to express his sincere gratitude to those who assisted me in accomplishing this humble effort:

To **Dr. Felisa E. Gomba**, Vice President for Academic Affairs and who is at the same time the researcher's adviser, for the perpetual positive responses in all my queries even beyond working hours. And most definitely, for selflessly imparting her expertise in research from the very beginning of this work's journey to the completion of this study;

To **Dr. Esteban A. Malindog, Jr.**, Dean of Graduate School and Chairman of the Committee on Oral Examination, for his compassionate assistance to me and to all the graduate school students that aid us to the accomplishment of our work;

To the members of the Committee on Oral Examination, **Dr. Emilio H. Cebu**, **Dr. Florabelle B. Patosa**, **Dr. Gil O. Amoyan**, and **Dr. Ronald L. Orale**, for their erudite scrutiny of this humble work, constructive inputs, suggestions, and recommendations, which brought this study to be more clearer and polished;

To all the **Directors**, **Officers**, and **Personnel of PRIME HR of SSU, UEP, NwSSU, all IT Faculty of CCIS, Teaching and Non-teaching Personnel** who served as respondents of this study, for the immeasurable patience in testing the prototype, responding to interviews, and answering the questionnaire;

To **Dr. Cherry I. Ultra**, UEP President, and **Dr. Marilyn D. Cardoso**, SSU President, for allowing the researcher to conduct interviews, and system evaluation in their PRIME HR offices;

To **Dr. Benjamin L. Pecayo**, NwSSU President, for granting his study leave and allowing him to have NwSSU as the base-location of the study. Also for the trust by approving his research to be implemented in the PRIME HR of the same University;

To **Dr. Riz Rupert L. Ortiz,** for his full support in the board meeting to help his study leave to be approved and to finish his dissertation;

To **CCIS Family**, for their support and valuable inputs to improve the functionality of the prototype;

To **Rev. Fr. Erwin L. Rodriguez**, and **Engr. Edwin L. Rodriguez**, his brothers, and **Mr. Erwin J. Rodriguez**, and **Mrs. Corazon L. Rodriguez**, his parents, for the encouragement, guidance, financial support, and for the prayers to finish his study;

To his ever supportive and loving wife **Leah M. Rodriguez**, and his children **Lex**, and **Enzo**, for being his strength and inspiration to finish the study;

Above all, to his **Lord Almighty**, the God of all Gods, the savior, and the giver of life, for providing him all the means, strength, wisdom, Blessings, love, and answered prayers.

DEDICATION

To my travel buddy, my best friend, and my wife,

Leah

For the eternal love, understanding, care, and unconditional support in this journey,

To my children,

Lhenard Lex**, and **Lorenzo Keith

For being my inspiration and the reason why I consider my life is complete,

The Lord Almighty

For keeping my love and faith resilient at all times,

This humble work is for you!

ERVIN

ABSTRACT

This study aimed to develop a hybrid descriptive data analytics system for the Human Resource Management office of a University. The proposed study applied a developmental evaluation design, an approach supporting new technology trends by gathering and evaluating real-time data. The software development process formulated a Hybrid Descriptive Data Analytics System for the Human Resource office, specifically, the RSP and L & D offices. In the aspect of usability, Regular Users had an overall weighted mean of 4.67, "Highly Acceptable" interpretation, and 0.52 SD. RSP had an overall weighted mean of 5.0, "Highly Acceptable" interpretation, and 0 SD. Meanwhile, L & D had a weighted mean of 5.0, "Highly Acceptable" interpretation, and 0 SD. The problems encountered in the current data utilization were constraints to the University's offices to perform their best potential on its daily operations. Moreover, the problems that will be encountered in future data utilization will make a particular office less efficient in responding to the client's request and queries. Lastly, the difficulties encountered in the present system operation were still expensive and still preceding navigation inefficient because of the data's decentralization. Therefore, an online system that will cater to data centralization and eventually improve its efficiency was required. The study determines the need to improve the findings in the current and future data utilization. Hence, the researcher would like to recommend that other offices

under the academics, administration, research, and extension should be included in separate research proposals to develop the office's necessary module for integration to the newly developed system.

TABLE OF CONTENTS

Chapter 1

THE PROBLEM AND ITS SETTING

Introduction

The new usual setting transformed the management of work differently in people's lives. Various IT applications performed seminars, conferences, and other essential meetings at less cost. Moreover, workers accomplish office works and relevant reports at the most comfortable and safe place at home. Somehow, the internet and online systems have likely become a necessity.

The new typical way of conducting transactions required the administrators, office heads, directors, or even presidents to handle its management in a distant location, including making critical decisions to allow its operations to continue working effectively. However, the decision-making insights must still come from an analysis generated from the relevant existing data. Peersman (2014) articulates that it is essential to make maximum use of existing data. It begins with a planning process of collecting data by conducting several reviews to understand its degree.

On the other hand, there are signs of indeed a sort of emptiness. Some researchers believed that the glass of Big Data, Data Analytics, and Artificial Intelligence(AI) is half-full and still being filled-up gradually. Big Data and AI are enabling companies to expand services beyond their reach and serve the

customers better if utilized creatively, wisely, and of course, effectively (Davenport and Bean, 2019).

With the advent of the Data Analytics System and its innovations, people become dependent on easy access and navigation. There are a lot of applications that use data analytics to be more efficient and effective. Analytics Vidhya Content Team (2015) shared thirteen excellent applications of data science recently. The most fundamental application is the Internet Search application. It allows people worldwide to find and locate similar or, most of the time, accurate information in a worldwide variety of site locations. Another is Digital Advertisements and Recommender Systems, which allows the world of digital marketing almost spoon-fed customer services to people instantly in almost anywhere and anything.

Moreover, sharing the idea of Image and Speech recognition by talking to the device, data analytics in this area allows the digital world to provide multiple options to people on what to do with the uploaded images and navigate software applications and online tools with ease. By using data analytics, gaming also evolved from 2D, 3D to virtual games and sensors. Moreover, Websites with Price comparison and online systems like Airline routing planning and taxi grabbing popped-up like unexpectedly. Banks also used data analytics to analyze risk probabilities and develop strategies to identify potential customers with a higher chance of consuming their products with more viable revenue. Logistics found data science or analytics one of the giant leaps in global competition and increased its revenue exponentially. It enhanced the company's operation in different areas,

such as discovering the fastest routes of deliveries, the best transportation mode, the best time to deliver, and more.

Meanwhile, private and government schools and universities have also started using data analytics to utilize a better teaching methodology, sustain operational activities, and maintain a student to being employee productivity. The boundless possibilities of data analytics or data science are already in the grasps of the people in the world. Yass (2017) emphasized that cloud-based information systems play an essential role in an organization's business value and performance. It presents the perceived improvements in information system processes indicated by the organization's performance. The following capabilities represented the source of information systems' cost, accuracy, usability, comparability, relevance, and transparency: automation, information processing, geographical, and tracking capabilities. Conclusively, almost everything in the world aims to enhance its operation and traditional processes. The generated data is better done through a cloud-based information system and data analytics.

Reyes and Redoña (2021) explained that people expect Higher Education Institutions(HEI) to achieve desirable performance through the designed intervention programs that balance life, behavioral responses and foster personal values. Akanmu and Jamaludin (2016) emphasize that HEI today is to the extent of having information overload and is somehow confined to its decision-making processes due to an increase of human resources needed. Unfortunately, limited data management tools are available presently.

Tulasi (2013) stressed that the present technology (data analytics) somehow transforms HEI's reason for existence and worth. It helps the capabilities of the institutions to be more firm and strong in facing the competitive world. The author said that Higher Education is incapable of gaining access to different data sets useful in decision-making. It was relatively a new era for the HEI to use data analytics. There was no difference in the significant purpose of data analytics in different areas and Higher Education.

The base-location of the study has an existing and operational Information System (IS). Unfortunately, the Management Information System (MIS) office has difficulty maintaining the operation's sustainability. The MIS office also encounters several problems from the outsourced System in implementing new procedures that must be implemented in the University Information System (UIS) since the provided accessibility is limited to accessing the database only. Moreover, most of the Universities in Samar are currently in a local area network setup. Worst, some of it works by office alone, and the navigation of data is not centralized. With this, the operations of the University might have several or more procedures to be done, such as record consolidation, before making critical or straightforward decisions.

Webber (2019) accentuated that despite the very significant benefit of data analytics, higher education is not proficient enough to utilize data analytics in supporting decision-making. Reinitz (2015) also emphasized that the present difficulty or dilemma is rich in data but poor in information.

Similarly, Human Resource Management (HRM) offices in most HEIs in Samar continue to maintain and use manual HR records and Systems. But several important matters and issues were arising in using manual Systems. Johnson et al. (2018) explained various problems, such as employment discrimination complaints with the local government agency to enforce equal opportunity. Another condition from the employees working from a company's remote location about not receiving payslips on schedule and finding it hard to acquire timely and accurate information on recent leave and other company benefits. Moreover, another issue like an employee not receiving any updated information relevant to recruiting an additional workforce three months ago, wherein the recruitment request's failure led to a negative effect on the office's overall performance.

Furthermore, another relevant matter like losing highly regarded production engineers because they did not receive appropriate training on new technology promised when hired. The research author emphasized that filing a resignation letter would be the first option since the previously identified problems and issues will require several weeks or months to complete. However, acquiring an HRIS or new technology trends like data analytics will help automate the HR data and processes necessary for the management to maintain better performances of the organization's human capital.

Also, Nagpal et al. (2020) used HR Analytics to help managers in Banking improve their decision-making. The Research includes an analytical approach in identifying predictors from HR practices to improve decision making. Similarly,

the targeted practices of the Research include recruitment, training, and performance management. The only difference was that the present study was intended for HEIs and not in banking decision-making.

The HR office needed a system that will help the core functions of PRIME to efficiently manage the increasing number of records and existing historical data to better improve and support future decision-making. The current operation of the University requires its client to be physically available for a particular transaction. With this current Pandemic situation, both people inside and outside of the University should continue having their transactions online 24/7. In this way, people are safe, and transactions are more efficient. And lastly, the administration enhances the quality of performance because of a more systematic and timely application of technology.

Statement of the Problem

This study aimed to develop a hybrid descriptive data analytics system for the Human Resource Management office of a University. Specifically, the researcher sought to answer the following questions:

1. What is the current and future data utilization on the following functions:
    1.1. academics;
    1.2. administration - HR Core Systems;
    1.3. research and extension?

2. What are the support system tools used in data utilization in the following areas:

   2.1. financial;

   2.2. operational; and

   2.3. technology support?

3. What are the problems encountered in the current and future data utilization and system operation?

4. What hybrid descriptive data analytic system may be designed and developed along with the following functions:

   4.1. academics;

   4.2. administration – HR Core Systems;

   4.3. research and extension?

5. What is the performance of the developed prototype of the System in terms of:

   5.1. usability;

   5.2. accuracy;

   5.3. reliability;

   5.4. efficiency; and

   5.5. functionality?

Theoretical Framework

Miller (2015) highlighted the management guru Peter Drucker and was one of the world's most influential mentors in the field of management, emphasized the theory "What gets measured, gets managed." The idea relates to almost every area in the world of Big Data Analytics (BDA). Several authors (including McAfee & Brynjolfsson, 2012; Chen et al., 2012; Davenport et al., 2012) believe that BDA will provide a massive contribution to innovative products and business opportunities. Furthermore, Gunther et al. (2017) stated that organizations could measure the economic value arising from BDA use in terms of an increased competitive advantage. Jasiulewicz et al. (2020) said that other economic and social costs resulting from BDA could manifest themselves in more robust decision-making.

Nevertheless, no matter how the people turn, the impact of Big Data is unstoppable. That includes the Higher Education area. Lane (2014) points out in his edited book about the idea of building a smarter university with the help of Big Data, Innovation, and Analytics. Whether looking at different angles such as student success measures, learning outcomes, student retention, or other educational metrics, the use of analytics and predictive modeling can be an asset to travel through the waters of Big Data.

On the other hand, the Human Resource area is facing an increase of pressure regarding the capacity of managing an organization's workforce just by looking at the quality and type of data available. A strong foundation in improving human

resources' ideas can support the organization's strategic direction through better information. But, data alone is not enough. Fleck (2016), Deloitte report that roughly 30% of firms surveyed are beginning to feel comfortable moving into analytics. For a better result, the author recommends using algorithms first from a significant number of data points to narrow down applicants' field and then utilize human judgment to pick from a few finalists.

Anderson (2008) justifies the illustration made by Marian Bantjes that "All models are wrong, but some are useful." It was proclaimed 30 years ago by George Box and claimed that George's theory is right. The author followed by a question of "what choice do we have?". It explains that only through the model would the people understand the world and its things. Companies like Google, commonly known as a company that handles abundant and increasing data, don't have to settle for wrong models.

Siegel (2013), a foreword from Thomas Davenport, emphasized that models are essential, which should not be avoided even with increasing data. Objectively, the author explained predictive analytics is concerned with how big the data is and what you do to deal with it.

The researcher includes ISO 9126 model in the present study in the proposed System's developed prototype's evaluation phase. Initially, ISO 9126 aims to provide a framework for evaluating software quality in 1991 (Titthasiri, 2014). The evaluation process used characteristics applicable to the prototype, namely functionality, reliability, usability, efficiency, and accuracy.

Conceptual Framework

The Conceptual Framework guides the study's conduct, wherein it depicts the concept of the study. The conceptual framework was designed based on the researcher's aim to achieve this study and several literature reviews.

Figure 1 illustrates the conceptual framework of the Human Resource Hybrid Descriptive Data Analytics System for Universities. The said figure showed the Input, Process, and Outcome of the Hybrid Data Analytics System's proposed development.

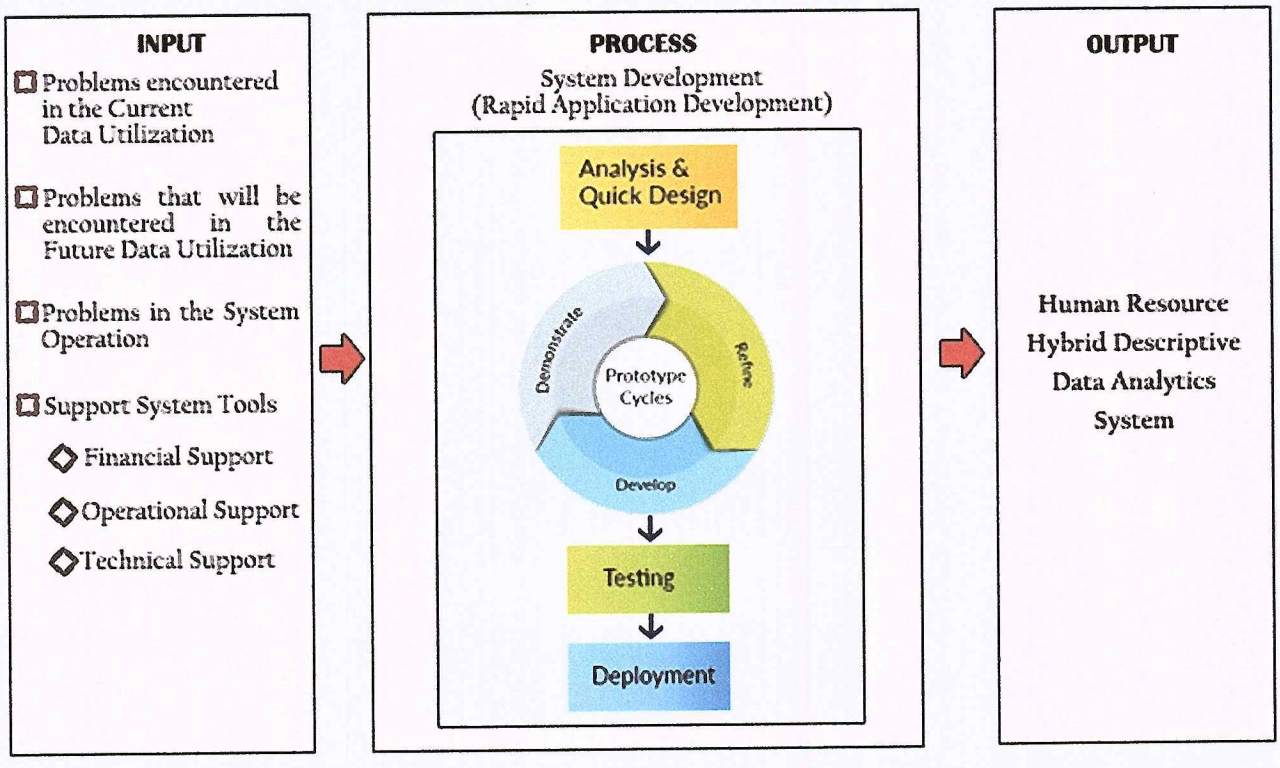


Figure 1. Conceptual Framework of the Development of Human Resource Hybrid Descriptive Data Analytics System

The development commenced by identifying the problems encountered in utilizing the current data in the present situation. Relevant data includes personnel data, student data, or administrative data. It was accepted as primary inputs to achieve the expected outcome. Similarly, identifying the possible problems in utilizing the data in the future was also considered to automate the computation or organizing of relevant information necessary to support decision-making. Furthermore, the present System's operations' processes or procedures were also significantly thought to develop a design plan to enhance the current process into a better one. The module was created due to PRIME HR operations standards, which allowed the researcher to determine the necessary fields required for RSP and L & D modules. But due to time constraints, the only dynamic design focused on the records but limited to the actual adding of new functions. Likewise, the researcher thought the University's capacity to support a proposed System to recognize the project's practicability.

Meanwhile, the actual development process continued after identifying problems encountered in data utilization and system operation. The process was done in modular using the Rapid Application Development approach. The approach allowed the researcher to customize the software development and implement it per module in every office.

Furthermore, the module's output includes the various functions and operations that solved the identified issues in data utilization and system operation. Transforming the traditional processes through responsive system

accessibility, recommender system, reminder system, descriptive data analytics implementation, and cloud-based deployment made the new system hybrid.

Significance of the Study

The proposed study aims to provide aid to the University through the benefits of developing a Hybrid Data Analytics Systems. Generally, the researcher believes that the said System will be beneficial in different significant areas of the University, such as:

SUC/HEI Personnel. Similarly, the study results would provide a similar advantage to other State Universities who offer and deliver higher education. Specifically, the analytics system concept for the Human Resource Management Office's core systems would produce a data analysis report based on the history to present data in the operations of the University relevant to Academics, Research, Extension, and Administration. The said data analysis report is a similar advantage to support and improve the University's decision-making quality.

Commission on Higher Education Office. The result of the study would support the evaluation result of the performance of the University in SUC leveling. The said System would produce a data analysis report based on the history to present data in the academics area. The developed system module in this area will provide benefits to the auditors of CHED. Likewise, to the administration of the said office.

Civil Service Commission Personnel. The study's result would significantly benefit the said personnel, such as an easy way to request relevant reports in the University's particular office.

HRM Practitioner. The study's result would improve human resource management through a reliable and transparent assessment, assistance, and awarding processes of HRM systems, practices, and competencies. The System would provide an automated and consolidated data analysis report relevant to the core systems of PRIME-HRM. The System would offer a hybrid type of conducting Human Resource Management operations by providing a responsive kind of accessibility, descriptive data analytics implementation, and cloud-based deployment. Specifically, the System would be beneficial in performing the four levels PRIME, to wit:

a) **Recruitment, Selection, and Placement System (RSP) Personnel.** The study's result would provide a descriptive data analytics system for RSP personnel to help manage all RSP related transactions. Therefore, generating descriptive data analytics based on the applicant's expertise, educational attainment level, automated analysis relevant to the applicant's record, and the University's personnel.

b) **Learning and Development System (L&D) Personnel.** Similarly, L&D's descriptive data analytics system would simplify personnel records' consolidation, generating descriptive data analysis of University's personnel training, seminar, and educational records. Moreover, the researcher also

included an automated cross-matching data analysis of training attendees and a summary of training records, and reminder functions for record submission.

c) Performance Management System (PM) Personnel. The study results would help generate descriptive data analytics of the performance, achievement, and monitoring of the University's personnel, particularly in Research and Extension.

d) Rewards and Recognition System (R&R) Personnel. Similarly, from the history of the records of the staff or employees of the University, the data analytics system of R&R would be beneficial to the said personnel in generating a descriptive data analytics of the possible person of the University that is qualified for a particular reward and or recognition.

University Administration. The study's result would be beneficial primarily in supporting the administration to secure better minor or critical decisions for the University's improvement.

Researchers. The findings of the study will help the researchers studying the data analytics system. It would be more beneficial to the researchers if the present study will provide a better understanding and additional inputs to proceed with similar learning.

Scope and Delimitation

The study focused on the development of the Human Resource Hybrid Descriptive Data Analytics System for Universities. The System focused on the

system module for the administration area on the PRIME HRM operations' core functions. Specifically, the system module included the Recruitment, Selection, placement (RSP) and Learning and Development (L & D) modules. The PRIME HR Offices of the three (3) Universities of Samar, namely, SSU, NwSSU, and UEP, evaluated the software's quality.

The study was not solving the SUC Leveling issues but on a similar concept or idea in monitoring performances and human resource decision making. The researcher did not include the other Modules (PM and R&R) in developing the prototype due to the assigned personnel's time availability. Furthermore, the said study did not involve Academic, Research, Extension System Modules due to time constraints. Therefore, not affecting the respondents beyond the scope. Northwest Samar State University was the base-development of the prototype.

Definition of Terms

Academics. The term is defined as "to be judged by no other standard than the truth" (Kwok, 2020). For this study, it refers to one major part that handles different types of data related to Faculty, Students, and Program-related information necessary to develop the various modules under the Academics area.

Accuracy. The term refers to the degree of conformity to standards or the truth (Buckner, 1983). Operationally, it refers to the software quality evaluation part of the prototype, which includes the correctness, exactness, and precision of a particular module's functionalities in the proposed System.

Administration. The term refers to the coordination of both the organization's resources and human force to systematically obtain or achieve a target or its goals (Amadi, 2008). In the present study, the term refers to one major part of the study that handles the different data types. Specifically, the various data that is being generated and processed in the PRIME HRM office (RSP, L&D, PM, & R&R). It is the main focus of the development of the proposed Hybrid Data Analytics System for Universities.

Cloud Data Server. The term refers to the hosted virtual server that users access over a network that offers performance characteristics similar to traditional physical servers that run in local data centers (TechTarget, 2018). The term refers to the virtual server in the present study, where the developed System's data will be processed and stored.

Cloud Integration. The term refers to the organization's determination to make sure that the data to be available for viewing and analyzing both local and online setup in concert with the data from on-premise applications (Informatica, 2020). In this study, the term refers to the University's data integrated into the Cloud server for a broader accessibility scope.

Current and Future Data Utilization. In the present study, the term refers to the present and future situation of using the University's data in every transaction. The result of the findings is one basis for designing and developing the prototype of the proposed study.

Data Analytics. The term refers to the process of examining the data sets to find trends and draw conclusions about the information it contains (Rouse, 2008). In the present study, the term refers to the process of utilizing all necessary data of a particular module to produce data analysis and generate recommended actions for the office, administration, or the University itself.

Efficiency. The term refers to measuring effectiveness with the utmost minimum consumable time, exerted energy, and expertise (Archer, 2010). Operationally, it refers to the part of the software quality performance evaluation on the proposed System's ability to respond to the user's needs and how the System navigates in a short period.

Financial. The term relates to managing funds or the organization's financial situation or business related to investment management (Jili'ow, 2016). Operationally, it refers to the University's ability to acquire information technology-related infrastructure or devices to support its present System. Moreover, it also refers to the University's capability to finance or invest in the proposed System.

Functionality. The term refers to the System's capabilities concerning security, error recovery, integrity, and data retention (Election Systems & Software, 2015). In the present study, the term refers to the part of the software quality performance evaluation of the prototype relative to executing the module's necessary functions, securing data, and recovering from errors encountered upon utilization.

Hardware. The term refers to the physical component or objects used in carrying out an activity, in contrast to the knowledge, skill, or theory required to perform the action mostly used collectively (Definitions, 2020). In the present study, the term refers to the physical component of the System used to develop and perform the prototype's operations.

Hybrid Data. It refers to a composite of mixed origin of data (vocabulary.com, 2020). In the present study, the term refers to combining the current data and descriptive data analytics application and cloud-service deployment.

Hybrid Descriptive Data Analytics System. It refers to the next level of data management systems with more creativity and freedom and more pressure to demonstrate value (Spooner, 2020). In the present study, it refers to the System's design and development were to extract facts of information from the existing raw data in a particular office in the University. The said extracted facts of data were generated with an automated descriptive data analysis process to form one useful report to support future decision-making. Moreover, the prototype is user friendly and responsive to any device and deployed in a cloud service.

ISO 9126. It refers to the International Standard tool for evaluating a software composed of four parts: Quality Model, External Metrics, Internal Metrics, and Quality in Use metrics presently revised to ISO/IEC 25010:2011 (Abran, 2010). In the present study, the term refers to the Software Quality Standard tool used to evaluate the usability of the developed prototype.

Model View Control (MVC). The term refers to the framework used to develop web applications more comfortable and faster through components Model, View, and Controller (Davis, 2015). In this study, the term refers to the framework used to create the proposed study prototype.

Operational. The term relates to the activities involved in doing or producing something (Cambridge Dictionary). Operationally, the term refers to implementing the University's capability to create the exact requested specification for the proposed prototype.

Prototype. The term refers to the tangible representation of just a part of the overall design intended for further visualization, evaluation, or even reflection to secure the final System (Beaudouin-Lafon & Mackay, 2017). Operationally, the term refers to the proposed hybrid data analytics system that focuses on the module functionalities of PRIME HRM only intended to test the improvement of the operation of the current from the proposed System.

Reliability. The term relates to homogeneity or consistency (Heale & Twycross, 2015). Operationally, the term refers to the capability of the proposed hybrid data analytics system to operate under uncontrolled circumstances like sudden power failure or the ability to withstand component failure but still execute consistent operations.

Research and Extension. It refers to the involving process of increasingly drawing upon knowledge acquired through science and innovation and its ability to facilitate the dissemination of the experience, encourage change and innovation

for end-users, improve productivity, sustainability, and competitiveness of the rural sector (Queensland Department of Agriculture, 2013). The term refers to another module that requires functionalities for research and extension office in the present study. The said module handles data relevant to research and extension records such as conducted research and extension projects, published papers, Research and extension linkages, and other suitable components.

Support System Tools. The term refers to the provided tools and technologies to enhance the human capacity to analyze and solve problems (National Research Council, 2006). It refers to the University's degree to support the proposed prototype, including financial, operational, and technical support.

Technology Support. It refers to the materials, information, energies, skills, laws, and rules of conduct that circulate to that support in achieving the given purpose or goal (Zeleny, 2020). The term refers to the University's present technology situation, which includes the current Network Setup, existing Information Communications Technology(ICT) equipment, Internet Connection details, technical support staff, and the University's readiness to support the proposed study implementing hybrid systems.

Usability. The term refers to the capacity to determine the System's attributes, user-friendliness, and user's perception upon using the System (Bevan, Kirakowski, & Maissel, 1991). In the present study, the term refers to the proposed hybrid data analytics system's capability to be user-friendly and respond accordingly based on the user's expectations or needs.

Web Packages. The term refers to collecting files, settings, databases, and auxiliary information packaged as a file structure or a compressed file for deployment (Glosbe, 2020).

Chapter 2

REVIEW OF RELATED LITERATURE AND STUDIES

This part of the study presents the related literature and studies or pertinent readings published in local or foreign settings. Books, journals, relevant documents, theses, dissertations, and other publications were the source of information taken. This part of the study provides enlightenment to the research problem.

Related Literature

The value of data and the importance of analytics had increased recently. Most Higher Education Institutions (HEIs) have a volume of data that appears uncontrollably in almost every activity, task, and transaction. Henke et al. (2016) agreed that with the combination of the said data, complex algorithms, and equipment with enhanced storage management capabilities, any business and organization would have a continuous and timely innovation sustainably. However, the capacity to capture data and analytics' value is one of the several challenges organizations face. Many HEIs considers a struggle to incorporate data-driven insights into its daily operations and processes. With an appropriate interpreter, like analytics, HEI accommodates the importance of data as a critical asset.

Webber et al. (2019) clarify that Higher Education decision-makers need to utilize the increasing volumes of data on the Institution itself. HEI would produce better decisions with more data. But as much as it would be right, more data would not assure making better decisions. Along with more data comes the need to use contextualized knowledge of the higher education organization, analytics strategies, and overall responsible use of data. Higher education administration and other leaders should consider how data analytics can harness data governance and organizational design.

Similarly, it is crucial to handle and analyze the historical and present data in a University properly. It is indeed a struggle for a University to take such a volume of data to maintain its operations and produce meaningful decisions. The only difference in the present study is that most of the Universities in Samar do not have an existing appropriate analytic tool to handle voluminous data, which could produce a factual basis to support University-wide and minor decisions.

Meanwhile, Human Resource (HR) operations are experiencing no distant time issues and matters about handling voluminous data. The HR office is one of the most critical assets of an organization. Thus, it needs to secure its competitive advantage by treating the employees as resources and aligning HR functions to their goals.

Momin et al. (2015) explained that HR tasks had increased nowadays due to globalization and abrupt change in business dynamics. Organizations must determine the essential factors of maximizing human capital returns, such as the

interrelationship between staff qualification to the needed personnel profile and the necessary competencies that should already be acquired to the compensation structure. Dawa et al. (2018) discussed how the probability model for hiring university professors was derived. The study was done through the logistic curve, determination of the professor's number of research output, research production, publication, and identification of predictors. The study's resulting model was obtained by means of the typical multiple regression analysis using arbitrary constants β0, β1, ..., βn. The study's difference from the present study is that the analysis were made through a manual computation that was not incorporated in any software. Similarly, the study Dawa et al., focuses on generating an analysis that will support the decision-making of the human resource officer or staff. The generated model might be more helpful if integrated into a HR computer system to serve its purpose better.

HR analytics or workforce analytics help the organization make workforce decisions by reducing costs, identifying the revenue streams, mitigating risks, and executing effective business strategies. Moreover, HR analytics also enables HR managers with predictive analytics to determine the future mainly for the organizations seeking a more proactive role in driving business strategy. As cited by Hecklau et al. (2016), the definition of Human Resource Management in this research is "a strategic approach towards the effective employment and development of a highly committed and qualified workforce to achieve the company's objectives." Wikhamn (2019) emphasized that HR managers should

adopt HRM strategies and practices to sustain their financial, social, and ecological goals.

Blanks (2019) explained the three types of HR analytics, and it's essential to get to strategic analytics. The types of HR analytics include descriptive analytics, predictive analytics, and prescriptive analytics. Blanks clarified that raw data alone would not explain why a particular scenario has happened unless aggregated. HR analytics uses descriptive data analytics to take and summarize historical data into something understandable. Meanwhile, predictive data analytics aimed to cater to forecasting to secure the organization's needs to prevent HR operations' worst scenarios. On the other hand, prescriptive analytics produce relevant recommendations based on the predictions and what has happened in the past.

Similarly, it reveals the significance of an appropriate system to hire employees to accomplish a particular job. An HEI or a University should consider an automated system for conducting the hiring process as an essential factor. The study includes developing a hybrid data analytic system consisting of the module of Recruitment, Selection, and Placement (RSP) of the University's PRIME HR. The said module can detect a pool of possible applicants that qualifies the offered position or item in the University. The system's analytical approach would be beneficial among HR managers in peak seasons of the HEIs human resource management operations.

Daniel (2015) generally categorized models that can develop from Big Data into Descriptive, Predictive, and Prescriptive data analytics. Descriptive data analytics models are grounded in the analysis of transactional and interactional data about teaching or learning. They can be used to identify trends such as student enrolment, graduation rates, and patterns likely to trigger an essential dialogue on improving student learning. But the presentation of descriptive analytics models alone is inadequate. Institutions need to be able to examine their present performances and be able to predict future outcomes.

On the other hand, predictive analytics models provide institutions with the ability to uncover hidden relationships in data and predict future outcomes with a certain degree of accuracy. For example, the said model enables institutions to identify students exhibiting risky behaviors during the academic program. Furthermore, prescriptive analytics models are actionable tools built based on insights gained from both descriptive and predictive models. The said model intends to help institutions accurately assess the current situation and make informed choices on alternative courses of events based on valid and consistent predictions.

Similarly, the three models strongly relate to the present study. It explains how the model present and the future direction of the outcome of this study. The developed prototype includes producing a descriptive data analysis of the routinary transactions and other significant existing data. Predictive data analysis will allow the office to determine possible scenarios. The management would gain

a better advantage of knowing the office's future operations and, on the other hand, prevent unnecessary actions that might interrupt the progress of the offices' overall performance. Eventually, both descriptive and predictive data analysis will serve as a tool to achieve prescriptive data analysis, which will help the management support firm decisions.

Furthermore, Müller, Junglas, Brocke, and Debortoli (2016), accentuate that it is a critical factor for the business success to use the benefits of data analytics tools to acquire new opportunities, secure future threats, and assure continuous advancement. However, a report with only twenty-seven (27%) percent of businesses invested in data analytics was successful. And one of the reasons is the failure to understand the organization's necessary conditions before using a particular data analytics tool (Ghasemaghaei et al., 2017a; Ghasemaghaei et al., 2017b). Ghasemaghaei et al. said that the existing research about utilizing data analytics tools focused only on anecdotal or unreliable evidence relevant to the impact of the said tools in the quality of most decisions produced.

Similarly, Brynjolfsson and McAfee (2017) explained the Dos and Don'ts of Artificial Intelligence (AI). In the article, the authors specifically represented AI by Machine Learning (ML). The author introduced that ML can continue its job and continue improving its performance without any human intervention. Machines are getting better and better in terms of learning. The author stressed that the rise of ML characterized two (2) factors. First is that human beings are more knowledgeable than they can tell. And secondly, ML systems were proved to be

an exceptional learner. ML only takes charge of tasks that were unsupervised by humans. It is where exciting possibilities open up. The author also emphasized that ML systems complement human activities to the point that a human being's work becomes even more valuable. But a doubt arises. What can a human do in the era of ML? It is a fact that computers nowadays are good at answering queries, but it is also a fact that humans are the ones who frame the problems by asking the right questions. The authors state that the most critical opportunities for human beings will lie at the intersection of two areas: 1) figure out the next problem to be solved; and 2) persuade people to talk about the issue and eventually provide multiple solutions. But the article was not published to differentiate the importance between humans and machines. The authors aim to figure out how it should complement each other. And in the coming years, ML's power and the capabilities of human beings will achieve success.

The mere fact that the University may have good leaders and smart people to manage the operations. It is also a fact that machines should be appropriately utilized and wisely to be more efficient and easier to manage.

HEIs in Samar might be behind in technology decades ago, but internet connection is currently available in almost every part inside and outside the campus. Applications and other online means of software enable the university people to access relevant solutions for practically every problem. Unfortunately, such standards in providing enlightenment of what is happening in the University based on the actual data, records, and precise output are not transparently

available. People inside the University are receiving decisions most of the time without understanding its reasons.

Meanwhile, technology in management should be considering the application of Hybrid IT Management, which includes the application of hybrid IT systems through in-house development of data centers incorporated into cloud-based infrastructure (Chernicoff and Murphy, 2017). Antsaklis (2000) defined the term "Hybrid" as a various composition while "Hybrid Systems" is a combination of systems with distinctive features. The author believed that the hybrid systems' primary role has a significant impact on embedded control systems and the multifaceted systems, several classifications of algorithms, and smart or intelligent systems. With the help of the said innovative technology, the University will optimize data potentials primarily to be more useful to the management's future decisions. Moreover, hybrid IT technology includes operation management that will help the University improve not only to decision-making but also the capacity of its human resources to function in different designations appropriately.

Furthermore, based on the article by Woodie (2014), Hybrid analytics yields Big data flexibility. The organization should consider a hybrid approach or the combination of several technologies, practices, and personnel that meet its needs regardless of several data analytics implementation options. The author stressed that while big data's evolution continuously persists, hybrid solutions that involve multiple systems running on-prem and in the cloud will eventually become the standards for data analytics.

Similarly, both the cited information above includes a hybrid type of application to data analytics. The study accentuated the clear advantage of implementing a Hybrid manner of managing data (on-prem and cloud). The said advantage is also going to be the key to supporting the University's administration to produce better quality decisions. The only difference is that the proposed hybrid data analytics system will focus on its operations history data.

On the other hand, decision-making is considered vital to the organization (Janssen, Voort, & Wahyudi, 2017). The said crucial decision is accurate and correct. With the vast volume of data and still rapidly increasing in an uncontrollable time, businesses and organizations utilize data analytics tools to aid knowledge sharing and secure the quality of its decisions.

Latif et al. (2019) presented an innovative technique to determine the most significant challenges Big Data is facing. Presently, the challenges include accuracy, privacy, and security. In this study, the author selected a relevant factor to determine the most significant among the said challenges. The author proposed the Analytic Network Process (ANP) technique to evaluate the challenges. The method allowed the author to determine substantial clues in the decision-making process to find solutions to such challenges.

Jarrahi (2018), AI and humans should understand the benefits of its strengths in coming-up with firm decision-making processes. According to the said author, there are uncertainties in decision-making. Uncertainty could branch to difficulties in making decisions, including a deficiency of resources, facts of

information, or alternative options. AI or other intelligent technologies could support humans in making decisions through predictive analytics. The said technology generates fresh ideas through probability and data-driven statistical inference approach. Identifying relationships of other potential factors will enable the human decision-makers to collect new information more effectively and improve future strategies.

On the other hand, the advantage of human beings in making decisions was also stressed-out. Specifically, human choices might be more helpful in times of high presence of uncertainty. Ransbotham (2016) said in his statement that "the ratio of examples of past similar decisions to stuff that might be important for those decisions is abysmally low." The combined interaction between AI and humans in collecting, analyzing data and superior innate understanding is one way to attain the sustainability of success in the world of competition. Hoffman (2016) said that AI systems could enable humans to produce better decisions because of the ability of AI to examine and highlight the essential information, which makes for human beings to narrow down options, make conclusions, and organize necessary actions. Conclusively, the people need machines to things for the people that can't do, will not do, or cannot do well (Mehta and Dvarakonda, 2018).

The above citations explain the importance of integrating the capacity of AI or Machines, innovations of decision-making techniques, and humans in helping the operation of the organization. The present study aimed to incorporate machine

learning capabilities and new approaches to providing additional support to the University to make better decisions.

Presently, the study's locale is experiencing several problems relevant to producing a transparent basis in all its decisions. The researcher believes that the above-cited literature will provide enlightenment on the proposed hybrid descriptive data analytics system's plan and design considerations.

Related Studies

Alfy et al. (2018) conducted a study exploring the benefits and the challenges of learning analytics in Higher Education Institutions (HEI). By 2008, a new stream of decomposable data became surmountable after the industry took off in 2003. The rapid growth of analyzable data gave an advantage to inventors to invent data analytics tools and techniques in parallel. The fast increasing growth of interest in data analytics explained by its potential to produce necessary and relevant information online. The application of data analytics into HEI is commonly known as Learning Analytics(LA).

Arroway et al. (2016) explained that Higher Education should provide means to obtain (LA). LA involves using a broad range of data and analysis techniques, such as statistical tests, explanatory and predictive models, and data visualization. The study's result included benefits for institutions, staff, and students—specifically, the process of including supporting informed decision-making.

Ifenthaler (2017) highlighted the higher education's preparedness for learning analytics. One of the said highlight was the number of staff available and technology that are designated for learning analytics. Several challenges were also determined that will limit the utilization of learning analytics which primary includes ethical issues, privacy protection, and the security of data relevant to the management's decision making.

Gašević et al. (2016) summarized three significant themes in LA implementation, namely, the development of Predicators and Indicators for various factors (e.g., academic performance, student engagement, and learning skills in a self-controlled manner); the use of visualizations to explore and interpret data and to prompt remedial actions; and the derivation of interventions to shape the learning environment. The diversity in LA implementation poses a challenge for educational institutions that plan to be involved in it, leading to a commonly voiced question – "How do we start the process for adopting Institutional Learning Analytics?"

Similarly, the cited studies above somehow relate to the present study. Despite of the advantage that might be provided by data analytics to the HEIs, uncertainties arose on the readiness of the institution in the application of analytics. HEIs in Samar still requires a regular practice on analytics application in all its operations to obtain sustain competitive advantage.

On the other hand, the study of King (2016) clearly emphasized that the utilization of data analytics in the human resource area is popularizing and

becoming common. Nonetheless, the said popularity includes doubts and uncertainties on the capacity of the human resource professionals to adapt data analytics technology to obtain organizational benefits. The study of King conducts various reviews on both the perilous and helpful of analytics in human resource. The study also argues for the involvement of academia in the practice of data analytics. And lastly, the study explains how quantitative tools would influence the management of human resources and its development.

In the study of Angrave et al. (2016), emphasized the statement of why HR is leading to fail in the big data challenge. Despite HR professional's excitement of the abilities of analytics, the literature shows that there were limited resources of information of rendering ideas to practice.

Murumba et al. (2017) highlights the characteristics of big data that are essential to educational institutions. The study explains how academia were beginning to have interest in applying big data in all its operations. Chiehyeon, Ki-hun, Min-Jun, Jun-Yeon, Kwang-Jae, and Maglio (2018) explained the increasing benefit of big data in providing several opportunities to information-intensive services (IISs). The study identified nine (9) key factors in characterizing data-based value creation. Specifically, the nine factors includes: 1) data source; 2) data collection; 3) data; 4) data analysis; 5) information in the data source; 6) information delivery; 7) customer (information user); 8) value in information use; and 9) provider network. The said factors were used to describe, analyze, and design the chain of value creation which means from data collection to value

creation in IISs. An information-intensive service is a type of service that requires information interaction between the provider and the customer to produce value (Karmarkar, and Apte, 2007). The study was a combination of action research consisting of six projects with an analysis of 149 cases. The study's main objective was to come up with an overall understanding of the nine factors in characterizing data-based value creation. A conclusion where made that the said factors showed that in order for the IISs to produce a value, three(3) components are necessary to be included, namely: 1) the collection of data from certain sources; 2) creation of useful information on the data sources using data analysis; and 3) delivery of information to users.

Similarly, the study of Chiehyon, et al. includes several processes on how the data should be managed, analyzed and valued to produce public information. The difference of the present study includes proposing the development of a hybrid descriptive data analytics system that will be utilized to manage the collected data, perform data analysis, and produce appropriate results for the delivery of information to the users thus supporting future decision-making processes.

In the study of Ghasemaghaei (2019), the role of knowledge sharing and analytics tools was distinguished. Bose (2003) defined knowledge sharing as activities of how knowledge circulates within the organization. Meanwhile, data analytics tools are a means of knowledge sharing which allows the organization to allow knowledge to be shared through the analysis of data that was integrated from both internal and external data (Côrte-Real, Oliveira, & Ruivo, 2017). The

said study used crossed-sectional data in assessing the research model. The study investigated that through knowledge sharing within the firm, the role of data analytics competency in enhancing the quality of the firm's decision will be realized. The findings reveal that despite many firms or organizations having its investment in using data analytics, it has been said that, still, the firm cannot improve the quality of the decision necessarily. Instead, firms should enhance their competency in utilizing data analytics tools to improve the quality of their decision through knowledge sharing. Conclusively, the study informs the firm's significant role of knowledge sharing in producing an enhanced quality of a decision by utilizing analytical tools.

The researcher believes that the present situation relates to the study of Ghasemaghaei since the University does not utilize any analytics tool to reinforce knowledge sharing within the administration or to all necessary people in improving the quality of its decision. Additionally, the researcher also believes that utilizing data analytics tools and requiring the University's people to understand its role will allow all the university people to increase the confidence in its capability to acquire both individual and overall decisions.

Furthermore, Duffield, Stowe, and Shankar (2013) patented a system that focuses on the presentation of data based on the structure of how it is being accessed. The said system included a graphical presentation analysis of the data from the point of access to the point of destination. A simpler explanation of the design is similar to the explanation of how data is being accessed in the Web in

different locations in the world and in different devices or types of display. Similarly, the system of the said inventor portrays the significance of the details of data to present a more technical yet eye-friendly data analysis visualization which is also one of the main targets of the proposed study in the presentation of data for decision support. The only difference is that the presentation of the data that will be expected in the proposed study focuses on the value of data in the decision making in the area of the administration, academe, research, and extension.

On the other hand, the invention of Holmes, Gibbons, Young, and Michelson (2010) is a system that captures data and provides analysis for health. Specifically, it is an integrated system that includes various essential functions for an infrastructure that could lessen the spread of diseases that can infect when it transpires. The said system can provide real-time sampling, generate modeling, and conduct data analysis pertaining to effective recommending interventions. Additionally, through the data of several cases, the said system can actually suggest and predict the impact of a particular decrease in illness. Similarly, the system that was invented by the said inventors captures actual and present data in order to help the people to as much as possible avoid sickness or illness. The proposed study aims to capture the existing from past to present data and conduct data analysis in order to help secure the decisions being made for the operation of the University. For this reason, possible actions will have fewer faults thus continue more progressive outcomes. The only difference is that the inventor used

the data related to health situations, while the present study focuses on the data of the Human Resource management office.

From capturing data, another invention relates to analyzing data. James (2003) aimed to develop a system that is able to provide needed results from the voluminous data available harvested. The said system has the ability to put a marker in a particular data file to identify the incidence of an event. Specifically, the system can correlate multiple types of patterns with events. Using the marker, the system can automatically provide an analysis of data, time scaling, do sorting algorithms, and conduct calculations. Similarly, the invention of James relates to the present study since the researcher is also expecting a voluminous type of data where data analysis is necessary, sorting algorithms, and calculations as well. The only difference between the invention of James and the present study is that the invented system automates data analysis to identify patterns of event, meanwhile the present study aims to automate data analysis to support the quality of making decisions.

Myrick, Priore, Freese, and Blackburn (2007) patented a system validating data and classifying the said data in an optical analysis system. The system used a Multivariate Optical Computing (MOC) approach which uses an optical computer to analyze the data while it is being collected. The said approach is known as the most powerful predictive spectroscopic technique that is way over the traditional approach or practices of collecting data. Although the invention focused on the analysis of signals, the proposed study aimed to predict possible future

procedures in data utilization to come up with a better quality decision. The only difference is that the study of Myrick, et.al used technology to predict signals from light while the present study aims to predict a better decision based on proper data utilization.

Furthermore, the proposed study if successfully made will somehow help some accrediting agencies like AACCUP, CHED, or Civil Service. If the system will be achieved, all Universities in Samar might have a more transparent, easy, and fast accreditation procedure and evaluation process. Moreover, said agencies and government offices can easily monitor the Universities through a Cloud Server.

The concept of the invention of Fahey (2014) somehow relates to the present study. Although the invention focused on using technologies to remotely monitor data detected by actual sensors like seismic sensors, volcanic sensors, oil or gas wells, and the like, the concept of the said inventor was to provide a solution of fast and easy monitoring despite the distance. Similarly, the agencies and government offices mentioned earlier can gain the same benefits as the said inventor's concept. The only difference is that the monitoring processes will not be conducted merely by the technology using sensors but through Cloud technology.

Most of the related literature and related study citations have been separately discussing the advantage of data analytics and significant human resource management operations that require improvement to better support decision-making. The present system is somehow helping the HR office. Still, the

staff has a hard time organizing their records and files to serve their clients better, more efficiently, and effectively. Moreover, effective synchronization of the data was not that effective in the present process; therefore, duplication and missing records were unavoidable. Furthermore, identifying proper recommendation decisions was also not that accurate since no current system could better manage the historical data. Also, the limited number of staff of the human resource office on their capacity to remind employees of the University were insufficient, which resulted in uncontrolled consolidation of necessary records. Lastly, the interpretation of the present or existing data of every department, college, or even the personnel itself was not suitably available. As a result, there was no appropriate decision-support system used to improve decision-making.

Based on the literature review, the present study determines the following research gaps that the proposed development of Human Resource should resolve Descriptive Data Analytics System, namely: Online implementation of the Human Resource operation of the University; Systematic and synchronized data entry forms; recommendation system; reminder system, and; automated descriptive data analytics system for decision-support system.

Chapter 3

METHODOLOGY

This chapter presents the methods and procedures used in conducting the study. Specifically, it shows the following: 1) research design; 2) instrumentation; 3) validation of the instrument; 4) sampling procedure; 5)data gathering procedure; and 6) the statistical treatment of data. The researcher would like to emphasize that the System's design was for possible utilization of Government HEIs, but Northwest Samar State University was the study's base location.

Research Design

The study applied a developmental evaluation design, an approach supporting new technology trends by gathering and evaluating real-time data. The software development process formulated a Hybrid Descriptive Data Analytics System for the Human Resource office, specifically, the RSP and L & D offices. Moreover, the researcher utilized an agile method approach in the software development process. Specifically, the System focused on the core systems of the Program to Institutionalize Meritocracy and Excellence in Human Resource Management (PRIME HRM). The System had two (2) sub-modules and integrated as one (1) Human Resource Management Hybrid Descriptive Data Analytics System.

Moreover, the program's development used the Server-side Scripting Programming Language, Model View Control (MVC) Framework for rapid growth, and Web Packages or Libraries for data analysis. The researcher believed that the development process would be more comfortable considering the previous web development experiences using the said programming language and framework. Moreover, it includes necessary features like 1) easy to write a program; 2) high-level programming language; 3) fast run time; 4) excellent in data handling capabilities; 5) flexible language for building new web applications from scratch, and 6) suitable libraries for Data Analytics. To manage the database of the prototype of the developed System, the researcher used an open-source, cross-platform web server and Cloud Database Server in the implementation in the Cloud.

For RSP, the algorithm allowed the office to efficiently analyze the existing datasets or records to produce data analysis of the shortlisted applicants for a particular available position offered in the University and other relevant reports. Meanwhile, L&D used the capabilities of the said algorithm to analyze and produce a descriptive analysis of the employees that recommend particular training, seminars, or conferences. Similarly, the performance management core system and recognition and rewards used the same recommendation system operation. The researcher utilized relevant Integrated Development Environment software applications and tools to secure a user-friendly interface.

Lastly, the design of the System includes integration of the Cloud. Primarily, the Cloud was necessary to centralize the access of the System in the University. Cloud includes algorithms and computational tools for advanced data analysis and manipulation. This phase will allow the System to utilize a more considerable amount of space to store the information equivalent to a costly physical server and eventually provides a massive advantage to the System to handle the historical, current, and upcoming data.

Figure 2 shows a block diagram of the developed System. It presents the Input, Process, Output, and Storage involved in the System. The Input of the System will be the required records of every office. The Processes block will be the core transactions of a module. The output block shows the determined expected result of every module and sub-modules of each office. Lastly, it includes a storage block to highlight the proposed System's implementation in a cloud environment.

Figure 3 shows the flowchart of the development and implementation process of the module in the System. It presents the necessary procedure in the system development process and system implementation.

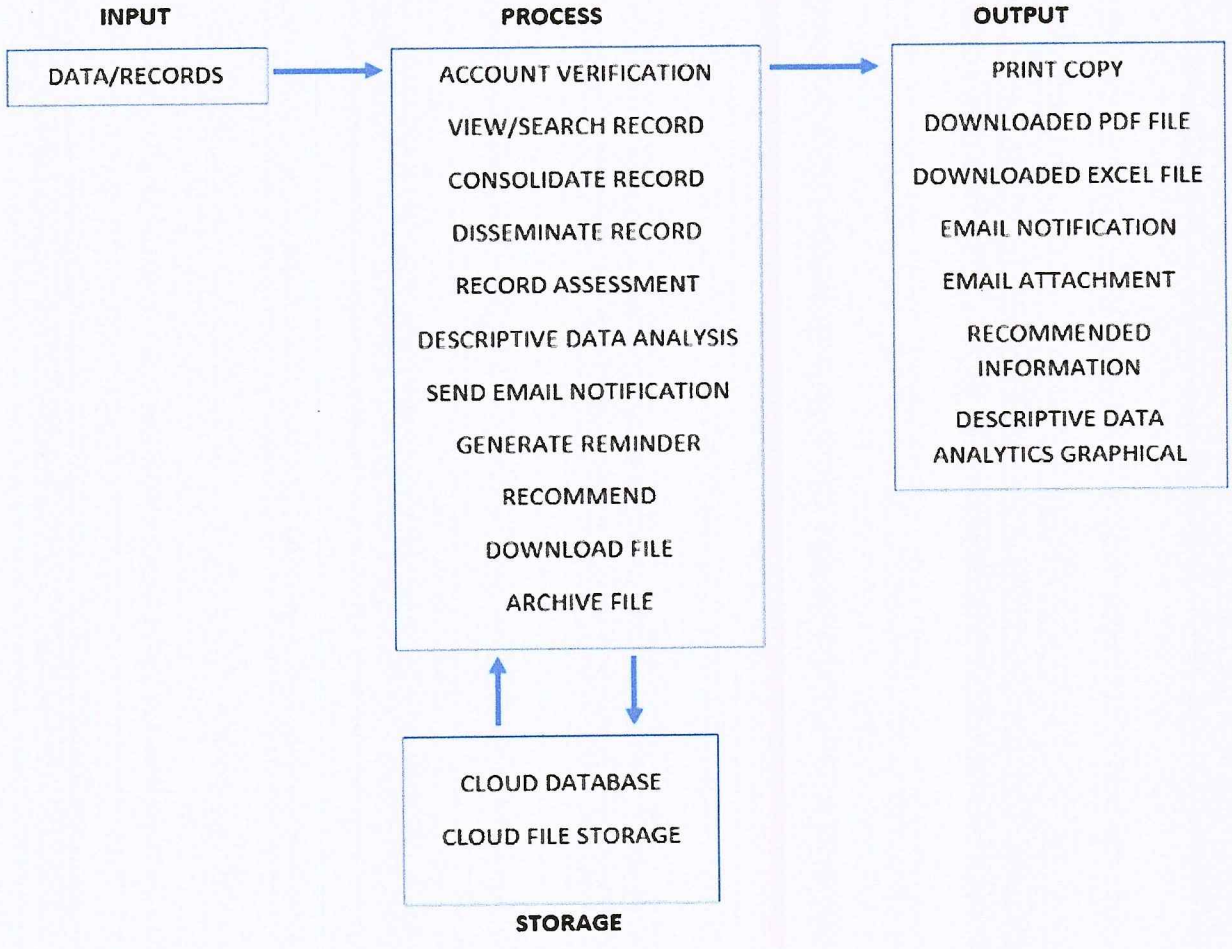


Figure 2. Block diagram of the developed System

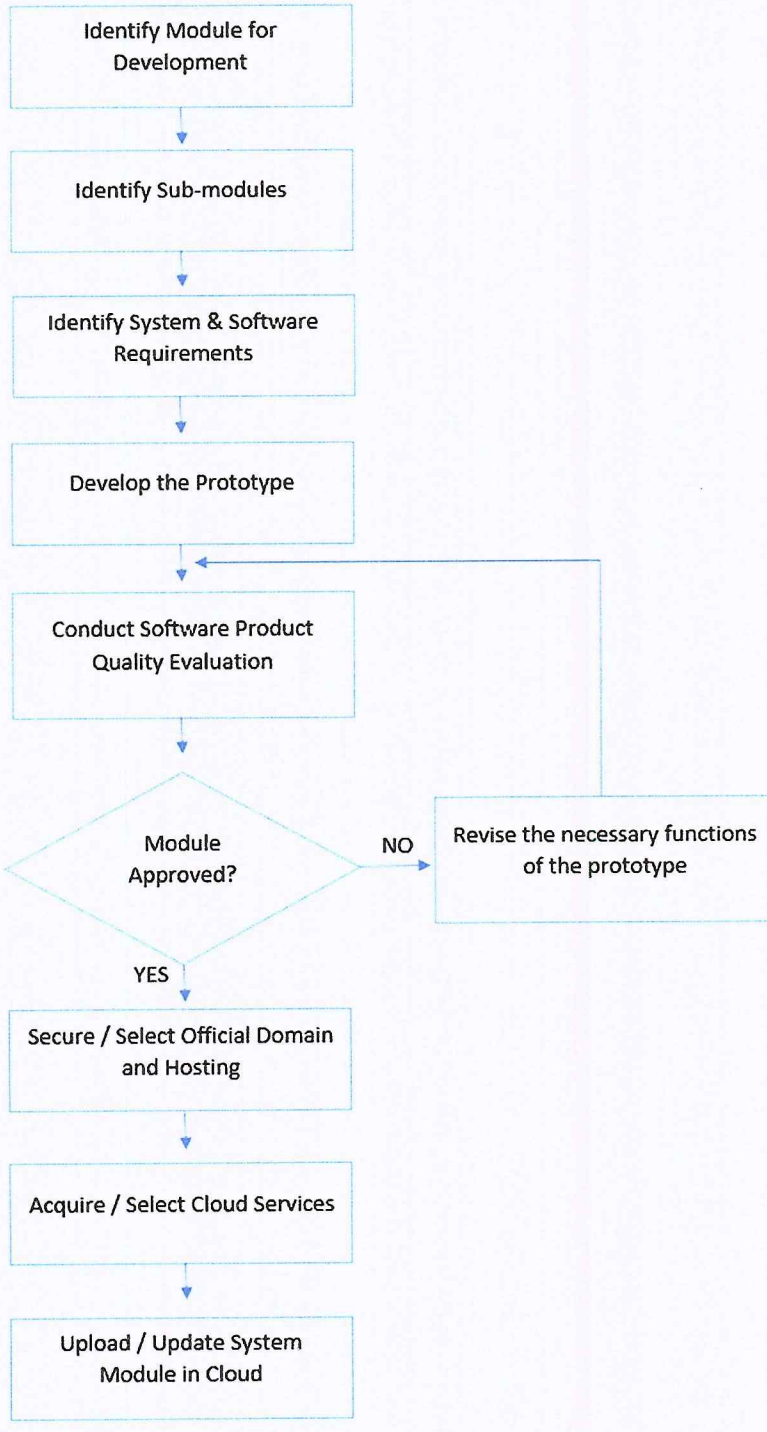


Figure 3. Flowchart of the development and implementation process of the System

Instrumentation

The research instrument used is a questionnaire that evaluates the functionality of the system prototype. The basis of the questionnaire used to check the software's quality was ISO/IEC 9126, an international standard for evaluating the software's product quality.

Presently, the existing manual processed System encounters usual problems before developing a new computerized or automated System. The fundamental issues were paperwork and decentralized records. Moreover, the problems were decentralization, organization, and fast and easy tracing of documents to support decision-making regarding the management of historical data. Lastly, no mechanism automatically formats the storing process of data to produce reliable and accurate data better.

The researcher designed a set of questionnaires to test the performance and level of the prototype's acceptability. It includes the following parameters: 1) usability; 2) accuracy; 3) reliability; 4) efficiency; and 5) functionality.

Validation of the Instrument

The researcher performed a validation procedure of the questionnaire to validate the appropriateness of the content of the instrument. The researcher conducted a pilot testing or dry-run to the Teaching and Non-teaching Personnel and the designated Personnel of the core systems of the PRIME HRM of Northwest Samar State University(NwSSU). Moreover, PRIME HRM Modules' functionalities

were tested and evaluated by the assigned Personnel of PRIME HRM of three Universities: 1) NwSSU; 2) SSU, and; 3) UEP. Validation had a minimum of 30 participants.

The researcher based the instrument's design for testing on the ISO/IEC 9126 software quality standards. The software evaluation questionnaire included Usability, Reliability, Accuracy, Efficiency, and Functionality. Three (3) designated Personnel of PRIME HRM utilized the said questionnaire in every HEI while navigating the system prototype. Sixteen (16) teaching personnel and eight (8) non-teaching personnel evaluated the System's prototype.

The respondents were allowed to test the prototype and provide their questionnaire responses before the testing process. Some of the respondents provided comments and feedback based on their experience in using the prototype.

Sampling Procedure

The study's sampling frame is the list of regular teaching faculty of every college or department and the list of full-time non-teaching Personnel. The researcher also includes designated Personnel of PRIME HRM of the University. Specifically, for Teaching and Non-teaching, the researcher employed Random Sampling for several reasons, such as understanding the difference between computer-oriented Personnel and not. Also, evaluating the system prototype consumes 1 to 2 hours per Personnel; that is why the researcher has chosen the

sampling method. On the other hand, the designated Personnel of PRIME HRM used a complete enumeration sampling technique since each PRIME HRM's core system has only one Personnel assigned.

Data Gathering Procedure

The researcher performed three (3) methods of data collection in this data gathering procedure, namely: 1) 1-on-1 interviews; 2) focus group discussions (FGD); and 3) direct observation. Specifically, the researcher performed 1-on-1 interviews with the designated Personnel of PRIME HRM, similar to the University's vice presidents. Meanwhile, the researcher completed both FGD and 1-on-1 Interviews to gather information relevant to the problems encountered in using the University's present and future data. And lastly, the researcher also utilized direct observation to observe the procedures involved in every core system module of the PRIME HRM.

Before gathering the data, the researcher initially wrote a letter to the University President requesting the researcher to perform data gathering at several offices of the University, especially the HRM office. After such, the researcher also wrote a letter to the department heads. And lastly, to the process owners of the PRIME HR core systems. Specifically, to allow the researcher to conduct data gathering for identifying the problems encountered in the existing operations in Research, Extension, Academic Affairs offices, and HRM system. Another intent of the said letter was to interview to determine the hybrid system

module to be designed and developed along with HRM in terms of 1) Recruitment, Selection & Placement; 2) Learning & Development; 3) Performance Management, and; 4) Rewards & Recognition.

Statistical Treatment of Data

In this study, the following statistical treatment of data techniques was necessary for the processing of data.

The researcher utilized Frequency and Percentage Distribution and Ranking to determine the problems encountered in current, future data utilization and system operation. The result was based on the Frequency counts of responses of the respondents. Moreover, the ranking was also included to determine the most frequent responses to each item.

For the study to determine the System's developed prototype's performance, the researcher used Weighted Mean since the instrument incorporates the Likert scale. Weighted Mean were the only statistical treatment method used because the developed System did not include predictive analysis yet, requiring other statistical techniques like regression or K Nearest Neighbor method. Specifically, the adjectival ratings and the corresponding range are the following:

Highly Acceptable (4.21 to 5.00), Acceptable (3.41 to 4.20), Moderately Acceptable (2.61 to 3.40), Slightly Acceptable (1.81 to 2.60), and Not Acceptable (1.00 to 1.80).

Table 1 shows the five (5) point scale, range, and verbal interpretation that serves as the basis for the interpretation of the software quality evaluation result. The said scale is characterized in different interpretation such as five (5) as Highly Acceptable down to one (1) as Not Acceptable.

Table 1

5 Point Scale, Range and Verbal Interpretation

Range	Verbal Interpretation	
4.21 - 5.00	**Highly Acceptable**	If the condition is highly extensive and functioning excellently.
3.41 - 4.20	**Acceptable**	If the condition is extensive and functioning well.
2.61 - 3.40	**Moderately Acceptable**	If the condition is lightly extensive and functioning moderately.
1.81 - 2.60	**Slightly Acceptable**	If the condition is lightly extensive but functioning fairly.
1.00 - 1.80	**Not Acceptable**	If the condition is not extensive and functioning poorly.

The software quality evaluation questionnaire used was collected and interpreted using Weighted Mean and Standard Deviation. Below is the formula used for calculation:

Weighted Mean formula used: $WM = \frac{\sum wx}{\sum w}$

Where:

WM = Weighted Mean
w = weights
x = values

Chapter 4

PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

This chapter presents the prototype's design, analyzes, and interprets the study's respondents' data. The presentation precedes in the form of tables and figures. Primarily, it introduces the design of the prototype. The data gathering of understanding current and future data utilization in the base location's significant areas was conducted through interviews and direct observation. It also presents the analysis to identify the system's prototype's similarities and differences from the existing system. The data gathering conducted in the pilot testing of the prototype utilized a questionnaire. Furthermore, the chapter presents the interpretation of the implication of each function of the prototype.

The prototype's design illustrates the sample product of the developed software intended for testing the concept or idea of the study. The prototype's purpose was to present the necessary user interface where the user can practice the actual operation to test the study's proposed solution.

Design of the Prototype

In principle, the system's design includes discussing the trends and technologies used in the system's prototype. Technologies such as the Hardware, Software, and Network are necessary for the discussion to guide the researchers

and readers to understand the utilized trends and technologies in both the development and implementation phase. Moreover, the researcher included the User Requirements to show the appropriateness of the design's functions. This portion of the study also shows the typical way to identify the factors considered necessary upon developing the Hybrid Descriptive Data Analytics System.

The software needs compatible computer tools and components to be developed, commonly known as "Hardware." Hardware is a physical part of the computer system. Appropriate hardware in software development was essential to ensure that the user executes the system's vital function. Table 2 shows the Minimum and Recommended hardware requirements in the development of the proposed prototype.

Table 2

Hardware Requirements for the Development of the System Prototype

Hardware	Minimum Specification	Recommended
Microprocessor	Intel i3 Series or Higher	Intel i5 or higher
Memory	3 GB	5 GB or Higher
Hard Drive	512 GB	1 TB Hard Drive or Higher
Display	1366x768 Resolution	1920x1080 Resolution
Printer	Standard Inkjet Printer	Laserjet Printer

Table 2 shows the minimum and recommended hardware requirements for the development of the system prototype. Microprocessor Intel i3 and memory of at least 3GB assures the proposed system's processing will execute proficiently. The Hard Drive with 512 GB minimum handles the increasing computer program files, database, reports, and other significant files. Moreover, the system's prototype standard view requires a minimum resolution display of 1366X7688. A typical inkjet printer or colored printer was necessary for the needed reports generated of the proposed. Identifying the essential hardware requirements was significant in minimizing or even avoiding compatibility issues while developing the proposed system.

On the other hand, the researcher also identified the software requirements in the prototype's development phase. Table 3 shows the software requirements for the development of the proposed system.

Table 3 shows the list of software necessary for the development of the system. Specifically, it is essential to identify PHP 7, HTML 3, CSS, JavaScript 6, and Bootstrap 3 as the minimum requirements in the coding process's development phase. The said versions of programming language, markup language, style sheet language, and CSS frameworks were the versions having the capabilities to design the functionalities and appropriate interface. It includes new features that meet the standard designs in the industry. The researcher recommends using Code Igniter to handle dynamic web structures. MySQL Xampp 7.2.24 was the compatible version of the said programming and scripting

languages to manage the local database. Adobe Reader 9 has the minimum standard capability to handle PDF files. MPDF allows the system to generate email PDF file attachments. The researcher also used the PHPOffice library (PHPWord and PHPExcel) to manage generated Word and Excel file reports. The Segment.php library allows the researcher to handle descriptive data analysis more straightforward than creating it in complex code.

Table 3

Software Requirements for the Development of the System Prototype

Software	Minimum Requirement	Recommended
Coding	• PHP 7 • HTML 3 • CSS • JavaScript 6 • Bootstrap 3	• PHP 7.3.5 Higher • HTML 5 • CSS 3 • JavaScript 7 • Bootstrap 4
Framework	• PHP, Code Igniter	• Code Igniter, Symphony
Local Web Server	• MySQL Xampp for Windows 7.2.24	• MySQL Xampp for Windows 7.3.11, MS SQL
Operating System	• Windows 10	• Windows 10 or higher
Utility Tools	• Adobe Reader 9	• Adobe Reader or Higher
File Handling Libraries	• MPDF • PHPOffice • Segment.php Lib.	• MPDF Latest Version • PHPOffice • Analytics-PHP Lib.

Furthermore, in the study's implementation part, the researcher also identified the same components for the implementers to understand the system to

work. Table 4 shows the Hardware requirements for the Implementation of the developed system.

Table 4

Hardware requirements for the Implementation of the Developed System

Hardware	Minimum Requirement	Recommended
Cloud Web Server	• Fixed Business Type • vCPUs: 2 • RAM: 1024MB • Disk Space: 20GB • Bandwidth: 750GB • Port speed: 100Mbits/sec	• Enterprise Type • vCPUs: 2 or higher • RAM: 2048 or higher • Disk Space: 40GB or higher • Bandwidth: 750 or higher • Port speed: 150Mbits/sec • Plesk/Web Admin Service

Table 4 shows the minimum and recommended hardware requirements upon system implementation. Cloud Service handles the management capabilities equivalent to Physical Computer Server and Networks. Fixed Business Type of Cloud Service allows the system to handle multiple office transactions or an organization like a University. The recommended specifications provide a better performance of management. Table 5 shows the software requirements for the Implementation of the developed system.

Table 5 shows the software minimum and recommended requirements for system implementation. Database Management System was not that different from Local MySQL DBMS except for data storage capacity. PHP Version was significant to handle all syntax or code functions in most relevant cases. SSL allows

the cloud system to secure online threats like account hackers. SSL handles the encryption of data transfer transactions.

Table 5

Software requirements for the Implementation of the Developed System

Software	Minimum Requirement	Recommended
Database Management System	• MySQL (MariaDB cloud VM)	• MSSQL Server (Cloud VM)
PHP Version	• PHP 7.1 Version(Cloud VM Compatible)	• PHP 7.3 Version(Cloud VM Compatible)
Security	• SSL	• SSL
Admin Panel	• Plesk/Web Admin Service	• Plesk/Web Admin Service
Technical Support	• Cloud Service Technical Support	• Cloud Service Technical Support

Admin Panel holds the University's IT Admin system functionalities to manage and manipulate actual data from the University. Web Admin Service was essential to configure the system based on the need of the University. Without Web Admin Service, customizing the system's prototype would be difficult. Technical Support allowed the IT Admin to coordinate with the Cloud Service IT Personnel with relevant system errors, misconfiguration, and maintenance concerns.

Table 6 shows the User Requirements for the Implementation of the developed PRIME HR system. It includes the type of users, capacity, and designation.

Table 6

User requirements for the Implementation of the Developed System

User	Capacity	Designation
RSP Personnel	• RSP Designated • Computer Literate • MS Office Application Literate • Internet Operation Literate	• Job Order/Permanent
L&D Personnel	• L&D Designated • Computer Literate • MS Office Application Literate • Internet Operation Literate	• Job Order/Permanent
Teaching & Non-teaching Personnel	• Computer Literate • MS Office Application Literate • Internet Operation Literate	• Temporary/Permanent

Table 6 shows the different users, along with their capacity and designation. RSP and L & D Personnel should be authorized designated Personnel, knows essential computer operation, MS Office Application literate, and knows how to manipulate internet operations. On the other hand, Teaching and Non-teaching Personnel should be in a temporary or permanent type of designation. Similarly, the said Personnel should be computer literate, MS Office Application, and internet operation literate.

Aside from Hardware and Software requirements, the researcher considered the Network requirements necessary for the actual operation. Table 7 shows the network requirements for the Implementation of the developed system.

Table 7

Network requirements for the Implementation of the Developed System

Network Type	Minimum Requirement	Recommended
Local Area Network	• Network Cable: UTP Cable CAT5 • Modem: VPN Security Enabled, Up to 150Mbps of data throughput • Router • Network Hub	• Fiber Optic • Modem: DIN Rail Mountable, VPN Securely meeting IPSec Standard, Intelligent Firewall, Interchangeable memory function, Gigabit connectivity, Up to 200Mbps of data throughput depending on the model, SD Card SLot • Router • Network Hub

Table 7 shows the type of network necessary to be set up, installed, and configured upon implementing the developed system. UTP Cable CAT5 was the minimum specification for network setup in a not distant location or office setup. Modem with VPN Security Enable feature allowed the user to connect to the VPN at all times. Router and Network Hub was for the primary network connection configuration.

Furthermore, the developed system includes functionalities implemented explicitly in a particular module. Table 8 shows the functional requirements for the Recruitment, Selection, and Placement Module of the prototype.

Table 8

Functional Requirements for the Recruitment, Selection, and Placement (RSP) Module

Functionality	Description	
Access Validation	*Input:*	• The system accepts the RSP Personnel's Username and Password to verify user access.
Acknowledgment Receipt	*Input:*	• The system accepts the Recipient Name, Address, City/Province, and Date Receive Information necessary for generating Acknowledgement Receipt.
	Process:	• The system allows the user to select from the list of acknowledgment receipt records easily. • The system allows the user to update the existing records.
	Output:	• The system generates Acknowledgement Receipt Printout.
Notice for IQ Test	*Input:*	• The system accepts the Recipient Name, Address, City/Province, Item Position, Specialization, Schedule Date, Schedule Time, and Post Date Information necessary for generating Notice for IQ Test.
	Process:	• The system allows the user to select from the list of IQ test notice records easily. • The system allows the user to update the existing records.
	Output:	• The system generates Notice for IQ Test Printout.
Notice for Interview & Screening	*Input:*	• The system accepts the Recipient Name, Address, City/Province, Date of IQ Test Taken, Item Position, Specialization, Accomplishment Date, Accomplishment Options, Interview & Screening Date and Time, Personality Test Date & Time, and Post Date Information necessary for generating Notice for Interview & Screening.
	Process:	• The system allows the user to easily select from the list of Interview & Screening Notice records. • The system allows the user to update the existing records.
	Output:	• The system generates a Notice for Interview & Screening Printout.

Functionality	Description	
Applicants Shortlist	*Input:*	• The system accepts the Year & Batch Number of the Applicants. • The system accepts Item Details such as Available Position, Bachelor's Degree Required, Number of Items Available, Campus, Subject Area Priority Need, Item Position, and Type of Personnel Information necessary for the Item Description. • The system accepts Shortlisted Applicant Information, namely: Complete Name of Applicant, Gender, Age, Date of Birth, License, Present Employment, Contact Number, Degree Obtained, Name of School, and Year Graduated or Units Earned Information. • The system accepts Evaluators Information for the specific Item, namely: Evaluator's Complete Name, Position or Designation, and Type of Evaluator (Member/Chairperson).
	Process:	• The system allows the user to easily select from the list of batch records, item records, shortlisted applicant records, and evaluator's records. • The system allows the user to update the existing records.
	Output:	• The system generates Applicants Shortlist Printout.
Individual Assessment	*Input:*	• The system accepts Individual Assessment Details: Common Criteria for Evaluation, Teaching Competence, Research Competence, Intelligence Competence, Psycho-social Attributes, and Personality Traits.
	Process:	• The system allows the user to search the Year and Batch Number of the Items Offered list.
	Output:	• The system generates the Individual Assessment Printout.
Comparative Assessment	*Process:*	• The system allows the user to search the list of Comparative Assessment Records.
	Output:	• The system generates a Comparative Assessment Record Printout.
Evaluator Records	*Input:*	• The system accepts Evaluators Information for the specific Item, namely: Evaluator's Complete

Functionality	Description	
		Name, Position or Designation, and Type of Evaluator (Member/Chairperson). • three categories: Teaching, Non-teaching, and Designated Personnel.
	Process:	• The system allows the user to update the existing records.
Personnel PDS	*Process:*	• The system allows the user to search the list of Personnel's PDS Records.
	Output:	• The system allows the user to view and print the Personnel's PDS.
Analysis	*Output:*	• The system allows the user to view the available applicant field of specialization through percentage view.

Table 8 shows the required functionalities of the RSP module. The table shows how the data executes in that particular function. The description field allowed the user to understand why a specific part was considered an input, process, and output.

On the other hand, the researcher similarly identifies the functional requirement s of the L&D Module. Table 9 shows the applicable requirements for the Learning and Development (L & D) Module.

Table 9 shows the functionality requirements of the L & D module. The table shows the different functions and the execution of data in the system. Similarly, the researcher includes the details in the description field to understand how this function acts as input, process, or output.

Table 9

Functional Requirements for the Learning and Development (L&D) Module

Functionality	Description	
Login	*Input:*	• The system accepts the L&D Personnel's Username and Password to verify user access.
TNA – New Tally	*Input:*	• The system accepts Profile Details, Assessment and Feedback, Individual Development Plan.
	Output:	• The system displays the TNA Result.
Consolidated	*Output:*	• The system allows the user to view all the TNA in
Two (2) Year Individual Development Plan	*Input:*	• The system accepts Personnel's Name, Current Position, Salary Grade, Years in the Position, Years in the Agency, Two-Year Period, Division, Further development year, Supervisor's Name, Purpose, Competency/Performance Assessment and Learning and Development Priorities, and Development Plan.
	Process:	• The system allows the user to search a list of Personnel • The system allows the user to update existing records
	Output:	• The system generates a Two(2) Year Individual Development Plan Printout
5 Year Individual Development Plan	*Output:*	• The system allows the user to view the Personnel's 5-year Individual Development Plan.
Training Records	*Input:*	• The system allows the user to accept Training Record Details, namely: Training Title, Start Date, End Date, Venue, Provider, Category, Total Hours, and Date Posted.
	Process:	• The system allows the user to add Personnel as Training Attendees. • The system allows the user to update the existing records
Attendees	*Process:*	• The system allows the user to update the Requirements submitted by the attendees. • The system allows the user to remove a Personnel as an attendee.

Functionality	Description	
Personnel Records	*Output*	• The system allows the user to view the current and completed training of the Personnel. • The system allows the user to view the 2-year and 5-year Individual Development Plan. • The system allows the user to view the regular and designated TNA records of a Personnel.
Training Analysis	*Output:*	• Training Analysis Result in percentage view. The function allowed the office to easily view each college/department's records regarding each personnel training status and the college or department itself. • The system allows the user to view the Personnel's

Furthermore, the researcher also identifies the Teaching and Non-teaching Module's functional requirements in a separate table. Table 10 shows the details of the functionalities related to other modules like RSP and L & D. Moreover, the table allowed the user to understand how the Teaching and Non-teaching users interact in the system and explain each part of the function to add a record and eventually generate a Personal Data Sheet record and other relevant result views.

Furthermore, the research described the system's overall structure or the internal components before the actual development process. It includes the Framework of the System Design, System Architecture, Functional Decomposition Diagram, Context Diagram (Level 0 DFD), and the Data Flow Diagram(Level 1).

The system design framework was necessary for presentation to provide the user with a glimpse of the different platforms, or in this study, the applicable term is the module. Figure 4 shows the Framework of the system design of the proposed system. It includes the different minor and major modules of the proposed system set up, designed, and written.

Specifically, it includes four major modules: 1) Academics; 2) Administration; 3) Research, and 4) Extension. Respectively, the identified modules will have their corresponding sub-modules.

The academics module includes academic Programs, Faculty, and Students sub-modules. For this study, the researcher designed two (2) of the four sub-modules of PRIME HRM under the administration: 1) Recruitment, Selection, and Placement sub-module; and 2) Learning and Development sub-module. The research module will include sub-modules for linkages, publications, patents and utility models, faculty research, and student research modules. Similarly, the extension module will also have the same modules focusing on the extension office's data.

Table 10

Functional Requirements for the Teaching & Non-teaching Personnel Module

Functionality	Description	
Login	*Input:*	• The system accepts the Personnel's Username and Password to verify user access.
Basic Information	*Process:*	• The system allows the user to update Profile Information, namely: Date of Birth, Place of Birth, Sex, Civil Status, Height, Weight, and Blood Type. • The system allows the user to update Address Information, namely: Citizenship, Residential Address, Zip Code, Permanent Address, Zip Code, Telephone Number, Mobile Number, and Email Address. • The system allows the user to update the Identification Number or Accounts Information, namely: GSIS ID Number, PAG-IBIG ID Number, PHILHEALTH Number, SSS Number, TIN Number, AGENCY EMPLOYEE ID. • The system allows the user to update the Employment Profile, namely: Campus, Personnel Type, Position, Years in the Position, Department, Designation, Supervisor, Work Shift Type, Appointment Status.
Family Background	*Input:*	• The system allows the user to accept Child Record, namely: Child's Complete Name and Date of Birth.
	Process:	• The system allows the user to update Parents & Spouse Information, namely: Spouse Information, Father's Information, & Mother's Information.
Educational Background	*Input:*	• The system allows the user to accept Educational Background Information, namely: Level, Name of School, Basic Education/Degree/Course, Period of Attendance From and To, Highest Level/Units Earned(if not graduated), Year Graduated, Scholarship/Academic Honors Received.

Functionality		Description
Eligibility	*Input:*	• The system allows the user to accept Eligibility Information namely: Career Service/RA 1080(Board Bar) Under Special Laws/CES/CSEE Barangay Eligibility/Driver's License, Rating(if applicable), Date of Examination/Conferment, Place of Examination/Conferment, License Number, Date of Validity
Work Experience	*Input:*	• The system allows the user to accept Work Experience Information, namely: Inclusive Dates, Position Title, Department/Agency/Office/Company, Monthly Salary, Salary/Job/Pay Grade & Step Increment, Status of Appointment, and Government Service.
Voluntary Work	*Input:*	• The system allows the user to accept Voluntary Work or Involvement in Civic/Non-government/People/Voluntary Organizations Information namely: Name & Address of Organization, Inclusive Dates, Number of Hours, and Position/Nature of Work.
Learning & Development (L&D) Intervention	*Input:*	• The system allows the user to accept Learning & Development Interventions/Training Programs Attended Information namely: Title of Learning and Development Interventions/Training Programs, Inclusive Dates, Number of Hours, Type of L&D(Managerial/Supervisory/Technical/etc.), and Sponsors.
Other Information	*Input:*	• The system allows the user to accept Skills Information. • The system allows the user to accept Non-academic Distinctions/Recognition Information. • The system allows the user to accept Membership in Association/Organization Information.
References	*Process:*	• The system allows the user to update References Information.
Training Needs Analysis (TNA)	*Input:*	• The system allows the user to accept a New Record of TNA Information as Teaching or Non-teaching Personnel and as a Designated Personnel.
	Process:	• The system allows the user to update the existing TNA record of the Personnel.
	Output:	• The system allows the user to display and print the TNA record.

Functionality		Description
Individual Development Plan (IDP)	*Input:*	• The system allows the user to accept Two(2)-years and five(5)-year Individual Development Plan Information.
	Process:	• The system allows the user to update the existing IDP Records.
	Output:	• The system allows the user to view and print the existing IDP Records.
Training Analysis	*Output:*	• The system allows the user to view the training analysis of the college or department.

Figure 5 shows the System Architecture of the prototype of the system. The design includes three(3) components and three(3) different system layers. The figure shows the conceptual model that describes the proposed system's organization or otherwise known as the Systems Architecture. The said architecture has three main components: 1) Contents or Main Modules of the system; 2) Results, Monitoring, and Data Analysis; and 3) Cloud Database.

The first component of the system includes System Interface, Main Modules, and it's corresponding Sub-modules. The System Interface allows the user to interact with the system's modules, provide input, store records, view analysis, and print results.

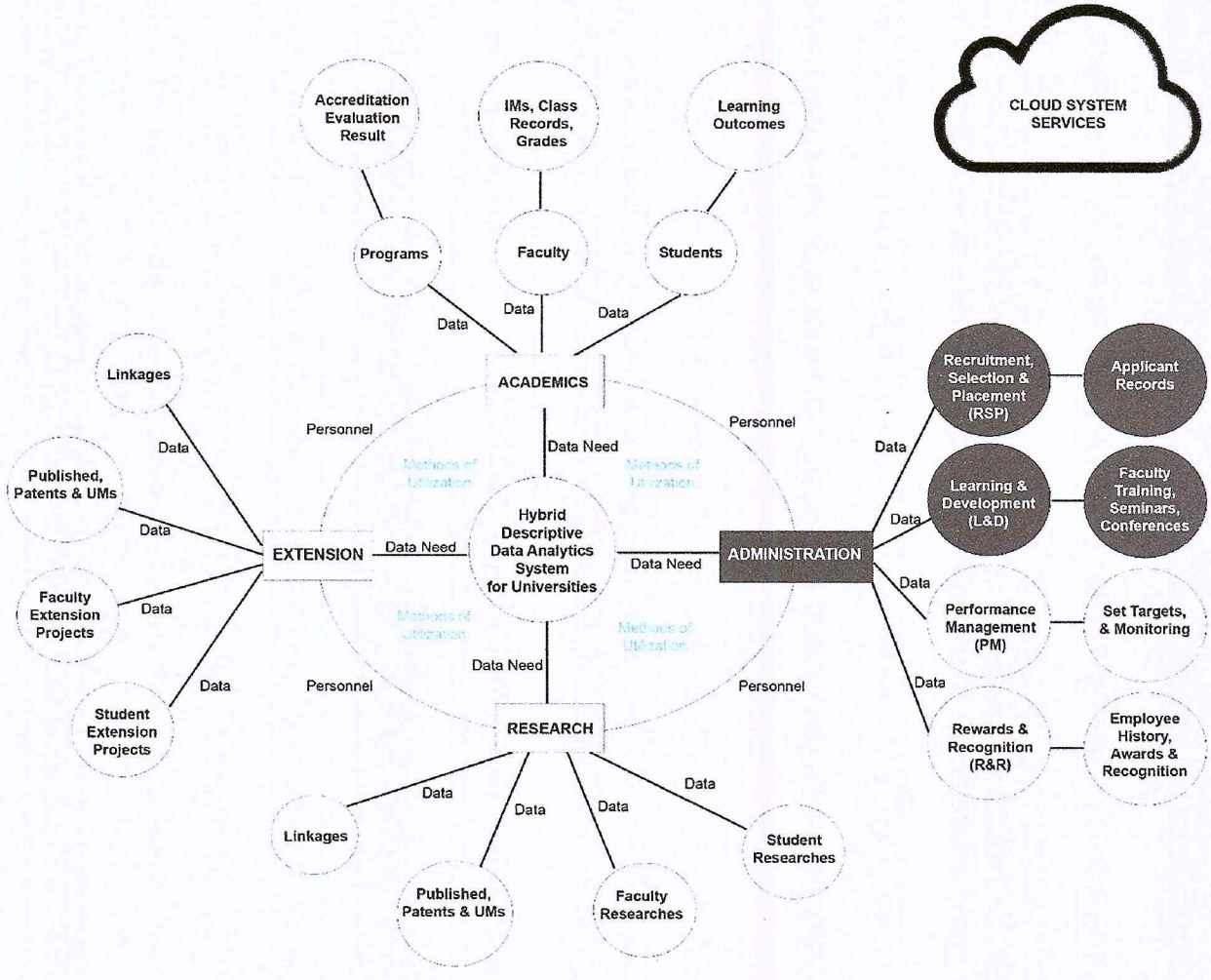


Figure 4. System Design Framework

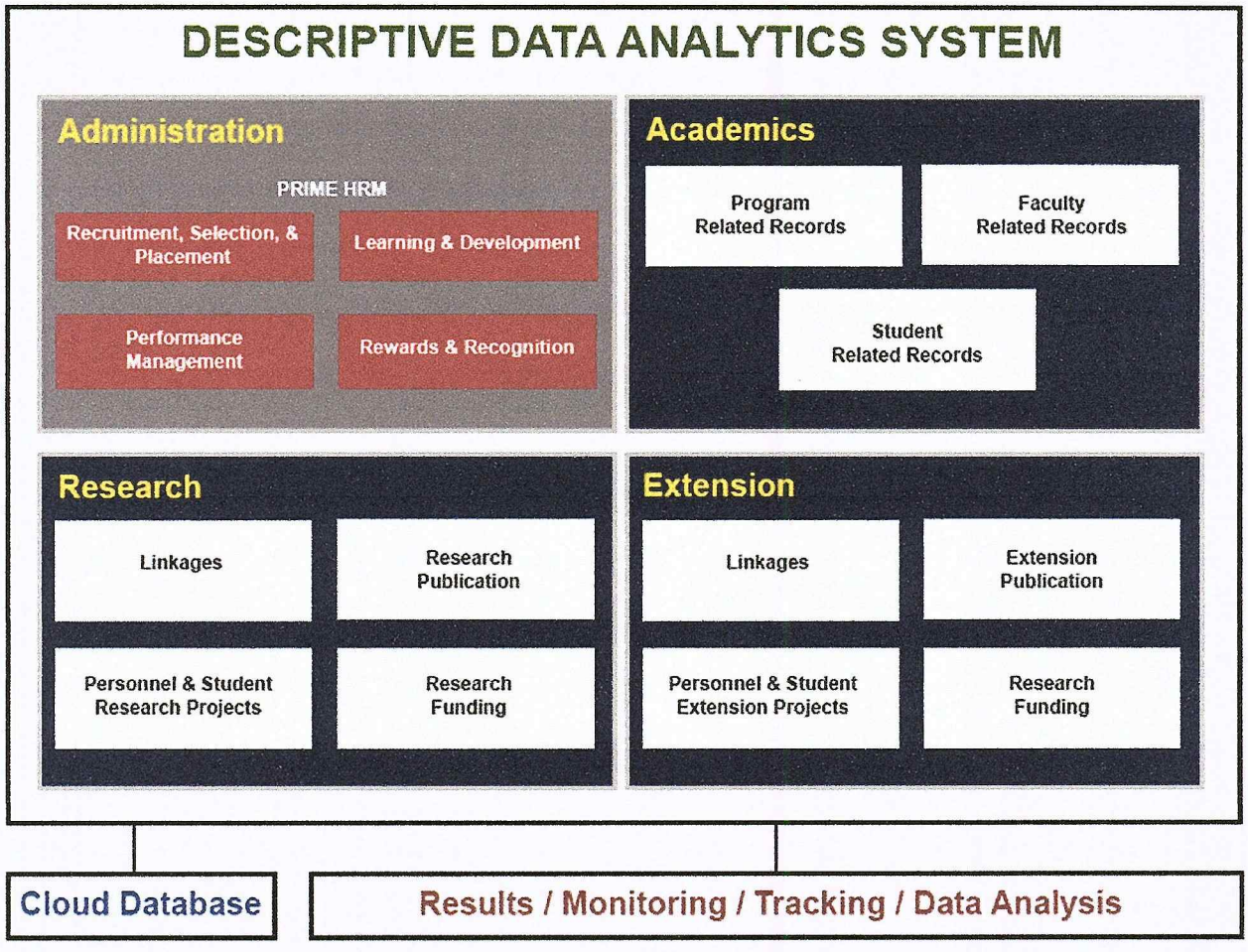


Figure 5. System Architecture of the System – PRIME HRM sub-modules

Furthermore, the Main Modules include the significant functions of a University. The researcher described the modules to have a lot of data processed and stored and later used to make decision-making. The said modules are Administration, Academics, Research, and Extension. And lastly, each module's sub-modules will have centralized access through a specific office, college, or user.

Meanwhile, results are a very significant component that requires tedious time and effort to be precise, accurate, and useful. The said component will allow the user to view, monitor transactions, print results, and produce descriptive data analysis. Another vital part of the said component was analyzing the existing records that update and notifies the user or a particular office about the current status of a specific transaction, request, or activity.

The secure administration and control of the Cloud Database obtain the scalability of the storage of data. The system provides better security of the data through the built-in cloud security services, decreases downtime, and reduces administrative maintenance efforts through the cloud database component. Although Cloud recognizes a high pricing factor, in the long run, the research believes that Cloud compares to be lower than a business, a company, or a University's operational expenditures.

Furthermore, the presentation of functions and processes are necessary for software design to provide a visual view of what the system looks like inside

conceptually. Figure 6 shows the functional decomposition diagram of the RSP module.

Figure 6 shows the Recruitment, Selection, and Placement (RSP) module functional decomposition diagram. The said diagram demonstrates that the module begins with access validation of the authorized RSP personnel. The said Personnel can conduct data entries, records search and generate results under the Acknowledgment Receipt, Notice for IQ Test, Notice for Interview and Screening, Applicants Shortlist, Individual Assessment, Comparative Assessment. The said module also allows the user to view the Personal Data Sheet of the University Personnel, and generate Personnel Records Analysis or any relevant data analysis requirements.

Learning and development module FDD were also described. Figure 7 shows the functional decomposition diagram of the L & D module. Figure 7 shows the L & D module functional decomposition diagram.

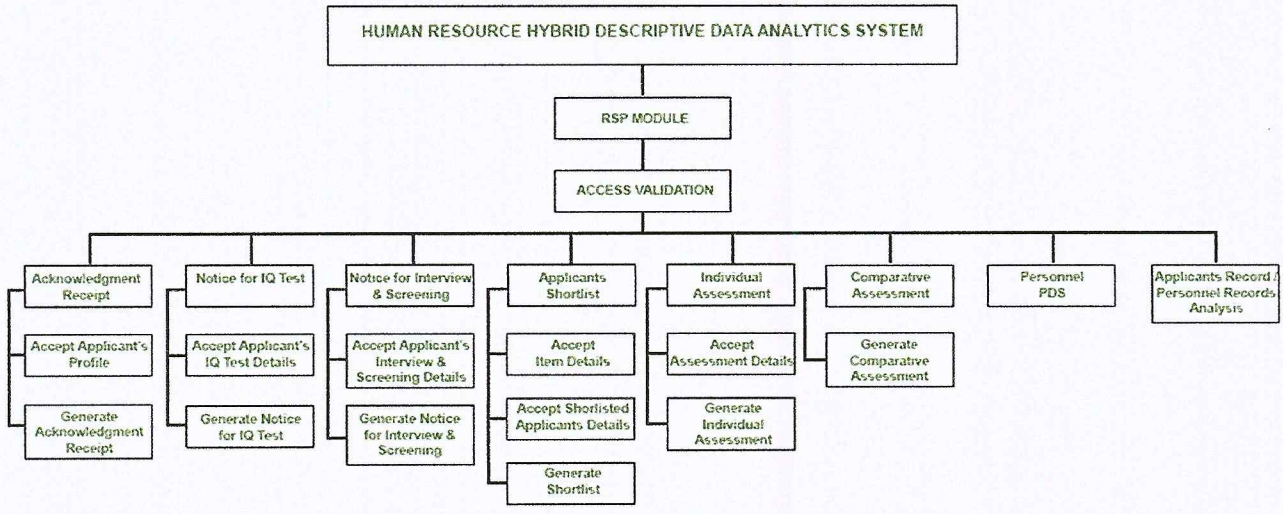


Figure 6. Recruitment, Selection, and Placement(RSP) Functional Decomposition Diagram(FDD)

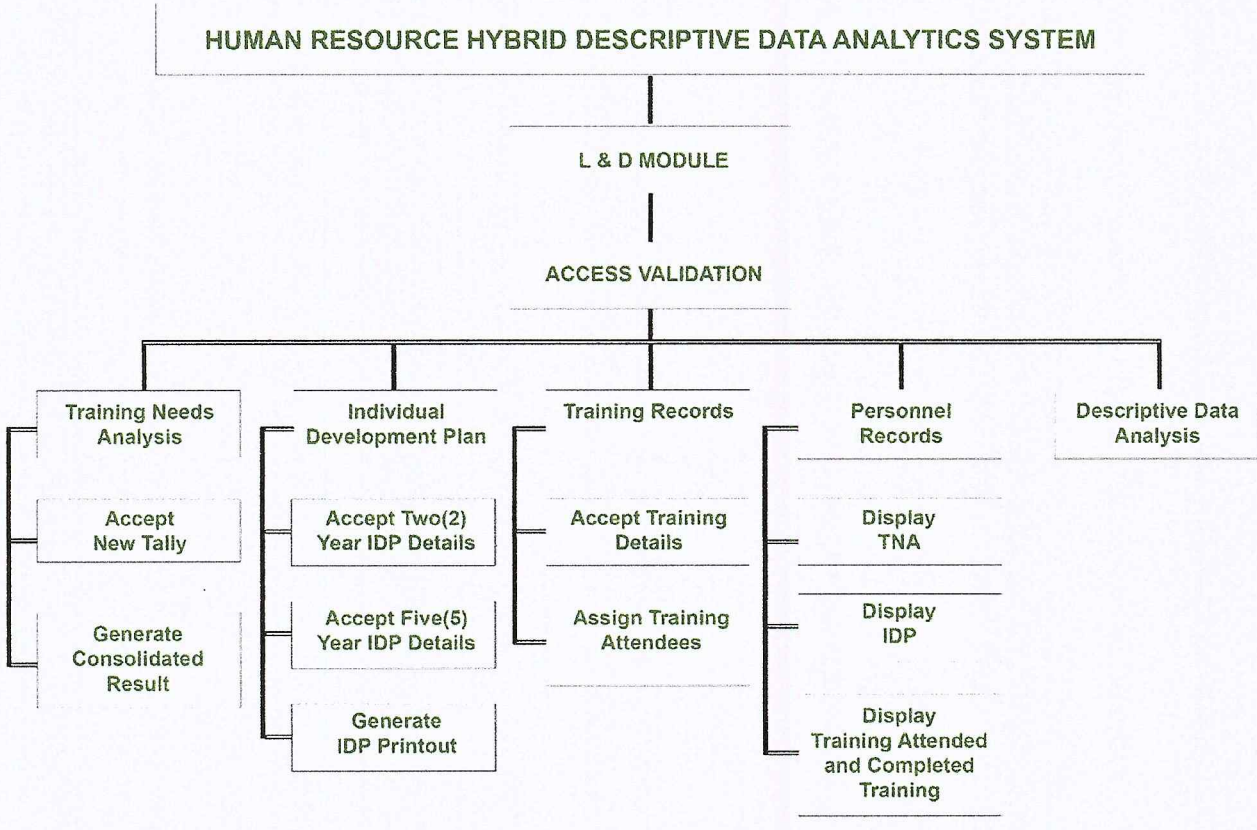


Figure 7. Learning and Development(L&D) Functional Decomposition Diagram(FDD)

The L & D FDD demonstrates that the module begins with access validation of the authorized L & D personnel. The said Personnel can conduct data entries, records search and generate results under the Training Needs Analysis and Individual Development Plan Functions.

Similarly, the diagram also shows that the said Personnel can conduct data entries and assign training attendees to Training Records function. In the said module, technically, data entries of TNA and IDP should be accomplished by Regular User (Teaching and Non-teaching Personnel). Records from the regular user will be automatically viewed by the L & D personnel for an easy tally of TNA survey and easy safekeeping of regular user IDP records. The said module also allows the user to records analysis or any relevant data analysis requirements under the said module.

On the other hand, Regular User's FDD was also described. Figure 8 shows the Teaching and Non-teaching Personnel Functional Decomposition Diagram.

Figure 8 shows the functional decomposition diagram of the Teaching and Non-teaching Personnel or the Regular User. The said diagram demonstrates that the said Personnel should have a valid user account to access the said module. If the user account entered were validated, data entries, search, and view of PDS information are enabled. Similarly, data entries for the Personnel's TNA and IDP are also available.

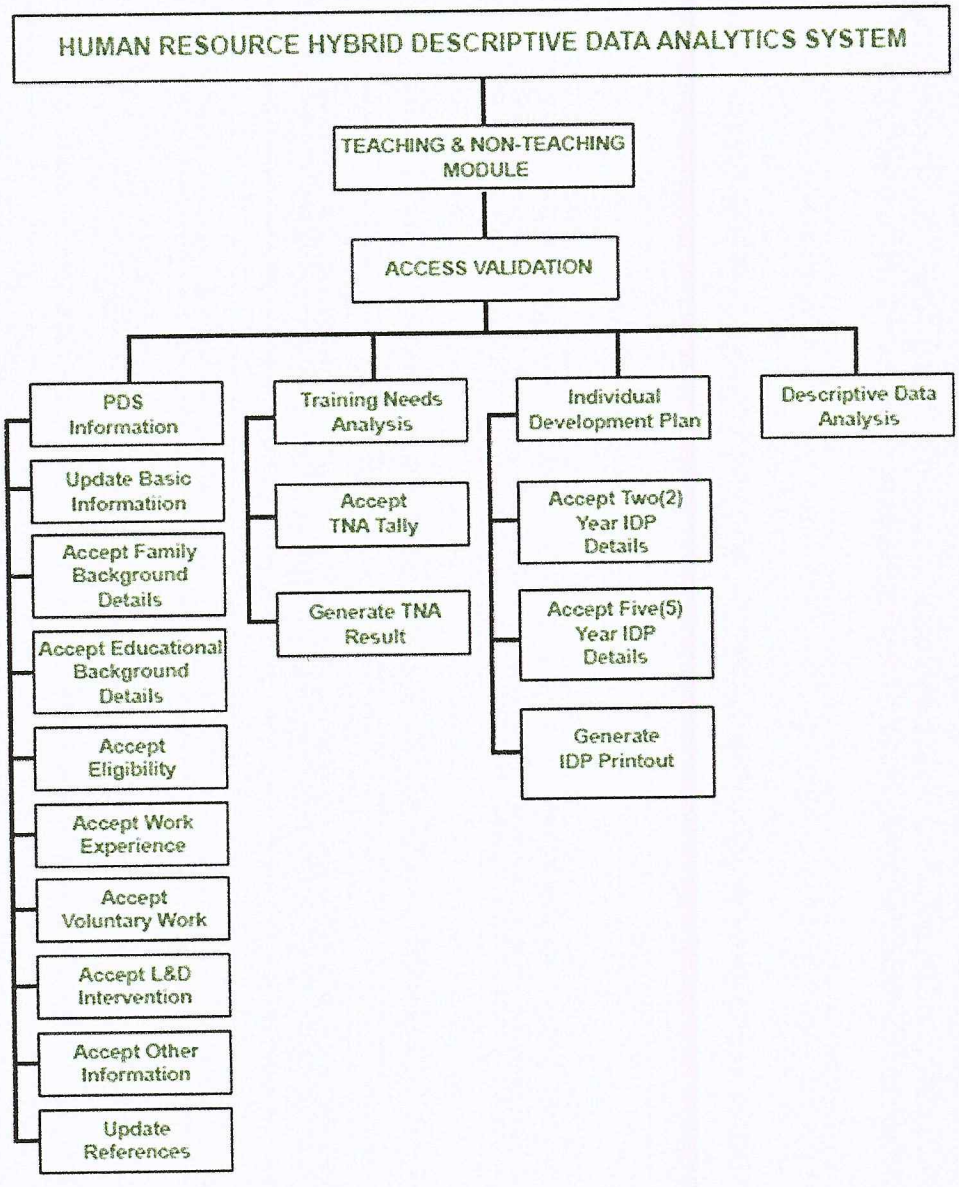


Figure 8. Teaching & Non-teaching Personnel (Regular user) Functional Decomposition Diagram(FDD)

Upon saving the TNA and IDP record, the result is automatically generated and received by the L & D Personnel. Training Record Analysis function allows the user to view the list of training attended. Moreover, the same function also allows the user to view the overall training record status of the office or college. With this function, the user can easily monitor and track the training records of the college.

Each function includes corresponding processes of data. To understand how the data is transmitted, and processed in the system, the context diagram is necessary to be presented. A context diagram is also known as the Level Zero (0) Data Flow Diagram. It allows the reader to understand the necessary input and output of a particular module of function. Figure 9 shows the RSP Module context diagram of the proposed system.

Figure 9 shows the context diagram of the RSP Module of the proposed system. The above figure demonstrates the required data to be entered into the system and the required information extracted from the system. The said module accepts Applicant's Profile, Acknowledgment Receipt Details, Notice for IQ Test Details, Notice for Interview and Screening Details, Shortlist Details, and Individual Assessment Details.

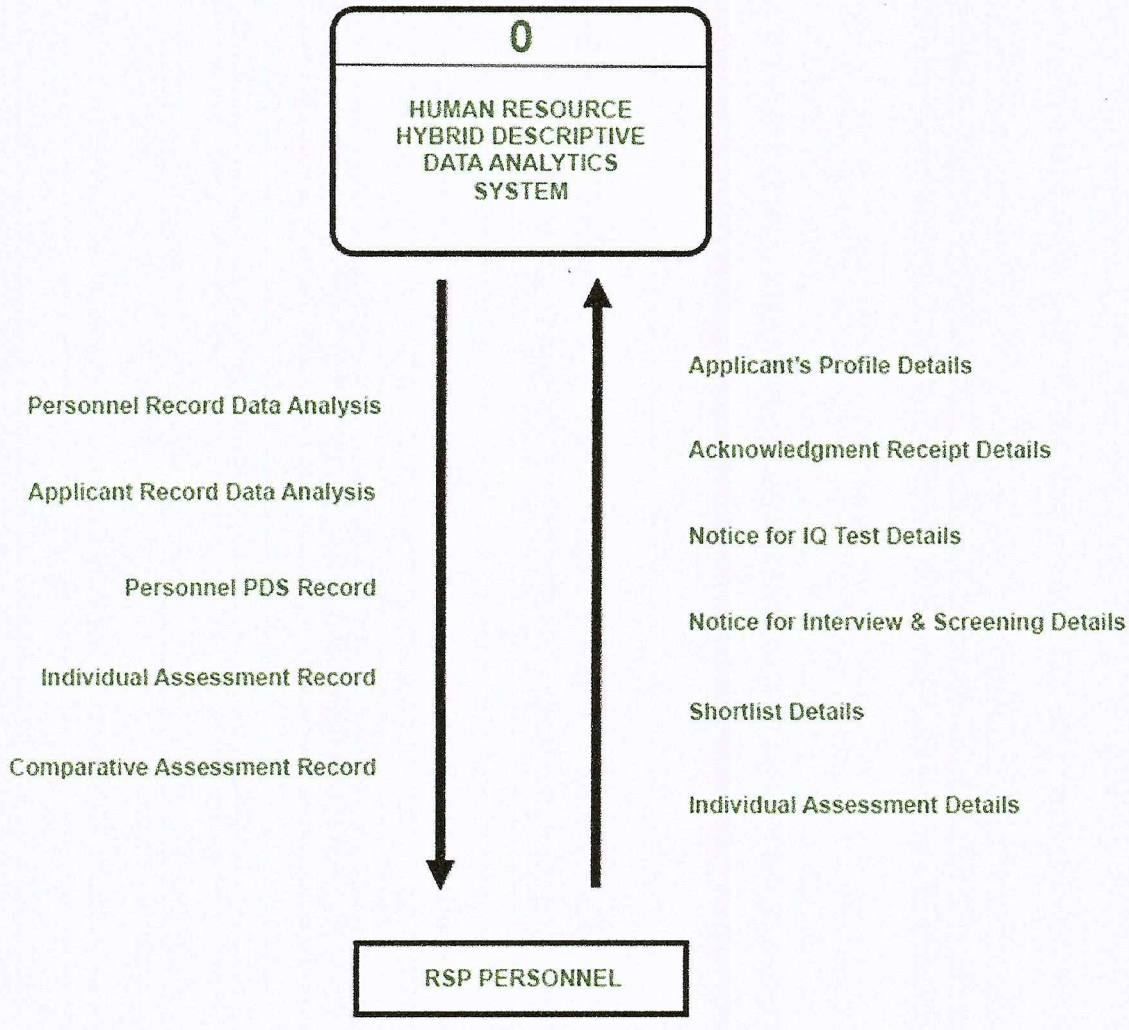


Figure 9. RSP Module Context Diagram of the System Prototype

Correspondingly, the identified inputs were used to produce results or output. The said output includes retrieval of Applicant Record Analysis, Personnel PDS Record, Individual Assessment Record, Comparative Assessment Record, and generate Personnel Record Analysis.

On the other hand, a context diagram for the L & D Module of the proposed system was also described. Figure 10 shows the L & D Module Context Diagram of the proposed Hybrid Data Analytics System for Universities.

Figure 10 shows the context diagram of the L & D Module of the proposed system. The above figure also demonstrates the required data to be entered into the system and the required information extracted from the system for the L & D Personnel.

The said module accepts TNA Tally Details, Two-year IDP Details, Five-year IDP Details, Training Details, and Training Attendees Details. Respectively, the identified inputs were used to produce results or output. The said output includes retrieval of TNA Record, Two-year IDP Record, Five-year IDP Record, and generate Training Record Analysis.

Similarly, a context diagram for the regular user module of the proposed system was also described. Figure 11 shows the Teaching and Non-teaching Module Context Diagram of the proposed system.

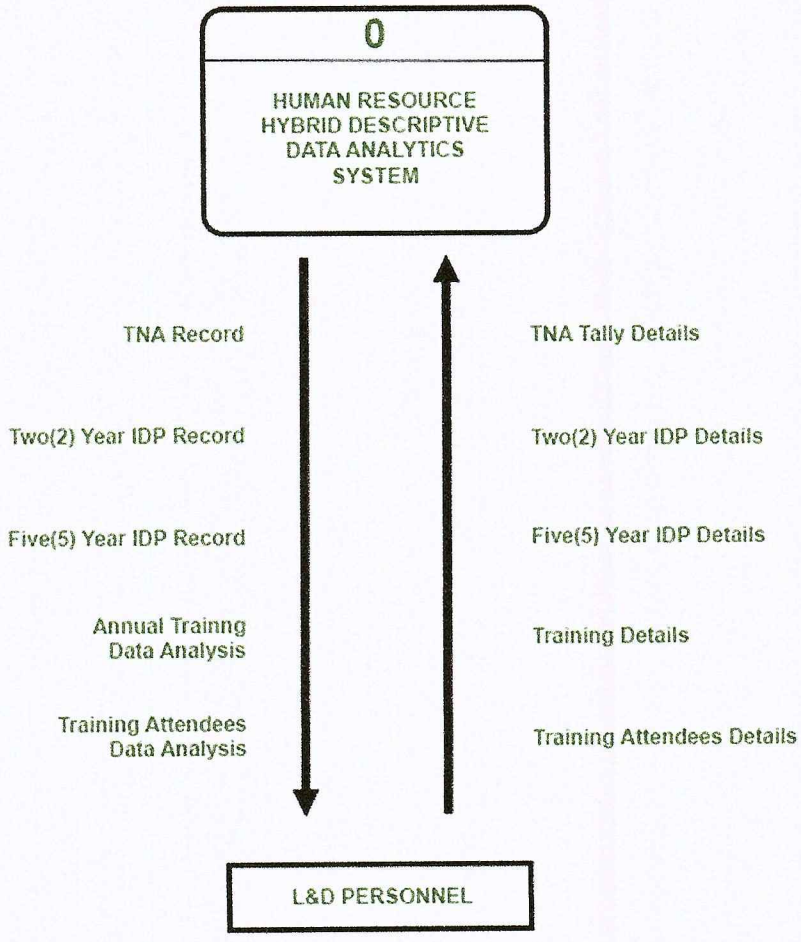


Figure 10. L&D Module Context Diagram of the System Prototype

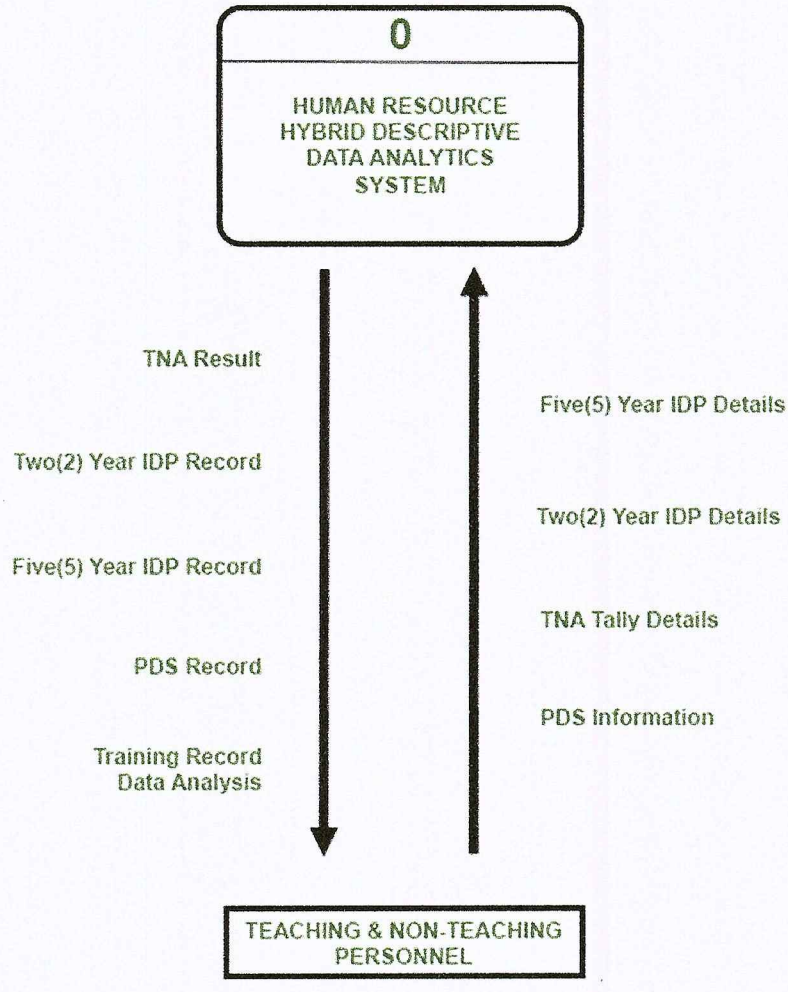


Figure 11. Teaching and Non-teaching Module Context Diagram of the System Prototype

Figure 11 shows the context diagram of the Teaching and Non-teaching Module of the proposed system. The above figure also demonstrates the required data to be entered into the system and the required information extracted from the system for the Teaching and Non-teaching Personnel. The said module accepts TNA Tally Details, Two-year IDP Details, Five-year IDP Details, and Personal Data Sheet Details. Respectively, the identified inputs were used to produce results or output. The said output includes retrieval of Two-year IDP Record, Five-year IDP Record, PDS Record, and generation of TNA result and Training Record Analysis.

The context diagram explains the list of data that are accepted and the list of records generated from the said data in a general form point of view. The content of the said diagram is explained in detail through the Level 1 Data Flow Diagram (DFD). DFD is designed to demonstrate processes that are performed when a particular data is entered into the system. It also demonstrates the processes that are being performed when a particular data is processed to produce required output, result or analysis. Figure 12 shows the RSP Module Level 1 Data Flow Diagram of the proposed Hybrid Data Analytics System for Universities.

Figure 12 shows the details of the processes executed when a data entry has been made. Each data entry corresponds to a particular process which either proceeds to another or saved in a storage location of the system. The storage is being accessed and the data is transmitted to another process and to another if necessary until a particular output is accomplished.

The said DFD describes six (6) data entries accepted and three (3) generated output. Moreover, it includes ten(10) processes for input and two(2) processes for generating output. Data is processed and generated are stored in nine(9) data stores or storage. And all processes are connected with flowlines to further explain the processes involved in the RSP module.

Furthermore, DFD level 1 for L & D Module was also described. Figure 13 shows the L & D Module Level 1 - Data Flow Diagram of the proposed Hybrid Descriptive Data Analytics System.

Figure 13 shows the details of the processes executed when a data entry has been made. Similarly, each data entry of the L & D DFD corresponds to a particular process which either proceeds to another or saved in a storage location of the system. The storage is being accessed and the data is transmitted to another process and another if necessary until a particular output is accomplished similar to the RSP DFD. The current DFD describes five (5) data entries accepted and four (4) generated the main output. Moreover, it includes nine (9) processes for input and four (4) processes for generating output. Data is processed and generated are stored in nine(9) data stores or storage. And all processes are connected with flowlines to further explain the processes involved in the L & D module.

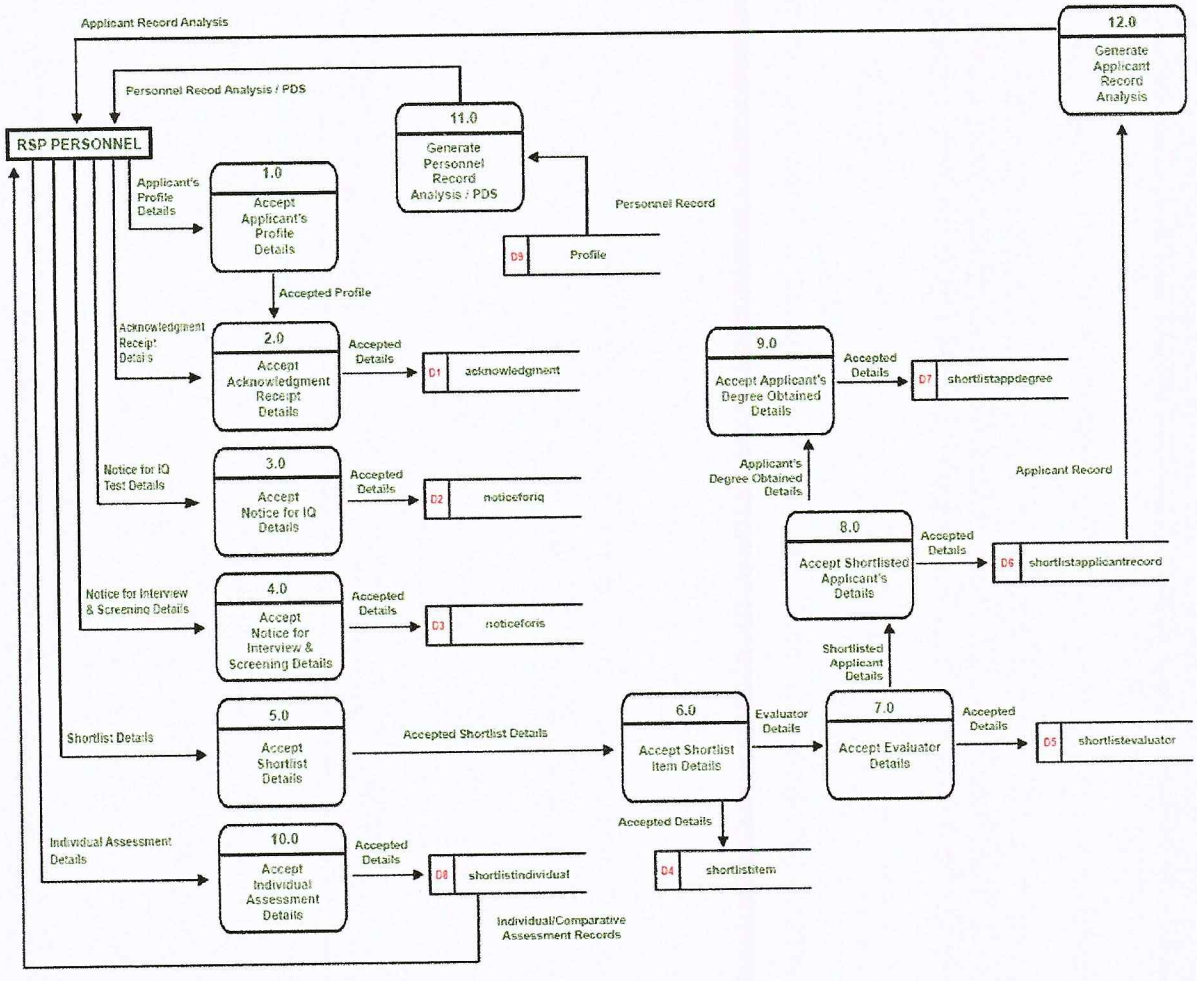


Figure 12. RSP Module Level 1 - Data Flow Diagram(DFD) of the System Prototype

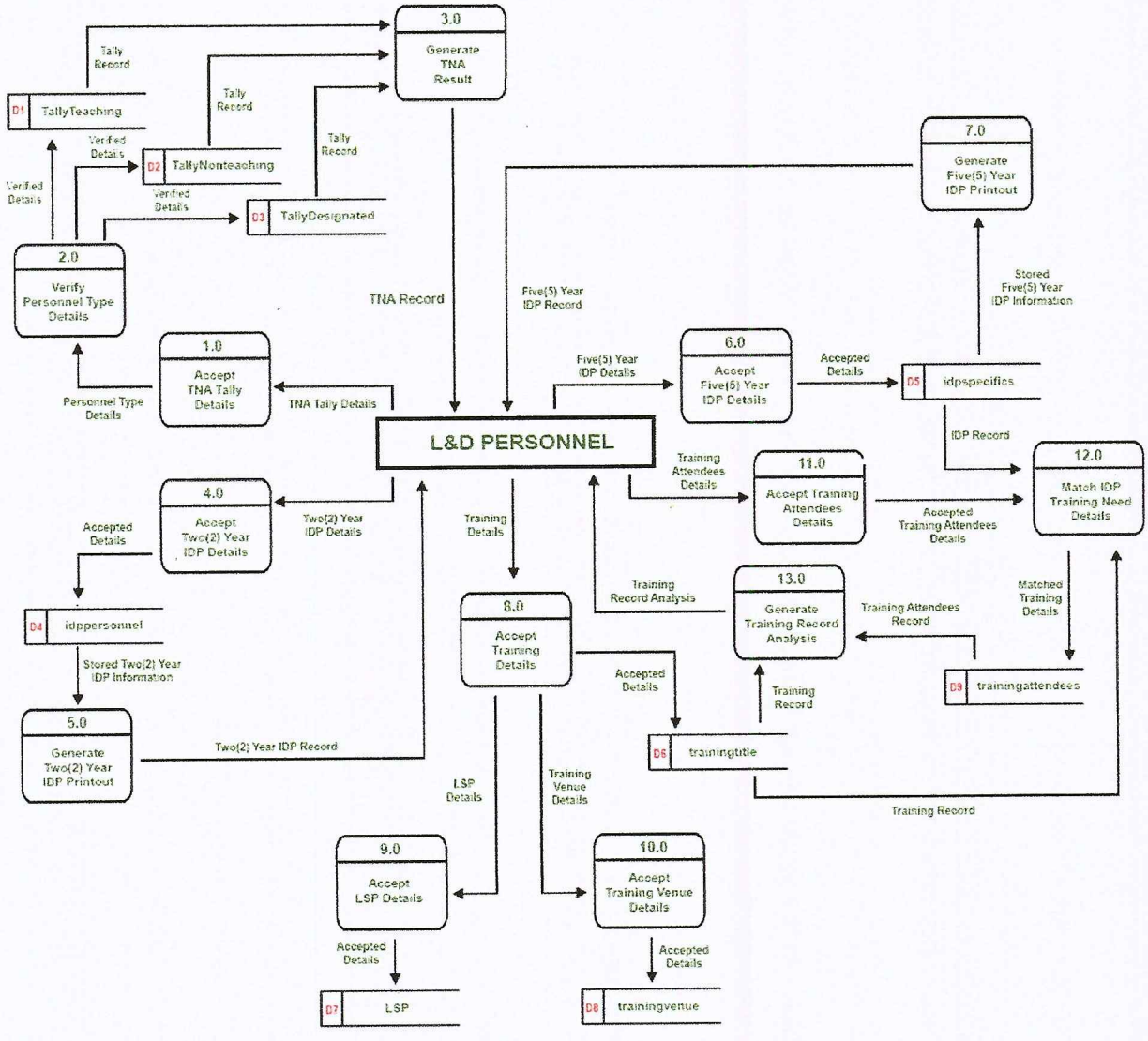


Figure 13. L&D Module Level 1 - Data Flow Diagram(DFD) of the System Prototype

Likewise, DFD level 1 for the Regular User Module was also described. Figure 14 shows the Teaching and Non-teaching Module Level 1 - Data Flow Diagram of the proposed Hybrid Data Analytics System for Universities.

Figure 14 shows the details of the processes executed when a data entry has been made. Similarly, each data entry of the Teaching and Non-teaching DFD corresponds to a particular process which either proceeds to another or saved in a storage location of the system. The storage was also being accessed and the data were also transmitted to another process and another if necessary until a particular output was accomplished similar to the L & D DFD. The current DFD describes four (4) data entries accepted and four (4) generated the main output. Furthermore, it includes five (5) processes for input and four (4) processes for generating output.

Data is processed and generated are stored in fifteen (15) data stores or storage. And all processes are connected with flowlines to further explain the processes involved in the Teaching and Non-teaching module.

Data storage executes a very delicate function in a system. It needs to be stored and secured systematically for better retrieval purposes. Data that are saved in an object called entities. Entities are described by attributes and being organized and managed systematically as one database. The said organization can be explained in detail through an Entity Relationship Diagram (ERD). Figure 15 shows the ERD of Recruitment, Selection, and Placement (RSP) Module.

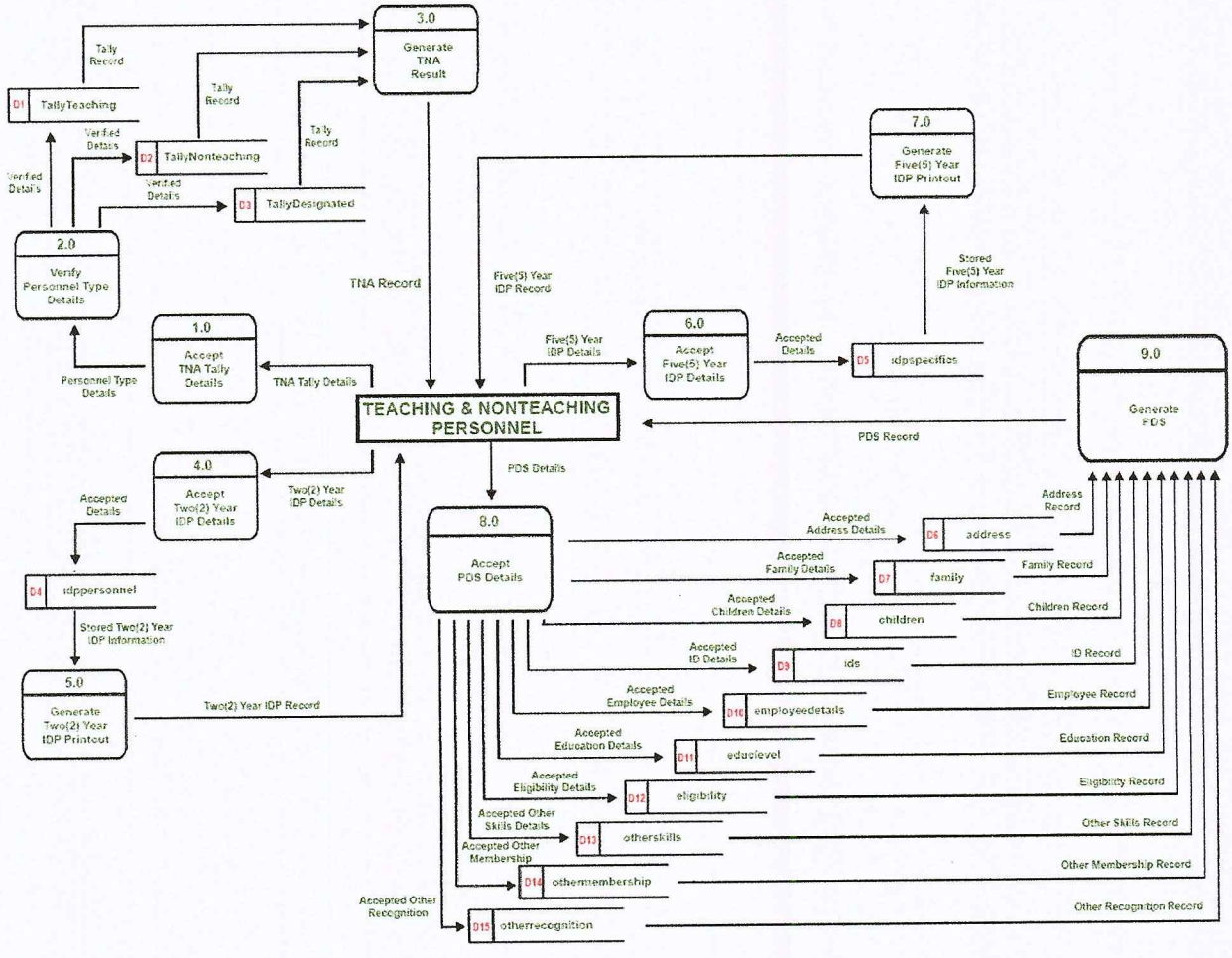


Figure 14. Teaching and Non-teaching Module Level 1 - Data Flow Diagram(DFD) of the System Prototype

Figure 15 shows the ERD of the RSP Module. The said diagram interoperates with 10 entity sets. The relationship of the said diagram or the number of occurrences of a particular data to other entities is explained by a corresponding cardinality. Cardinality, basically defines the number of data is related from one entity to another. In the said diagram, it involves two (2) cardinalities namely: 1) One-to-one cardinality, and; 2) One-to-many cardinality.

Furthermore, the ERD of the Learning and Development module was also designed. Figure 16 shows the entity-relationship diagram of the learning and development module for the proposed system.

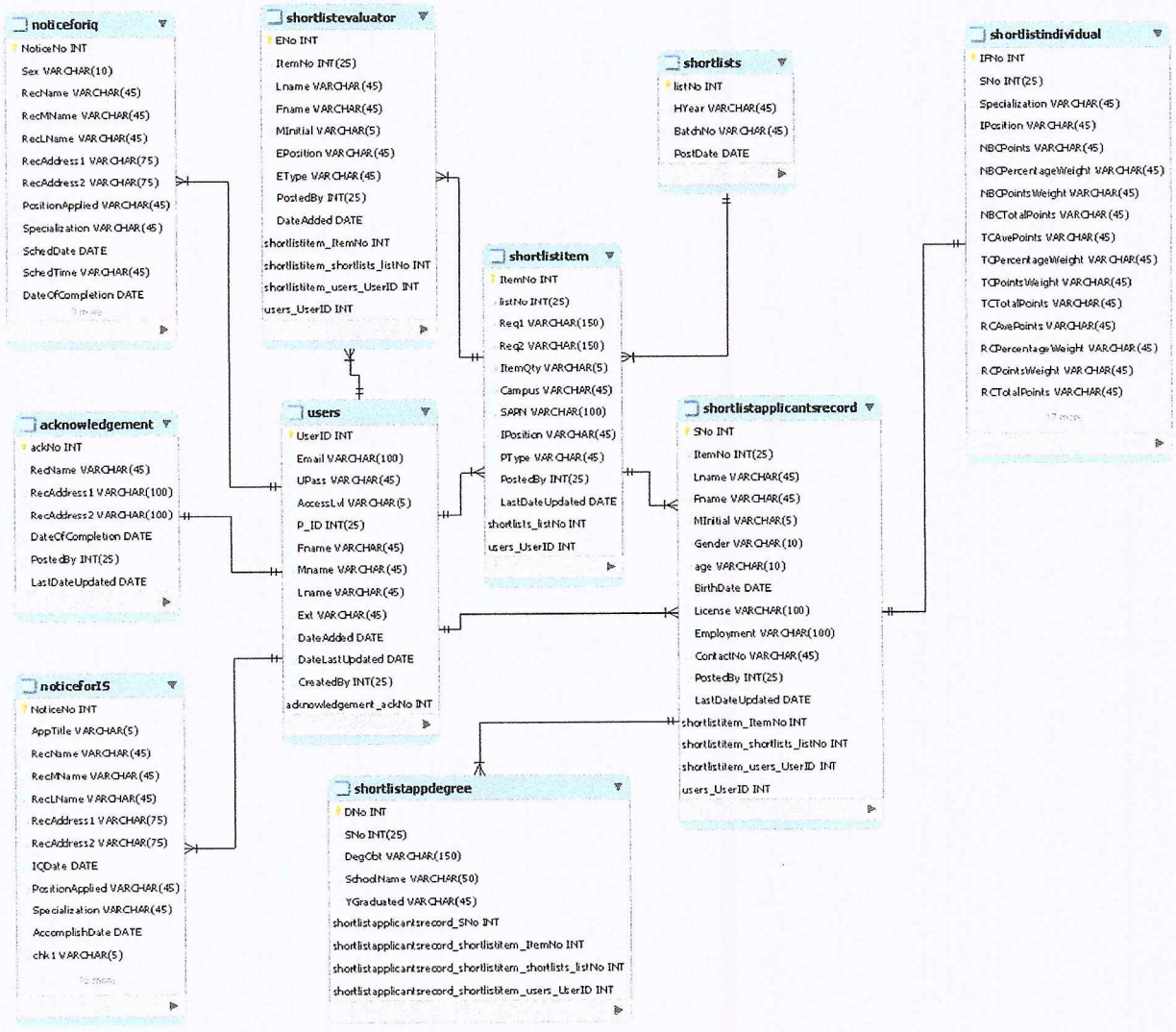


Figure 15. Entity Relationship Diagram of Recruitment, Selection, & Placement(RSP) Module

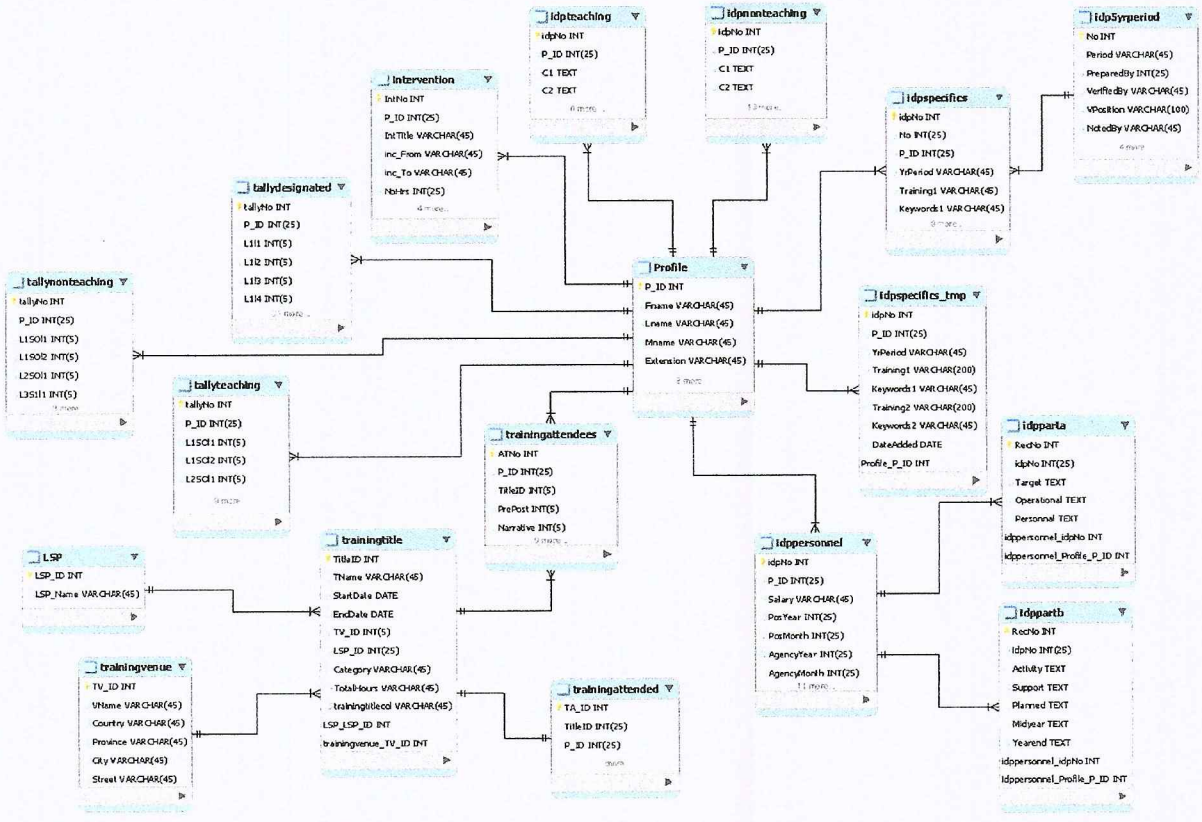


Figure 16. Entity Relationship Diagram of the Learning and Development (L&D) Module

Figure 16 shows the ERD of the L & D Module. The said diagram interoperates with 18 entity sets. In the said diagram, it also involves two (2) cardinalities namely: 1) One-to-one cardinality, and; 2) One-to-many cardinality. On the other hand, ERD for Teaching and Non-teaching Module. Figure 17 shows the ERD of the Teaching and Non-teaching module for the proposed Hybrid Data Analytics System for Universities.

Figure 17 shows the ERD of Teaching and Non-teaching Module. The said diagram interoperates with 15 entity sets. In the said diagram, it also involves two (2) cardinalities namely: 1) One-to-one cardinality, and; 2) One-to-many cardinality.

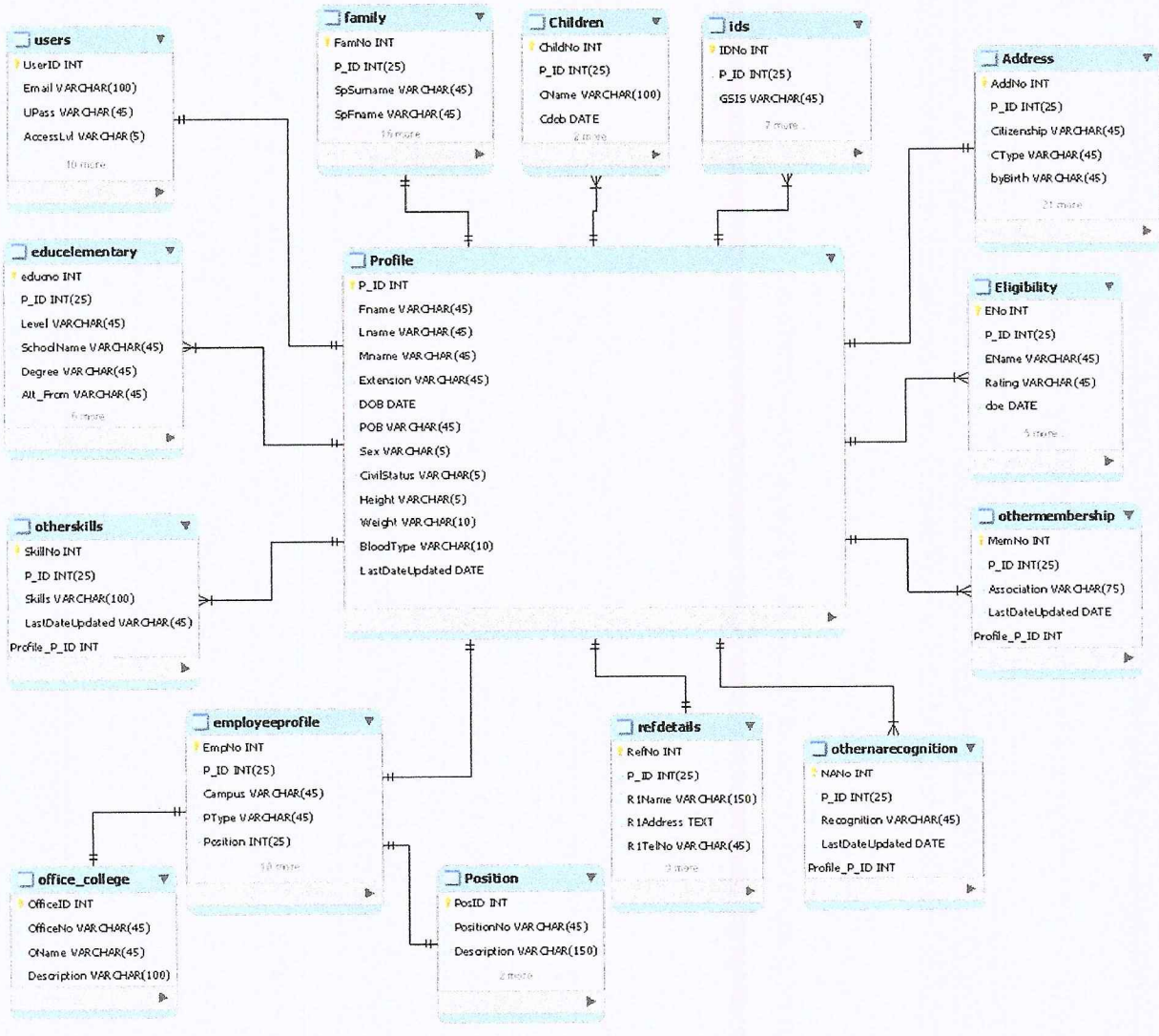


Figure 17. Entity Relationship Diagram of Teaching & Nonteaching Module

Current and Future Data Utilization in Academics, Administration, Research and Extension

Current data utilization presents the general processes of every college and office of the University relative to how records of information are utilized in a particular office. Meanwhile, Future data utilization presents the general processes close to how the process of data utilization will be monitored, tracked, and analyzed for the University's better plans, decisions, and strategies. The presentation of different functions involves three main operational components of the University namely: 1) Academics; 2) Administration and; 3) Research and Extension.

Academics. Shows the Current and Future Data Utilization of the Academic function. Table 11 includes a list of offices, current data utilization, and future data utilization fields.

The identified list of current data utilization of every offices under the administration area were the list of current processes necessary to secure the present data. On the other hand, the identified list of future data utilization was the list of necessary operations to organize and manage historical data to produce necessary reports to support future decisions under the administration area.

Table 11

Current and Future Data Utilization in Academics

Office	Current Data Utilization	Future Data Utilization
Student Affairs	• Secure and retrieve Dental and Medical Records. • Secure and retrieve Student Publication records. • Secure and retrieve Scholarship records. • Secure and retrieve Student Organization records. • Secure and retrieve Guidance and Testing Center records. • Secure and retrieve Arts, Social and Cultural Affairs records • Secure and retrieve Library Records. • Secure and retrieve Sports, Physical and Fitness Development records. • Secure Semestral Report records	• Monitor and track the Dental and Medical records. • Monitor and track Student Publication records. • Monitor and track Scholarship records. • Monitor and track Student Organization records. • Monitor and track Guidance and Testing Center records. • Monitor and track Arts, Social and Cultural Affairs records • Monitor and track Sports, Physical and Fitness Development records. • Generate progress analysis from the submitted semestral report records.
College Deans	• Secure and search formulated program of supervision per semester. • Secure and search developed and maintained teaching procedures, methods, and guides. • Record and search updated curriculum offerings. • Record and search for Syllabi Preparation activities. • Secure Instructional Materials Strategies and Records • Record and search curricular, co-curricular, and all activities of the Department.	• Implement innovative strategies from the formulated program of supervision per semester. • Implement new strategies from the developed and maintained teaching procedures, methods, and guides. • Monitor and track updated curriculum offerings. • Monitor and track new trends implemented in the Syllabi Preparation activities • Monitor, track, and implement new trends to the Instructional Materials Strategies and Records.

Office	Current Data Utilization	Future Data Utilization
College Deans	• Secure records of Student Enrollment, Admission, • Graduates, Faculty Teaching Load, and semestral observation of faculty members. • Secure Faculty Research and Extension project records. • Secure Faculty training and development records. • Secure semestral report records.	• Monitor and track curricular, co-curricular, and all activities of the Department. • Monitor and track records of Student Enrollment, Admission, Graduates, Faculty Teaching Load, and semestral observation of faculty members. • Monitor and track Faculty Research and Extension project records. • Monitor and track Faculty training and development records. • Generate progress analysis from the semestral report records.
University Registrar	• Secure and search evaluated and produced Academic records. • Secure and search Enrolment or Admission records. • Secure and search requested and released documents. • Secure and search archive records in the cabinet • Secure semestral report records.	• Monitor, track, and produce analysis from the evaluated and produced Academic records. • Monitor, track, and produce analysis from the Enrolment or Admission records. • Monitor and track requested and released documents. • Monitor and track archive records in the cabinet. • Generate progress analysis from the semestral report records.
Vice President of Academic Affairs Office	• Secure and search submitted reports of all the Personnel or offices relevant to the Academic Affairs office. • Secure office annual report records.	• Monitor, track, and produce analysis from the submitted reports of all the Personnel or offices relevant to the Academic Affairs office. • Generate progress analysis from the history of annual report records.

Administration. Shows the Current and Future Data Utilization of the Administration function. Table 12 includes a list of offices, current data utilization, and future data utilization fields.

Table 12

Current and Future Data Utilization in Administration

Office	Current Data Utilization	Future Data Utilization
Chief Administrative Office	• Secure and retrieve relevant HRMO office records. • Secure and retrieve relevant Supply & Property Management office records. • Secure and retrieve relevant Procurement office records. • Secure and retrieve relevant Records office records. • Secure and retrieve relevant Infrastructure Development office records. • Secure and retrieve relevant General Services office records. • Secure and retrieve relevant Management of Information System office records. • Secure and retrieve relevant Accounting office records. • Secure and retrieve relevant Budget office records. • Secure and retrieve relevant Cashier office records. • Secure and retrieve relevant Auxillary Service and Business Affairs office records.	• Monitor, analyze, and track relevant HRMO office records. • Monitor, analyze, and track relevant Supply & Property Management office records. • Monitor, analyze, and track relevant Procurement office records. • Monitor, analyze, and track relevant Records office records. • Monitor, analyze, and track relevant Infrastructure Development office records. • Monitor, analyze, and track relevant General Services office records. • Monitor, analyze, and track relevant Management of Information System office records. • Monitor, analyze, and track relevant Accounting office records. • Monitor, analyze, and track relevant Budget office records.

Office	Current Utilization	Future Data Utilization
Chief Administrative Office	• Secure office annual reports records	• Monitor, analyze, and track relevant Cashier office records. • Monitor, analyze, and track relevant Auxillary Service and Business Affairs office records. • Generate progress analysis from office annual reports records.
Vice president for Administrative Affairs	• Secure and search submitted reports of all the Personnel or offices relevant to the Administrative office. • Secure office annual report records.	• Monitor, track, and produce analysis from the submitted reports of all the Personnel or offices relevant to the Administrative Affairs office. • Generate progress analysis from the history of annual report records.

Research and Extension. Shows the Current and Future Data Utilization in Research, and Extension function. Table 13 includes a list of offices, current data utilization, and future data utilization fields.

The identified list of current data utilization of every offices under the research and extension area were the list of current processes necessary to secure the present data. On the other hand, the identified list of future data utilization was the list of necessary operations to organize and manage historical data to produce necessary reports to support future decisions under the research and extension area.

Table 13

Current and Future Data Utilization in Research and Extension

Office	Current Data Utilization	Future Data Utilization
Research and Development Services	• Secure and retrieve research proposals, projects, linkages, and publication records. • Secure and retrieve periodic evaluation of the R & D programs and activities records. • Secure and retrieve research records that were recommended for presentation in national and international fora. • Secure and retrieve research funds, procurement of supplies and materials records. • Secure and retrieve relevant periodical reports.	• Monitor, track, and analyze research proposals, projects, linkages, and publication records. • Monitor, track, and analyze the periodic evaluation of the R & D programs and activities records. • Monitor, track, and analyze research records that were recommended for presentation in national and international fora. • Monitor, track, and analyze research funds, procurement of supplies and materials records. • Generate progress analysis from relevant periodical reports.
Extension Services	• Secure and retrieve extension proposals, projects, linkages, and publication records. • Secure and retrieve periodic evaluation of the extension projects, programs, and activities records. • Secure and retrieve extension projects for funding, procurement of supplies and materials records. • Secure and retrieve relevant periodical reports.	• Monitor, track, and analyze extension proposals, projects, linkages, and publication records. • Monitor, track, and analyze the periodic evaluation of the extension projects, programs, and activities records. • Monitor, track, and analyze extension projects for funding, procurement of supplies and materials records.

Office	Data Current Utilization	Future Data Utilization
		• Generate progress analysis from relevant periodical reports.
International Affairs	• Secure Philippine DFA and foreign embassies relevant records regarding cultural exchanges, scholarships, fellowships, research associateships, and donations. • Secure and retrieve an international funding agency's relevant records. • Secure and retrieve international linkages program records. • Secure and retrieve other relevant international affairs office records. • Secure relevant periodical reports.	• Monitor, track and analyze Philippine DFA and foreign embassies relevant records regarding cultural exchanges, scholarships, fellowships, research associateships, and donations. • Monitor, track and analyze international funding agency's relevant records. • Monitor, track and analyze international linkages program records. • Monitor, track and analyze other relevant international affairs office records. • Generate progress analysis from the relevant history of periodical reports.
Public Relations & External Affairs	• Secure and retrieve relevant Public Relations and External Affairs records. • Secure relevant periodical reports.	• Monitor and track relevant Public Relations and External Affairs records. • Generate progress analysis from the relevant history of periodical reports.
UDRRM	• Secure and retrieve relevant UDRRM programs and activities records. • Secure relevant periodical reports.	• Monitor, track and analyze relevant UDRRM programs and activities records. • Generate progress analysis from the relevant history of periodical reports.
GAD	• Secure and retrieve relevant GAD programs and activities records. • Secure relevant periodical reports.	• Monitor, track and analyze relevant GAD programs and activities records. • Generate progress analysis from the relevant history of periodical reports. •

Office	Data Current Utilization	Future Data Utilization
Research Centers	• Secure and retrieve relevant Research Center programs and activities records. • Secure relevant periodical reports.	• Monitor, track and analyze relevant Research Center programs and activities records. • Generate progress analysis from the relevant history of periodical reports.
Vice president for Research & Extension office	• Secure and retrieve submitted reports relevant to Research and Extension office. • Secure relevant periodical reports.	• Monitor, track, and analyze submitted reports relevant to Research and Extension office. • Generate progress analysis relevant periodical reports.

Support System Tools used in data utilization

This part of the study shows the support system tools used relative to financial, operational, and technology support. A University always aims to provide quality services in every aspect of its organizational Framework. Investing in ICT became a necessity for every organization to assure goal attainment and produce a better quality of services to its clientele. Table 14 shows the acquired support system tools used in data utilization financial area.

Table 14

Acquired Support System Tools in Finance Area

Acquired System Support Tool	Approved budget
University Information System	P5.4 M approved budget(Board Res. No. 45 s. 2011)
Supply and delivery of Hardware	P985,000 approved budget(Board Res. No. 47 s. 2010)
e-NGAS	P500,000 approved budget (For Procurement)

Table 14 shows the current system support tools acquired to help manage data utilization in the base location of the study. University Information System (UIS) were the existing system used for the computerization of data in a particular office. The present situation of UIS is LAN based or dependent to Local Area Network connection. Supply and delivery hardware includes the hardware acquired to implement computerization. The present status of the hardware available in the base location of the study were still insufficient to support the needed equipment in all offices. The e-NGAS system for the accounting office were procured but not yet implemented. The system support tools identified were the means in supporting the current data utilization in the base location of the study. Meanwhile, table 15 shows the acquired support system tools used in data utilization operation area.

Table 15 shows the list of operations included in the outsourced UIS. In the Acquired (UIS) Operation column, it shows the list of modules/package included when the UIS was acquired. On the other hand, the implementation status shows the current operational among the list of packages. Specifically, the human resource package was accepted but not yet implemented neither operational. It will require the programmer from the outsourced company to visit the University to customize the functionalities to fit in the needs of the HR office. Furthermore,

table 15 shows the in-placed Network Setup of the support system tool of data utilization in technology support area.

Table 15

Acquired Support System Tools in Operation Area

Acquired System (UIS) for Operation	Implementation Status
Phase I – Registrar Module	Operational
Phase I – Enrolment Module	Operational
Phase II – Short Courses Module	Accepted but need to Revisit
Phase II – Academe/Curriculum Module	Accepted but need to Revisit
Phase II – Medical and Dental Module	Accepted but need to Revisit
Phase II – Research and Extension Module	Accepted but need to Revisit
Phase II – Digital Data Archiving Module	Accepted but need to Revisit
Phase II – University Website with Web-based query	Accepted
Phase II – Cashier and Budget Module	Accepted but need to Revisit
Phase II – Property Management Module	Accepted but need to Revisit
Phase II – Executive Information Module	Accepted but need to Revisit
Phase II – Payroll	Partially Accepted but need to Revisit
Phase II – Time Keeping	Partially Accepted but need to Revisit
Phase II – Human Resource	Partially Accepted but need to Revisit
Phase II – Control Panel of HRIS	Partially Accepted but need to Revisit
MS Office Application-based transactions	Operational

Table 16 shows the existing network setup of the base-location of the study. The present network setup can accommodate the online setup but there are no online systems yet in place or operational. Presently, it allows the transaction to selected offices to store information in a server located in the MIS office. The selected offices are dependent in the availability of the server inside the University

only. Moreover, table 16 shows the available technical support for MIS who manages the support system tool of data utilization in technology support area.

Table 16

Technology Support Existing Setup

Network Setup	Implementation
Network Infrastructure Design	Fiber Optic in the Main Campus only
Local Area Network	Per Office/College
Internet Bandwidth	o 100 Mbps Dedicated Line distributed to the whole University o 4 pcs of 50 Mbps VDSL Connection o 50 Mbps Internet connection for Computer Laboratories

Table 17

Current Technical Personnel Support for MIS

Designation	Quantity	Status of Employment
MIS Director	1	Permanent
System Programmer	1	Permanent
Network Administrator	3	2 Permanent, 1 Job Order
UIS Administrator	1	Permanent
ICT Maintenance Personnel	2	Job Order
Internet Lab. In-charge	1	Job Order
Website Administrator	1	Permanent
Website Technical Support	1	Job Order

Table 17 shows the available skilled Personnel hired to manage the data utilization in the base location of the study. The present setup of the MIS office suffices the needed operation of the University regarding the network and internet connection. The base location of the study presently has only one (1) MIS office

therefore headed by 1 MIS Director only. Other operations were maintained appropriately by other designated skilled Personnel.

The problems encountered in the current and future data utilization were included to present the identified problems in managing how the data was being used. Similarly, the possible problems in managing and organizing the historical data in the future were also identified. Lastly, the list of problems in the present operation were also identified to understand the problems of the different parts of the current system.

Problems encountered in the current, future data utilization, and system operation

In this part of the study, FGD and individual interviews were conducted to the respondents and the responses collected were focused on the problems encountered in the current data utilization and the problems that will be encountered in the future data utilization. Furthermore, the responses were also collected for the problems encountered in the system operation. The said responses were collected from 33 total respondents which include three(3) Vice presidents, six(6) HRM Personnel, fifteen(15) Teaching Personnel and nine(9) Non-teaching Personnel.

The following responses of the problems encountered were categorized into three namely: 1) Current Data Utilization; 2) Future Data Utilization, and; 3) Present System Operation, and presented through tables. Table 18 showed the

problems encountered in the current data utilization of a University before the Implementation of the proposed system.

Table 18

Problems encountered in the Current Data Utilization

Problems Encountered of the Current Data Utilization (*N*=33)	Frequency (f)	Percentage (%)	Rank
MS Excel dependent transactions in record keeping, monitoring, and generation of progress report	33	100%	1
Generating of reports that requires a lot of time of work	30	91%	2
Generating of comparative assessment type of report	29	88%	3
Saving of records by file and folder	28	85%	4.5
Notification or reminders	28	85%	4.5
Current system of faculty records are safe kept by folder but some of the contents were not fully categorized	27	82%	6
IPCR entry validation and computation consistency	26	79%	7.5
Searching history of records	26	79%	7.5
Search and identify student and faculty research projects or thesis that will be helpful to research and extension projects.	25	76%	9
Consolidate personnel trainings and seminars by Category	24	73%	10
IPCR and OPCR management is hard to validate since the entries of the personnel were incorrect.	21	64%	11
Manual checking of personnel who attended a particular training per year	20	61%	13
Manual Computation per record	20	61%	13
Re-encoding of consolidated data	20	61%	13
Computation of NBC Points with regards to seminars or trainings attended and type of training (Local, Regional,etc.)	19	58%	15

Problems Encountered of the Current Data Utilization (*N*=33)	Frequency (f)	Percentage (%)	Rank
Generation of NBC 461 evaluation result based from Local Evaluators	16	48%	17
Sharing of files and or records	14	42%	20
Dissemination of Information with regards to Research and Extension Project activities	13	39%	21
Consolidation of IDP records	10	30%	23.5
Consolidation of reports	10	30%	23.5
Dissemination of research document templates	10	30%	23.5
Reminders or notification for License Renewal or Expired	10	30%	23.5
Duplication of records	8	24%	27
Notification to outsider applicants	8	24%	27
Sharing of files and or records from L & D to RSP is not efficient	8	24%	27
Problem to identify personnel to attend the available training	7	21%	29.5
Problem to identify personnel with training from those without	7	21%	29.5
Sorting of research projects according to classification like regular, or special case	6	18%	31
Computation of tally result of TNA per personnel	4	12%	33
Consolidation of TNA records	4	12%	33
Searching history of applicant records and qualification requirements	4	12%	33

Table 18 shows the list of common problems encountered by the Personnel of a University before the Implementation of the developed system. The said table includes the current problems of the Personnel in the utilization of the past and present data of the University. Several common terminologies were identified in the said list namely: 1) Computation; 2) Consolidation; 3) Safe Keeping or Saving of Records; 4) Dissemination; 5) Duplication; 6) Evaluation; 7) Generation; 8)

Inconsistency; 9) Validation; 10) Manual Process; 11) Notifications; 12) Searching; 13) Sharing, and; 14) Sorting.

The list was ranked according to the most frequent response to the least. The result of the table shows that almost 50% of all the responses talks about the problem in the manual processes of current system. Although the current system utilize computers to execute the process, it was still MS Excel dependent processes wherein the storage and searching of data were still not easy to manipulate to produce organized and meaningful results to support decision-making.

Furthermore, the process of "safekeeping of faculty records" was also identified as a common problem. The process was done through physical folders which is according to 82% of the respondents, the said process is only manageable for several months or at least a year but not applicable after 5 years and above.

More problems was determined with more than half of the number of respondents percentage rate such as IPCR entry validation and computation inconsistency, searching history of records, searching student and faculty research records to support research and extension projects, consolidation of trainings, and seminars of all the Personnel, validation of OPCR and IPCR with incorrect entries, manual checking of personnel records, manual computation, re-encoding of data, and inconsistencies in NBC 461 computation. But these problems will be solved in the Performance Management module but will not be part of this study due to time constraints.

On the other hand, there were part of the list of problems that were identified to be the least common but were found to be equally important to specific Personnel such as submission of periodical results, sharing of files or records, dissemination of information regarding research and extension project-related tasks or activities, consolidation of IDP records, reports, reminders of license renewal, identification of Personnel with trainings from the Personnel without, sorting, consolidation of TNA records, and searching history of applicant records and qualification requirements.

Likewise, the list of problems that will be encountered for future data utilization was also determined by the same respondents. Table 19 shows the problems that will be encountered in future data utilization.

Table 19 also shows the list of common problems that will be encountered by the Personnel in the future data utilization such as management of the historical data. The said table includes the common problems of the Personnel regarding the future utilization of data of the offices of the entire University. Different common terminologies were also recognized in the said list namely: 1) Comparison; 2) Detection; 3) Generation; 4) Inventory; 5) Monitoring; 6) Locate, and; 7) Tracing.

Table 19

Problems that will be encountered in the Future Data Utilization

Problems the will be Encountered in the Future Data Utilization (*N*=33)	Frequency (f)	Percentage (%)	Rank
Comparison of new records to old records	33	100%	1.5
Generating of report from Histrory of records	33	100%	1.5
Inventory of trainings and seminars is not easily traced	31	94%	3
Tracing of IDP record for a particular training	30	91%	4.5
Monitoring Teaching and Non-teaching Training records acquired	30	91%	4.5
Generating of summary of training records for the whole University	29	88%	6
Monitoring of research for submission of terminal report	28	85%	7
Summary of Trainings for college or office and the individual personnel	27	82%	8
Tracing of research and extension records by expertise or by theme	25	76%	9
Monitoring Number of completed researches per college	24	73%	10.5
Tracing of submission of reports with signatories or approval consumes time per office	24	73%	10.5
Tracing of IPCR and OPCR records	22	67%	12
Generating of annual reports	21	64%	14
Monitoring of requested supplies for research and extension	21	64%	14
Monitoring of research progress like completed or submitted to publication	21	64%	14
Comparison of published research to list of CHED accredited journals	18	55%	16
Monitoring Number of implemented research	17	52%	17.5
Problem to find and locate records like existing research projects consumes a lot of time	17	52%	17.5
Monitoring Number of approved proposal per college	15	45%	19.5

Problems the will be Encountered in the Future Data Utilization (*N*=33)	Frequency (f)	Percentage (%)	Rank
Monthly Monitoring of research for submission of progress report	15	45%	19.5
Monitoring of teachers per subject and monitoring of part-timer per college	14	42%	21.5
Searching of available teaching personnel for subject Loading	14	42%	21.5
Monitoring the personnel of updating eligibility records	13	39%	23
Tracing of Academic Records of the Employed Personnel necessary for Temporary Position Status of employment	9	27%	24
Detection of NBC Points for personnel with ceiling points	5	15%	25

Furthermore, based on the result's ranking, most of the possible problems will be more on how to manage the records to understand the difference of the status of historical data and the status of present data. It also signifies that locating the history of records might not be manageable due to a lack of record organization. Table 19 shows the problems encountered in the current System Operation using manual operations.

Table 20 showed the list of commonly encountered problems in the system in a University's current operation. The said list involves personnel management, office management, document processing, and physical filing of records problems and data utilization. Most of the responses were about having a system that is centralized and as much as possible transparent to the details of the records such

Table 20

Problems encountered in the current System Operation

Problems Encountered in System Operation (*N*=33)	Frequency (f)	Percentage (%)	Rank
Problem of paperworks	30	91%	1
Records are not centralized	28	85%	2
Monitoring of budget for training	24	73%	3
Problem to compare, control and trace budget allotment per personnel with regards to attending trainings and seminars	19	58%	4
Some important history of data were not accessible	18	55%	5
Outsourced System is not that customizable to fit the transactions of the University	16	48%	6
Tracing of activity records from the previous administration	10	30%	7
Current process is overpowered thus to bypass proper step by step process of the system	7	21%	8
No central mechanism to determine personnel for travel	6	18%	9.5
The office of L & D was not aware of the personnal training of the personnel right until the training was completed	6	18%	9.5
Problem to control or limit the number of training per personnel	4	12%	11
No proper filing of Faculty records from the previous administration	3	9%	12
No proper filing of Certificates submitted from research training	2	6%	13.5
The present system or situation of the University is not institutionalized	2	6%	13.5

as research project budget allocation, procured supplies and materials, or evaluation results. Nevertheless, the problem list implies that many issues will worsen if data utilization issues will not be addressed.

The next table presents the difference of the current manual operation and the operations of the developed system. Table 21 shows the comparison of the HRD manual operation and developed hybrid descriptive data analytics system.

Table 21.

Human Resource Department - Recruitment, Selection, and Placement (RSP) Manual Operation and Hybrid Descriptive Data Analytics System Comparison

Manual Operation	Hybrid Descriptive Data Analytics System
• Create new records in separate MS Word files or Excel files such as acknowledgment receipts, list of applicants, etc. • Create a notification for the qualified applicant to proceed to the next recruitment process through a new document file and manually calling the specified contact number of the applicant. • Takes 15 to 20 minutes task accomplishment per applicant • Create a new MS Word file to produce shortlisted applicants. • Opens the existing records of the qualified applicants, copies the information, and pastes it in the newly created Word File.	• New records were created through Entry Forms and stored the information in the cloud database. • Using filter search to find the qualified applicant • Update the status by clicking a button, then automatically sends a notification email for the preceding process. • Takes 3 to 5 minutes task accomplishment per applicant • The prototype cannot produce SMS Notification, but the implementation depends on the research project's budget. • Filter applicants through a search box and add the selected applicant to the shortlisted file along with its complete information. • Click a button to generate the shortlisted applicants along with the

Manual Operation	Hybrid Descriptive Data Analytics System
• It takes time to open previously created different files of different applicants. • It takes more than an one (1) hour to accomplish the task.	• complete information of authorized signatories. • It takes 3 to 5 minutes to accomplish the task.
• Create a new MS Word file to produce the Individual Assessment form of each qualified applicant for demonstration. • Add the list of qualified applicants in the Individual Assessment List of Records through manual data entry of the information of the applicants. • It takes 4 hours (half day) or more depending on the number of items offered or the number of applicants.	• Filter qualified applicants through a search box and produce an Individual Assessment form of the selected applicant. • Click view Individual Assessment Records to show an automated view of the list of qualified applicants with the option to view and print records individually. • It takes 4-8 minutes to accomplish the task.
• Create new MS Word File to produce a Comparative Assessment Form by copying all individual assessment records of all the applicants. • It takes 1 to 2 hours to accomplish the task depending on the number of items offered or the number of applicants.	• Filter applicants by batch and view automated Comparative Assessment Form view result. • It takes 3-5 minutes to generate comparative assessment form.
• Manually creating an analysis from the list of records of applicants stored in an excel file. • It takes days to weeks to browse and compare records	• Generate descriptive analysis of the history applicants through display the records per college/office with chart. • It takes 3 to 5 minutes to generate descriptive analysis of the history of records of applicants.

Table 21 shows the RSP recruitment process and its' difference between the manual operation and the hybrid descriptive data analytics system. Most manual operations are created into separate files in the local computer and generate reports by manually searching the file, copying and pasting the records to another file to synchronize the records. On the other hand, the hybrid descriptive data analytics system uses entry forms and search filters to add new records and systematically transfer records to different reports to generate reports efficiently. Furthermore, table 22 shows the comparison of the HRD L & D manual operation and the developed hybrid descriptive data analytics system.

Table 22

Human Resource Department – Learning and Development (L & D) Manual Operation and Hybrid Descriptive Data Analytics System Comparison

Manual Operation	Hybrid Descriptive Data Analytics System
• The list of personnel records was re-encoded for L & D official records. • Survey questionnaires such as TNA, etc., were manually printed and manually disseminated per college/office/personnel. • It takes 1-2 hours to disseminate survey questionnaires • Answered questionnaires were collected manually per college/office/personnel. • It takes days or weeks to revisit every colleges/departments to collect the answered questionnaires.	• Registered Personnel from the RSP office will be automatically available in the L & D Module. • Survey questionnaires were automatically available in every Personnel's account. • Submission of the answered questionnaire was automatically available in the L & D office.

Manual of Operation	Hybrid Descriptive Data Analytics System
• IDP records were collected manually per college/office/personnel. • It takes 15 to 30 minutes to collect IDP records	• IDP records were automatically available in the L & D office after submission
• Manually checks the IDP records for self capability enhancement requests of all the Personnel. • It takes 2-3 hours to determine the Personnel that needs the available training.	• Automatically recommends Personnel for any available enhancement program based on the current IDP record. • It takes 8 to 10 seconds to determine the Personnel that need the available training.
• Manually search, copy, and paste personnel training/seminar/schooling records per college/office/personnel to produce quarterly or annually Learning and Development program reports. • Takes 3 to 5 days to accomplish the task	• Filter option to select a date to produce quarterly or annual learning and development reports of all Personnel per college/office. • It takes 10 to 20 seconds to accomplish the task
• Manual searching of the file and manual counting of the number of training records per Personnel per office/college to generate periodical training analysis report. • Takes 1 to 2 days to accomplish the task	• Automated view of periodical training analysis report through one button or tab click. • It takes 10 to 15 seconds to accomplish the task

Table 22 shows the L & D processes and difference between the manual operation and the hybrid descriptive data analytics system. The manual operations include re-encoding, manual tracing of record, and manual inventory of documents that consumes a lot of time to accomplish a particular report. On the

other hand, the hybrid descriptive data analytics system provides fast record viewing through search filters of records from the RSP module, recommender function, and descriptive data analysis to produce reports with charts.

Similarly, table 23 also shows the comparison of the HRD regular user (teaching and non-teaching Personnel) manual operation and the developed hybrid descriptive data analytics system. The presentation of the table was important to shed light of the improvements from the manual operations to a new systematic way of operation.

Table 23

Human Resource Department – Regular User Manual Operation and Hybrid Descriptive Data Analytics System Comparison

Manual Operation	Hybrid Descriptive Data Analytics System
• Creating new Personal Data Sheet record by either editing the content of the necessary containers like Degree, Trainings, Seminars, employment records, etc. • The Personnel usually bring-out its records physically and manually looking for the updated documents to be entered in the PDS form. • It takes 5 to 15 minutes at least to update the content of the PDS	• Accepts necessary information needed for producing Personal Data Sheet record through a systematic data entry form. • Adding of entries per container like Degree, Trainings, Seminars, Employment Records, and other important information in the PDS was provided for easy generation of PDS file for printing. • It takes 3 to 7 minutes at least to update the content of the PDS

Manual Operation	Hybrid Descriptive Data Analytics System
• The L & D officer manually browse the L & D records to monitor the capability improvement achieved of all the Personnel of the University. It also includes the comparing of the Individual Development Plan (IDP) records of every individual who matches the available opportunity for training, scholarships, etc. • It takes 2 to 3 days to crossmatch IDP records of all the Personnel and determine to Personnel for recommendation to attend the available opportunity for training, scholarships, etc.	• The L & D officer uses filter options to view the capability improvement achievements of every Personnel. • The system automatically displays the number of trainings, and Seminars attended by a particular personnel. • The system automates the cross matching of the available opportunity for training, scholarships, etc. to the submitted IDP plan and automatically recommends or shortlist the Personnel that might need the available opportunity. • The L & D officer uses filter to generate a descriptive analysis of the summary of trainings, seminars attended per department/college or individually. • It takes 8 – 12 seconds to recommend Personnel to attend the available opportunity of training, seminars, scholarships, etc.

Performance of the developed prototype of the system

The proposed system has been tested and evaluated by selected users in three (3) Universities of Samar. The said Universities were Northwest Samar State University, Samar State University, and the University of Eastern Philippines. The activity allowed the researcher to observe several positive feedbacks and significant recommendations.

The system's Recruitment, Selection, and Placement module were found to be more helpful to speed up the processes and or transactions done by the RSP personnel to accomplish and produce significant reports accurately and efficiently.

The online conduct of the RSP transactions allows the office to be more reliably productive to its regular works and accomplishments.

On the other hand, the Learning and Development module was also found to be more effective compared to the traditional processes of the said office using traditional tools for producing results. The data analysis and automated functions of the proposed system allowed the Personnel to simplify and improve the accuracy and efficiency of the current system. Through the proposed module for L & D, it was realized that the processes that involve necessary information from all the Personnel of the University will be done in a more synchronized manner.

Meanwhile, the system's module for the Regular User (Teaching and Non-teaching Staff) were also found to be efficient from the transactions and tasks of the current system. The module provided the regular user an easier way to edit, download, and print an up to date Personal Data Sheet record. The PDS function of the proposed system is more adaptable than a stand-alone hard copy or soft copy PDS file since the said function allows the Human Resource office to be updated about the personnel relevant records. Additionally, online transactions such as Training Records inventory, Training Needs Analysis, and Individual Development Plan was found to have a better advantage.

The evaluation result of the prototype was found to be functional, reliable, usable, efficient, and accurate. Specifically, the said result was based on the simulation and testing conducted to 15 Teaching Staff, 9 Non-teaching Staff, 3 RSP Personnel, and 3 L & D Personnel from PRIME HRD Office of three Universities

of Samar namely SSU, NwSSU, and UEP. The software quality evaluation questionnaire was based on the ISO 9126 Software Quality International Standards of ISO/IEC. Each respondent used and tested the proposed system to understand mainly its level of acceptability. Table 24 shows the functionality evaluation result for the Regular User module. The table is intended for showing how the necessary functionalities of the said module responded to the needs of the user when executed.

Functionality evaluation for regular user module was conducted to evaluate the necessary functions by the said user such as Personal Data Sheet data entry, Employee profile, TNA, and IDP. The mean weight of Item 1 resulted in **4.79** with an interpretation of "**Highly Acceptable**" and SD of **0.41**. The result signifies that the function made for accepting data entry of PDS is highly accepted by the end-users. SD result verifies that most of the end-users response were closely clustered around the mean which means that end-users agrees to accept and include the said functionality in the proposed system. Similarly, other items demonstrate a similar interpretations and explanations.

The overall mean weight result of **4.70** simply implies that the functionalities included in the Regular User module were "**Highly Acceptable**", the nature of the response of the respondents is homogeneous and is verified to have a highly extensive condition and functioning excellently.

Table 24

Regular User Module Functionality Evaluation Result

FUNCTIONALITY	MEAN WEIGHT	INTERPRETATION
The module were able to accept necessary inputs of the Personal Data Sheet.	4.79	Highly Acceptable
The module were able to accept necessary inputs of an Employee Profile.	4.46	Highly Acceptable
The module were able to accept necessary inputs for Training Needs Assessment record.	4.71	Highly Acceptable
The module were able to accept necessary inputs for Individual Development Plan record.	4.75	Highly Acceptable
The module allowed the user to view the list of Trainings attended.	4.67	Highly Acceptable
The module were able to provide data analysis of the Training Records of the Personnel.	4.58	Highly Acceptable
The module allowed the user to change profile password for security.	4.92	Highly Acceptable
The module were able to adhere the standards, conventions or regulations in laws similar prescriptions relating to functionality.	4.71	Highly Acceptable
Overall Mean Weight	**4.70**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Table 25 shows the reliability evaluation result for the Regular User module. The table is intended for showing the extent of consistency, and trustworthy the module is relative to the needs of the said user upon execution.

Table 25

Regular User Module Reliability Evaluation Result

RELIABILITY	MEAN WEIGHT	INTERPRETATION
User accounts were uniquely accessed.	4.96	Highly Acceptable
Records were viewed precisely according to how it were previously saved.	4.92	Highly Acceptable
Records were not allowed to be saved unless necessary data entries were filled.	4.13	Acceptable
Data entries were precisely accepted.	4.08	Acceptable
Information were accessed and viewed consistently in other browsers available.	4.42	Highly Acceptable
Option to recover files or records were provided.	3.71	Acceptable
Option to backup files or records were provided.	3.63	Acceptable
The module were capable to adhere to standards conventions or regulations relating to reliability.	4.25	Highly Acceptable
Overall Mean Weight	**4.26**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Reliability evaluation for regular user module was conducted to evaluate the necessary functions for the said user if whether it maintains a specified level of performance even under different conditions. The items with weighted means

4.96 and **4.92** denote that the module was consistent in terms of accessing accounts uniquely and retrieving stored records in the database. Although the items with the lowest weighted means **3.67** and **3.63** were found to be acceptable, which means the functions are still found to be necessary for the module, it also means that backup and recovery options should be improved. Furthermore, the overall mean weight result of **4.26** implies that the capability of the module to maintain its level of performance in a given situation were "**Highly Acceptable**", the nature of the response of the respondents were homogeneous and were also verified to have a highly extensive condition and functioning excellently.

Table 26 shows the usability evaluation result for the Regular User module. The table is intended to describe the capability of the module to be user-friendly, easy to be learned, and easy to be operated.

Usability evaluation for regular user module was conducted to evaluate the necessary functions for the said user were easy to be understood and attractive to the user. The first item with a mean weight of **4.63** simply implies that the module was "**Highly Acceptable**" to be user-friendly. The module was also found to have a weight mean of **4.71** and were interpreted as "**Highly Acceptable**" that the function was implemented to be easy to be learned. Generally, the overall weighted mean resulted to **4.67** which implies that the usability feature that was implemented in the Regular User module was "**Highly Acceptable**", the nature of the response of the respondents were homogeneous and verified to have a highly extensive condition and functioning excellently.

Table 26

Regular User Module Usability Evaluation Result

USABILITY	MEAN WEIGHT	INTERPRETATION
User-friendliness were practically observed.	4.63	Highly Acceptable
Easy to learn process of using the module were implemented.	4.71	Highly Acceptable
Module were designed to be easily operated and controlled.	4.58	Highly Acceptable
User recommends to use or implement the newly designed module.	4.71	Highly Acceptable
The module were capable to adhere standards, conventions, style guides or regulations relating to usability.	4.71	Highly Acceptable
Overall Mean Weight	**4.67**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Table 27 shows the efficiency evaluation result for the Regular User module. The table is intended to describe the capability of the module to deliver appropriate performance, in a minimal period, under stated conditions.

Efficiency evaluation for regular user module was conducted to evaluate the time behavior of the process execution of each function implemented in the module of the proposed system. Securing data entries of records were found to be "**Highly Acceptable**" with the weighted mean of **4.67**.

Table 27

Regular User Module Efficiency Evaluation Result

EFFICIENCY	MEAN WEIGHT	INTERPRETATION
Data entry of records were secured efficiently.	4.67	Highly Acceptable
Records were efficiently searched and viewed.	4.50	Highly Acceptable
User interface were designed to be navigation efficient.	4.67	Highly Acceptable
Reports were efficiently generated.	4.88	Highly Acceptable
The module were capable to adhere standards or conventions relating to efficiency.	4.63	Highly Acceptable
Overall Mean Weight	**4.67**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

It simply means that the module was efficient in storing records into the database. Similarly, item 2 denotes that records were efficiently retrieved as well with the result of **4.50** weighted mean and "**Highly Acceptable**" interpretation. Moreover, other items were found similarly to be efficient with regards to navigation and generating reports. Generally, the overall weighted mean resulted in **4.67** which implies that the capabilities of the Regular User module relative to time behavior were "**Highly Acceptable**", with homogeneity response, high extensive condition, and functioning excellently.

Table 28 shows the accuracy evaluation result for the Regular User module. The table is intended to describe the capability of the module to produce the required degree of precision.

Table 28

Regular User Module Accuracy Evaluation Result

ACCURACY	MEAN WEIGHT	INTERPRETATION
Records were accurately searched and viewed.	4.67	Highly Acceptable
Records were accurately saved or stored in the database.	4.75	Highly Acceptable
Reports were accurately generated.	4.71	Highly Acceptable
Accounts were accurately accessed.	4.88	Highly Acceptable
The module were capable to adhere standards or conventions relating to accuracy.	4.71	Highly Acceptable
Overall Mean Weight	**4.74**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Accuracy evaluation for regular user module was conducted to evaluate the level of data precision for both input and output process transactions. Input processes involved in searching and saving records were found to be accurate having a weighted mean of **4.67** and **4.75** respectively with an interpreted result of

"**Highly Acceptable**". On the other hand, the Output processes like viewing, retrieving, and generating reports were also found to be "**Highly Acceptable**". Generally, the overall weighted mean resulted in **4.74** which means that the capabilities of the Regular User module relative to providing the necessary results with a high degree of precision were "**Highly Acceptable**", with homogeneity response, with a high extensive condition, and functioning excellently.

Table 29 shows the functionality evaluation result for the RSP module. The table is intended for showing how the necessary functionalities of the said module responded to the needs of the user when executed.

Table 29

RSP Module Functionality Evaluation Result

FUNCTIONALITY	MEAN WEIGHT	INTERPRETATION
The module were able to accept necessary inputs to produce Applicant Acknowledgment Receipt report consistently.	5.00	Highly Acceptable
The module were able to accept necessary inputs to produce Notice for IQ Test report consistently.	5.00	Highly Acceptable
The module is able to accept necessary inputs to produce Notice for Interview and Screening report consistently.	5.00	Highly Acceptable
The module is able to accept necessary inputs to produce Applicants Shortlist report consistently.	5.00	Highly Acceptable

FUNCTIONALITY	MEAN WEIGHT	INTERPRETATION
The module is able to accept necessary inputs to produce Comparative Assessment report consistently.	5.00	Highly Acceptable
The module were able to accept data entry for new personnel record consistently.	4.67	Highly Acceptable
The module were able to interoperate to User's module data entry.	4.33	Highly Acceptable
The module were able to provide data analysis.	5.00	Highly Acceptable
The module were accessible to an authorized RSP Personnel only.	5.00	Highly Acceptable
The module were able to adhere the standards, conventions or regulations in laws similar prescriptions relating to functionality.	4.67	Highly Acceptable
Overall Mean Weight	**4.88**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Functionality evaluation for RSP module was conducted to evaluate the necessary functions by the said user such as securing acknowledgment Receipt, producing Notice for IQ Test, Interview, and Screening, generating applicants shortlist, individual and comparative assessment reports. The items with the weighted mean result of **5.0** signify that the functions provided to RSP module were "**Highly Acceptable**" simply means that all the user personnel of RSP module from three different Universities uniformly agrees that the functions provided

were compliant to the needs of the said Personnel. The item with a weighted mean result of **4.67** and **4.33** needs a slight improvement but still considered and interpreted as "**Highly Acceptable**" which means that the module allows the RSP personnel to interoperate from the Regular User module. The overall mean weight result of **4.88** simply implies that the functionalities included in the RSP module were "**Highly Acceptable**" and the nature of the response of the respondents is homogeneous. Furthermore, the result also verifies that the module was able to have a highly extensive condition and function.

Table 30 shows the reliability evaluation result for the RSP module. The table is intended for showing the extent of consistency, and trustworthy the module is relative to the needs of the said user upon execution.

Table 30

RSP Module Reliability Evaluation Result

RELIABILITY	MEAN WEIGHT	INTERPRETATION
User accounts were uniquely accessed.	5.00	Highly Acceptable
Records were viewed precisely according to how it were previously saved.	4.33	Highly Acceptable
Records were not allowed to be saved unless necessary data entries were filled.	4.00	Acceptable
Data entries were precisely accepted.	4.67	Highly Acceptable

RELIABILITY	MEAN WEIGHT	INTERPRETATION
Option to recover files or records were provided.	4.00	Acceptable
Option to backup files or records were provided.	4.00	Acceptable
The module were capable to adhere to standards conventions or regulations relating to reliability.	4.67	Highly Acceptable
Overall Mean Weight	**4.33**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Reliability evaluation for RSP module was conducted to evaluate the necessary functions for the said user if whether it maintains a specified level of performance under different conditions. The first item with a weighted means **5.0** denotes that the module was consistent in terms of accessing accounts uniquely and the second item with 4.33 implies that retrieving stored records in the database was "**Highly Acceptable**" to be consistent as well. The same with the Regular User module result, the backup and recovery options resulted to have the lowest result which means for further improvement. Nevertheless, the overall mean weight result of **4.33** still implies that the capability of the module to maintain its level of performance in a given situation was "**Highly Acceptable**". Moreover, the nature of the response of the respondents was also homogeneous and was functioning excellently.

Table 31 shows the usability evaluation result for the RSP module. The table is intended to describe the capability of the module to be user-friendly, easy to be learned, and easy to be operated by the RSP personnel.

Table 31

RSP Module Usability Evaluation Result

USABILITY	MEAN WEIGHT	INTERPRETATION
User-friendliness were practically observed.	5.00	Highly Acceptable
Easy to learn process of using the module were implemented.	5.00	Highly Acceptable
Module were designed to be easily operated and controlled.	5.00	Highly Acceptable
User recommends to use or implement the newly designed module.	5.00	Highly Acceptable
The module were capable to adhere standards, conventions, style guides or regulations relating to usability.	5.00	Highly Acceptable
Overall Mean Weight	**5.00**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Usability evaluation for the RSP module was conducted to evaluate the necessary functions of the user from the said module were easy to be understood and appealing to the user. All the items were found to have a 5.0 weighted mean with the interpretation of "Highly Acceptable". It simply means that the functions

under the said module were tested and verified to be understandable, easy to learn, user-friendly, and compliance with regards to usability. Generally, the overall weighted mean resulted in **5.0** implies that the usability feature that was implemented in the RSP module were "**Highly Acceptable**", and were having a homogeneity response. Furthermore, the result verifies the functions provided were to have a highly extensive condition and excellent function.

Table 32 shows the efficiency evaluation result for the RSP module. The table is intended to describe the capability of the module to deliver appropriate performance, in a minimal period, under stated conditions in consideration to RSP personnel.

Table 32

RSP Module Efficiency Evaluation Result

EFFICIENCY	MEAN WEIGHT	INTERPRETATION
Data entry of records were secured efficiently.	4.67	Highly Acceptable
Records were efficiently searched and viewed.	5.00	Highly Acceptable
User interface were designed to be navigation efficient.	4.67	Highly Acceptable
Reports were efficiently generated.	5.00	Highly Acceptable
The module were capable to adhere standards or conventions relating to efficiency.	5.00	Highly Acceptable
Overall Mean Weight	**4.87**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Efficiency evaluation for RSP module was conducted to evaluate the time behavior of the process execution of each function implemented in the module of the proposed system. RSP module process was found to be "**Highly Acceptable**" with the weighted mean of **4.67** in two items. It simply means that the module was efficient in storing records into the database and the navigation was designed to be competently fast. Similarly, the result of the other 3 items with the result of **5.00** weighted mean and "**Highly Acceptable**" interpretation simply denotes that the module allows the user to retrieve information and generate the report in just a slight period. Hours of work just to generate a comparative assessment result took **8** to **12** seconds using the module of the prototype. Days of generating an analysis report of all the Personnel's academic backgrounds took **5** to **8** seconds using the module of the prototype. Also, the overall weighted mean resulted in **4.87** implies that the capabilities of the RSP module relative to time behavior were "**Highly Acceptable**", with homogeneity response, high extensive condition, and functioning excellently.

Table 33 shows the accuracy evaluation result for the RSP module. The table is intended to describe the capability of the module to produce the required degree of precision.

Table 33

RSP Module Accuracy Evaluation Result

ACCURACY	MEAN WEIGHT	INTERPRETATION
Records were accurately searched and viewed.	5.00	Highly Acceptable
Records were accurately saved or stored in the database.	4.67	Highly Acceptable
Reports were accurately generated.	5.00	Highly Acceptable
Accounts were accurately accessed.	5.00	Highly Acceptable
The module were capable to adhere standards or conventions relating to accuracy.	4.67	Highly Acceptable
Overall Mean Weight	**4.87**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Accuracy evaluation for RSP module was conducted to evaluate the level of data precision for both input and output process transactions. Input processes involved in searching and saving records for RSP were found to be accurate having a weighted mean of **5.00** and **4.67** respectively with an interpreted result of "**Highly Acceptable**". On the other hand, the Output processes like viewing, retrieving, and generating reports were also found to be "**Highly Acceptable**" with the weighted mean of **5.00** and **4.67,** respectively. Generally, the overall weighted

mean resulted in **4.74** which means that the capabilities of the RSP module relative to providing the necessary results with a high degree of precision were "**Highly Acceptable**", with homogeneity response, with a high extensive condition, and functioning excellently.

Table 34 shows the functionality evaluation result for the L & D module. The table is intended for showing how the necessary functionalities of the said module responded to the needs of the user when executed.

Functionality evaluation for L & D module was conducted to evaluate the necessary functions by the said user such as accessing Personnel training records, TNAs, and IDPs. Majority of the functions were found to have a weighted mean result of **5.0** with the interpretation of "**Highly Acceptable**" denotes that the module perfectly allows the user to add Personnel to specific training, detect personnel IDP records relevant to available training, monitor requirements submission, consolidate TNA and IDP records using the L & D personnel account only.

Other items were also found to be "**Highly Acceptable**" with the weighted mean result of **4.67**. The result means that the module was able to allow the user to successfully add training details, interoperate to the records from Regular User, provide data analysis, change the user account password, and meet the standards, regulations, and conventions relating to functionality.

Table 34

L & D Module Functionality Evaluation Result

FUNCTIONALITY	MEAN WEIGHT	INTERPRETATION
The module were able to accept necessary inputs to add Training Details.	4.67	Highly Acceptable
The module were able to identify and add personnel to a specific training.	5.00	Highly Acceptable
The module were able to detect personnel's IDP training need relevant to the available training.	5.00	Highly Acceptable
The module were able to check the necessary requirements of the personnel to be submitted after attending a particular training.	5.00	Highly Acceptable
The module were able to consolidate the Training Needs Assessment of all the Personnel.	5.00	Highly Acceptable
The module were able to consolidate the Individual Development Plan of all the Personnel.	5.00	Highly Acceptable
The module were able to interoperate to User's module data entry.	4.67	Highly Acceptable
The module were able to provide data analysis.	4.67	Highly Acceptable
The module were accessible to an authorized L&D personnel only.	5.00	Highly Acceptable
The module allowed the L&D Personnel to change his/her own password.	4.67	Highly Acceptable
The module were able to adhere the standards, conventions or regulations in laws similar prescriptions relating to functionality.	4.67	Highly Acceptable
Overall Mean Weight	**4.85**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

The overall mean weight result of **4.85** implies that the functionalities included in the L & D module were "**Highly Acceptable**" and the nature of the response of the respondents is homogeneous. Similarly, the result also verifies that the module was able to have a highly extensive condition and function.

Table 35 shows the reliability evaluation result for the L & D module. The table is intended for showing the extent of consistency, and trustworthiness of the module relative to the needs of the said user upon execution.

Table 35

L & D Module Reliability Evaluation Result

RELIABILITY	MEAN WEIGHT	INTERPRETATION
User accounts were uniquely accessed.	5.00	Highly Acceptable
Records were viewed precisely according to how it were previously saved.	4.67	Highly Acceptable
Records were not allowed to be saved unless necessary data entries were filled.	4.67	Highly Acceptable
Data entries were precisely accepted.	4.67	Highly Acceptable
Information were accessed and viewed consistently in other browsers available.	5.00	Highly Acceptable

RELIABILITY	MEAN WEIGHT	INTERPRETATION
Option to backup files or records were provided.	4.33	Highly Acceptable
The module were capable to adhere to standards conventions or regulations relating to reliability.	4.67	Highly Acceptable
Overall Mean Weight	**4.67**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Reliability evaluation for L & D module was conducted to evaluate the necessary functions of the said module for the L & D user if, whether it maintains a specified level of performance under different conditions. The items with a weighted means **5.0** with the interpretation of "**Highly Acceptable**" denotes that the module was consistent in terms of accessing accounts uniquely and in retrieving and viewing system information in different browsers. Similarly, items which resulted to 4.67 with the same interpretation of "Highly Acceptable" implies that the records were viewed precisely according to how it was previously saved, records were not allowed to be saved unless necessary data entries were filled, data entries were precisely accepted, and verifies that the module created were capable of adhering to standard conventions, or regulations relating to reliability. The same with the Regular User module result, the backup and recovery options resulted to have the lowest result which means for further improvement.

Nevertheless, the overall mean weight result of **4.33** still implies that the capability of the module to maintain its level of performance in a given situation was "**Highly Acceptable**". Moreover, the nature of the response of the respondents was still homogeneous and was functioning excellently.

Table 36 shows the usability evaluation result for the L & D module. The table is intended to describe the capability of the module to be user-friendly, easy to be learned, and easy to be operated by the L & D personnel.

Table 36

L & D Module Usability Evaluation Result

USABILITY	MEAN WEIGHT	INTERPRETATION
User-friendliness were practically observed.	5.00	Highly Acceptable
Easy to learn process of using the module were implemented.	5.00	Highly Acceptable
Module were designed to be easily operated and controlled.	5.00	Highly Acceptable
User recommends to use or implement the newly designed module.	5.00	Highly Acceptable
The module were capable to adhere standards, conventions, style guides or regulations relating to usability.	5.00	Highly Acceptable
Overall Mean Weight	**5.00**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Usability evaluation for L & D module was conducted to evaluate the necessary functions of the user from the said module were easy to be understood and appealing to the user. Similar to the RSP module, all the items were also found to have a 5.0 weighted mean with the interpretation of "Highly Acceptable". It simply means that the functions under the said module were tested and verified to be understandable, easy to learn, user-friendly, and compliance with regards to usability. Moreover, the overall weighted mean resulted in **5.0** also implies that the usability feature that was implemented in the L & D module were "**Highly Acceptable**", and were having a homogeneity response. Furthermore, the result also verifies the functions provided were to have a highly extensive condition and excellent function.

Table 37 shows the efficiency evaluation result for the L & D module. The table is intended to describe the capability of the module to deliver appropriate performance, in a minimal period, under stated conditions in consideration to L & D personnel.

Efficiency evaluation for L & D module was conducted to evaluate the time behavior of the process execution of each function implemented in the module of the proposed system. The majority of the L & D module process were found to be "**Highly Acceptable**" with a weighted mean of **5.0**.

Table 37

L & D Module Efficiency Evaluation Result

EFFICIENCY	MEAN WEIGHT	INTERPRETATION
Data entry of records were secured efficiently.	4.67	Highly Acceptable
Records were efficiently searched and viewed.	5.00	Highly Acceptable
User interface were designed to be navigation efficient.	5.00	Highly Acceptable
Reports were efficiently generated.	5.00	Highly Acceptable
The module were capable to adhere standards or conventions relating to efficiency.	5.00	Highly Acceptable
Overall Mean Weight	**4.93**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

It simply means that the module was efficient in storing records into the database, the navigation was also designed to be competently fast and were able to allow the user to retrieve information and generate the report in just slight period. In the actual operation, creating a tally result of all the teaching personnel alone takes **two(2) weeks** to finish. Roughly computation of **1.5 hours** per tally sheet of Personnel. While using the module, it only took **8 to 10 seconds** to view and print TNA tally results. Also, in a manual-based type of searching and

retrieving IDP records takes **17** seconds while using the module took **5** to **6 seconds**. Moreover, days of tracing IDP records related to the posted training took **1 minute** and **6 seconds** using the module of the prototype. Overall, the weighted mean resulted in **4.93** entails that the capabilities of the L & D module relative to time behavior were "**Highly Acceptable**", with homogeneity response, and with high extensive condition and function.

Table 38 shows the accuracy evaluation result for the L & D module. The table is intended to describe the capability of the module to produce the required degree of precision for the L & D user.

Table 38

L & D Module Accuracy Evaluation Result

ACCURACY	MEAN WEIGHT	INTERPRETATION
Records were accurately searched and viewed.	5.00	Highly Acceptable
Records were accurately saved or stored in the database.	5.00	Highly Acceptable
Reports were accurately generated.	5.00	Highly Acceptable
Accounts were accurately accessed.	5.00	Highly Acceptable
The module were capable to adhere standards or conventions relating to accuracy.	5.00	Highly Acceptable
Overall Mean Weight	**5.00**	**Highly Acceptable**

Legend:

4.21 - 5.00	=	Highly Acceptable
3.41 - 4.20	=	Acceptable
2.61 - 3.40	=	Moderately Acceptable
1.81 - 2.60	=	Slightly Acceptable
1.00 - 1.80	=	Not Acceptable

Similarly, the accuracy evaluation for L & D module was conducted to evaluate the level of data precision for both input and output process transactions. All items were found to have a weighted mean of **5.0** with the interpretation of "**Highly Acceptable**". It implies that the module was highly accepted to have the capability to store, search, view, and generate reports accurately using the L & D personnel user account only. Generally, the overall weighted mean resulted to **5.0** purely means that the capabilities of the L & D module relative to providing the necessary results with a high degree of precision were also "**Highly Acceptable**", with homogeneity response, with a high extensive condition, and function.

Overall, the prototype has received a highly acceptable result which means that the need of the users and most of the problems or issues from RSP and L & D offices were resolved. The researcher received positive feedbacks from other HRD Office from different Universities which makes the prototype ready for Implementation and more upgrades in a real-time operations.

Chapter 5

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary of findings, formulated conclusions, and recommendations of the study. The result of the conducted investigation and system prototype development was the basis of the presentation.

Summary of Findings

This study's primary purpose is to develop the Hybrid Human Resource Descriptive Data Analytics System to provide a better data utilization online system and help produce decision support in the future. Also, this study aimed to provide a solution to the problems encountered of the personnel of Human Resource Management office specifically in Recruitment, Selection, and Placement (RSP), and Learning and Development (L & D) offices such as ease of records data entry, processing, searching records, and generating data analysis reports. Lastly, this study aimed to help both RSP and L & D personnel be efficient in responding to the University's teaching, and non-teaching personnel in any related queries relevant to RSP and L & D functions of PRIME HRM.

The following were the findings of the study:

1. The common activities found to the current and future data utilization of the University on the following functions:

1.1. *Academics.* There are four (4) major modules that will be created in the said function namely: 1) Student Affairs; 2) College Deans; 3) University Registrar, and; 4)Vice president of Academic Affairs Office. Possible submodules will be designed and developed under the student affairs functions such as Dental and Medical Records, Student Publication Records, Scholarship Records, Student Organization Records, Guidance and Testing Center Records, Arts, Social, and Cultural Affairs records, Library Records, Sports, Physical, and Fitness Development Records.

The current data utilization transactions determined were mostly on securing records, and reliable retrieval of records. Meanwhile, the future data utilization transactions determined were mostly focused on monitoring and tracking or tracing of records.

1.2. *Administration.* There are two (2) major modules that will be created in the said function namely: 1) Chief Administrative Office module, and; 2) Vice president for Administrative Affairs Office module. Submodules will be designed under the chief administrative office functions such as HRMO module (PRIME HRM), Supply and Property Management Office module, Procurement Office module, Records Office module, Infrastructure Development Office module, General Services Office module, Management of Information System Office module, Accounting Office module, Budget Office module, Cashier Office module, and Auxillary Service and Business Affairs Office module.

Similarly, the current data utilization transactions determined were mostly in securing data records and reliable retrieval of records. On the other hand, the future data utilization transactions determine were also mostly focused on monitoring, and tracing of records.

1.3. *Research and Extension.* There are eight (8) modules that will be designed and developed in the said function namely: 1) Research and Development Services; 2) Extension Services; 3) International Affairs; 4) Public Relations and External Affairs; 5) UDRRM; 6) GAD; 7) Research Centers, and; 8) Vice president of Research and Extension Office.

Correspondingly, the current data utilization transactions determined were mostly in securing data records and reliable retrieval of records. On the other hand, the future data utilization transactions determine were also mostly focused on monitoring and tracing of records.

2. Support system tools used in data utilization in the following areas:

2.1. *Financial.* In connection to the financial part of the support system of the University, presently, the University is using Local Area Network-based system University Information System or UIS of approximately 5.4 Million pesos. Additionally, the supplies and hardware were procured and delivered worth with the approximate amount of 985,000 thousand pesos. Recently, a budget to procure Electronic-National Government Accounting System worth with an approximate amount of 500,000 was approved.

2.2. *Operational*. The Outsourced UIS is in the Phase II level of development. Phase I only covers Registrar and Enrolment Modules. Both modules were functional. The Phase II of the UIS includes several modules, mostly Accepted. Still, there is a need for revisit namely Short Courses module, Academe module, Research and Extension module, Digital Data Archiving module, University Website with Web-based query, Cashier and Budget module, Property Management module, Executive Information module, Payroll, Time Keeping module, Human Resource module, and Control Panel HRIS module. Besides, most of the transactions in different offices are still MS Application-based dependent transactions operationally.

2.3. *Technology Support*. The University's technology support has an active setup and configuration of local area network infrastructure using fiber optic cable connection between colleges and offices, and UTP cable CAT5 network setup per college or office. MIS workforce includes 11 skilled personnel to support the said configured infrastructure and conduct regular maintenance, namely: 1) One (1) MIS Director; 2) One (1) System Programmer; 3) Three (3) Network Administrator; 4) One (1) UIS Administrator; 5) Two (2) ICT Maintenance Personnel; 6) One (1) Internet Laboratory In-charge; 7) One (1) Website Administrator, and; 8) One (1) Web Technical Support.

3. List of problems encountered for Current and Future data utilization and in the System Operation. In the current data utilization, several common

terminologies were identified in the said list namely: 1) Computation; 2) Consolidation; 3) Safe Keeping or Saving of Records; 4) Dissemination; 5) Duplication; 6) Evaluation; 7) Generation; 8) Inconsistency; 9) Validation; 10) Manual Process; 11) Notifications; 12) Searching; 13) Sharing, and; 14) Sorting. The list was ranked according to the most frequent response to the least. The table shows that almost 50% of all the responses talk about the problem in the manual processes of the current system. Although the current system utilizes computers to execute the process, it was still MS Excel-dependent processes wherein the storage and searching of data was still not easy to manipulate to produce organized and meaningful results to support decision-making.

Meanwhile, in future data utilization, different common terminologies were also recognized in the said list, namely: 1) Comparison; 2) Detection; 3) Generation; 4) Inventory; 5) Monitoring; 6) Locate, and; 7) Tracing. Furthermore, based on the result's ranking, most of the possible problems will be more on managing the records to understand the difference of the status of historical data and the status of present data. It also signifies that locating the history of records might not be manageable due to a lack of record organization. Table 19 shows the problems encountered in the current System Operation using manual operations.

Lastly, a list of problems encountered in the system operation involves personnel management, office management, document processing, and physical filing of records problems and data utilization. Most of the responses

were about having a system that is centralized and as much as possible transparent to the details of the records such as research project budget allocation, procured supplies, and materials, or evaluation results. Nevertheless, the problem list implies that many issues will worsen if data utilization issues will not be addressed.

4. The newly developed system is capable of performing RSP operations such as securing data entries and easy updates through a systematic entry forms. Moreover, a filtering option were also developed for easy searching of existing data. Through the search filter options, viewing of relevant data were very much easier to display than the manual process. Furthermore, email notification and reminder system were implemented to notify and update either the personnel or the client of the current status of the application. Lastly, the prototype includes a descriptive data analysis to efficiently generate records status analysis relevant to history of applicants and University personnel.

   Likewise, it is also capable of performing L & D operations such as Filtering options to view University personnel records. In addition, the prototype includes the management of office's survey questionnaire intended for the utilization of the entire University. It automatically manages both dissemination and consolidation in a centralized manner. Also, the survey function includes automated computation and interpretation of results. Moreover, the L & D module includes filtering option to efficiently retrieve the

list of learning and development activities of all the personnel in the University according to a specified filter date. A recommender and reminder systems were also implemented to help the HR personnel manage Individual Development Plan achievements and necessary follow-up activities to the personnel of the University respectively. Lastly, a descriptive data analysis were included to the module, which determines the learning and development status of the University viewed by the department, college, or office.

All the information of the regular user (Teaching and Non-teaching Personnel) relative to RSP and L & D offices can be managed through a provided individual account and stored directly in the corresponding office in a centralized manner in a cloud server.

5. Assessment result of the evaluation mechanism used to test the functionality, reliability, usability, efficiency, and accuracy of three (3) modules, namely: 1) Regular User; 2) RSP; and; 3) L &D, resulted positively.

Regular Users had an overall weighted mean of 4.7, "Highly Acceptable" interpretation in the aspect of functionality. RSP had an overall weighted mean of **4.88**, "**Highly Acceptable**" interpretation. Meanwhile, L & D had a weighted mean of **4.85**, "**Highly Acceptable**" interpretation.

Regular Users had an overall weighted mean of 4.26, "Highly Acceptable" interpretation in the aspect of reliability. RSP had an overall weighted mean of **4.33**, "**Highly Acceptable**" interpretation. Meanwhile, L & D had a weighted mean of **4.67**, "**Highly Acceptable**" interpretation.

In the aspect of usability, Regular Users had an overall weighted mean of **4.67**, "**Highly Acceptable**" interpretation. RSP had an overall weighted mean of **5.0**, "**Highly Acceptable**" interpretation. Meanwhile, L & D had a weighted mean of **5.0**, "**Highly Acceptable**" interpretation.

Regular Users had an overall weighted mean of 4.67, "Highly Acceptable" interpretation in the aspect of efficiency. RSP had an overall weighted mean of **4.87**, "**Highly Acceptable**" interpretation. Meanwhile, L & D had a weighted mean of **4.93**, "**Highly Acceptable**" interpretation.

Regular Users had an overall weighted mean of 4.74, "Highly Acceptable" interpretation in the aspect of accuracy. RSP had an overall weighted mean of **4.87**, "**Highly Acceptable**" interpretation. Meanwhile, L & D had a weighted mean of **5.0**, "**Highly Acceptable**" interpretation.

Conclusions

Based on the findings, the researcher was able to come up with the following conclusions:

1. The current data utilization requires a system that will accept data entries accurately and reliably, a system that can quickly search existing records efficiently, produce a helpful report, and centralized data dissemination and consolidation. On the other hand, future data utilization requires a

system that can systematically organize historical data to form reliable information to support the management's decision-making.

2. The current system of most SUCs in Samar acquired a computerized system but primarily implemented in Registrar and Cashier's office only. Most of the HR systems are still done manually and do not have any computerized online system to improve work performance. The University administration should consider preparing a specific budget to produce online systems, especially in the Human Resource Development Office.
3. The new system was able to address the identified problems in the current data utilization and be prepared for the possible issues encountered in the future data utilization in the HRD office and other offices in the University.
4. The new system will help attain a higher PRIME HRM level than outsourcing or acquiring costly ICT systems to manage HRM.
5. The developed prototype provided a highly acceptable module for RSP, L & D, Teaching, and Non-teaching personnel of the University in Usability, Accuracy, Reliability, Efficiency, and Functionality. Hence, the research should be considered for funding, implementation, and further study.

Recommendations

Based on the findings and generated conclusions of the study, the following recommendations were proposed:

1. The study determines the need to improve the findings in the current and future data utilization. Hence, the researcher would like to recommend that other offices under the academics, administration, research, and extension should be included in separate research proposals to develop the office's necessary module for integration to the newly developed system.
2. The University's capacity to invest (financial) and manage (human resource) new technologies to improve its operation is highly achievable. With that said, the researcher would like to recommend an additional budget in acquiring a cloud-server specification that can handle an online system like Hybrid Descriptive Data Analytics System.
3. The problems encountered in the current and future data utilization and system operation considerably affect the performance and quality of service provided to its clientele; therefore, the researcher would like to recommend that the study be submitted to the University and approved for application.
4. The prototype mostly met the functional requirements of both RSP and L & D operations. Therefore, the researcher would like to recommend full implementation of both RSP and L &D modules to the said offices to improve the functionality and eventually complete its development.

5. Upon upgrading the system to obtain predictive data analysis, the researcher should utilize Delphi Method in gathering information amongst experts.
6. The researcher highly recommends re-evaluating the developed system using ISO 25010:2011 Software Engineering Quality Standards before implementing the study.
7. The researcher would like to recommend this study to other researchers as a guide to similar studies.

Chapter 6

HUMAN RESOURCE HYBRID DESCRIPTIVE DATA ANALYTICS SYSTEM

This chapter presents the developed prototype for the Human Resource Development office. Specifically, the researcher developed a system prototype for the Recruitment, Selection, and Placement (RSP) Office and Learning and Development (L & D) Office. The sequence of the presentation began with the accessibility up to the generation of the descriptive data analysis. The researcher used figures for the user interface followed by an instructional procedure on using the system.

Recruitment, Selection, and Placement (RSP) Module

1. User Login Interface

The user login interface allows the RSP Personnel to provide an authorized user account through a valid username and Password. Figure 18 shows the interface for user login.

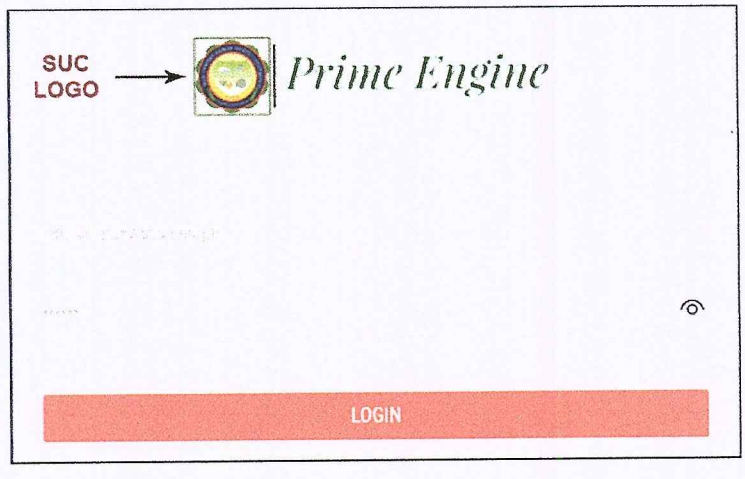


Figure 18. User Login Interface

How to Login

1. Click the "**Email**" input box and type your registered Email Address.
2. Click the "**Password**" input box and type your registered Password.
3. Click the "**Login**" button or press *Enter* key on your keyboard.

2. Dashboard Homepage

The dashboard homepage of the RSP module includes a navigation icon and sidebars. Furthermore, the navigation icons are shortcut links of the sidebar. Sidebar links display the necessary information for viewing the available menu in RSP. Figure 19 shows the home page of the RSP user.

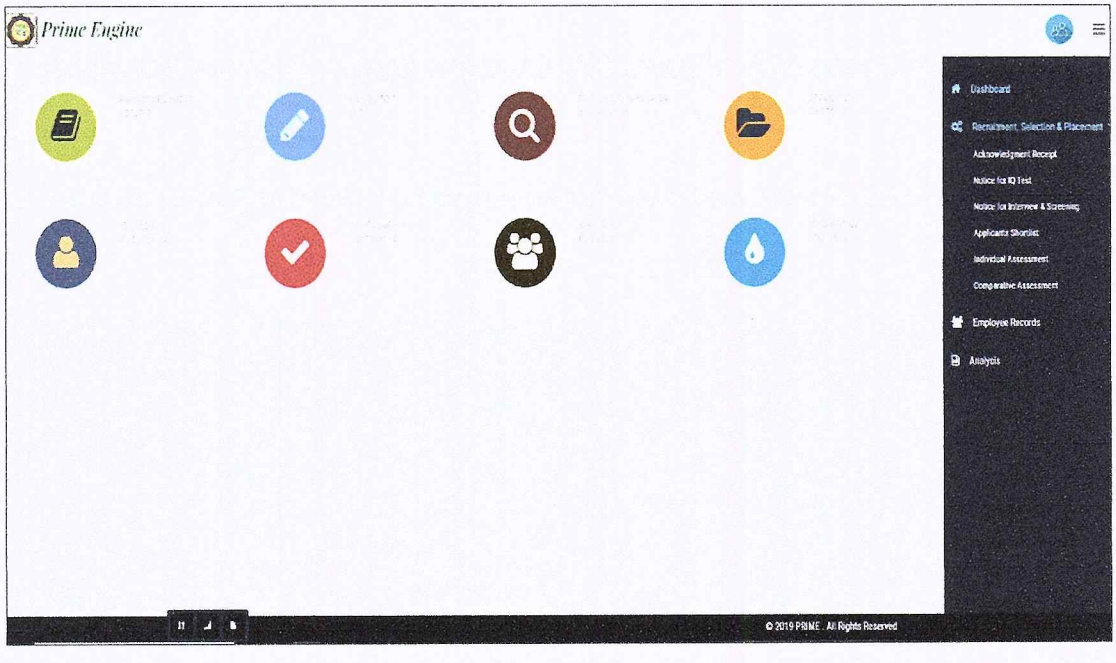


Figure 19. Dashboard Homepage

How to view a specific page

1. Using Dashboard Icons

1. Dashboard icons are rectangular shapes with corresponding labels for a specific page of the system.

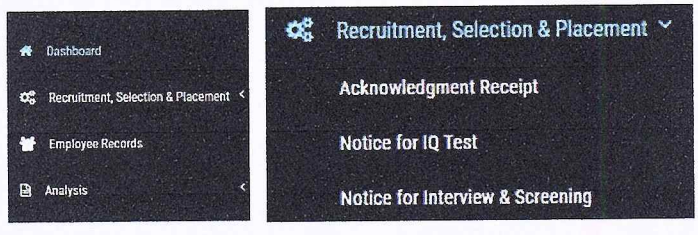
   Sample icons:

2. Using your mouse, click the specific icon that you want to access, and the system will redirect you to the corresponding page of the icon selected.

1. Using Sidebar Menu

1. Sidebar menus are text-based links located on the right side of the screen. Sidebar menu with multi-function includes sub-menu.

   Sample:



2. On the sidebar on the right side of the screen, click the specific menu, and the system will redirect you to the corresponding page of the menu selected. If the chosen menu contains a sub-menu, the system will redirect you to the corresponding page after clicking the sub-menu.

3. **Data Entry Form**

Data entry forms are copies of the printed form in digital format. It allows the system to accept input from the user and store the obtained information in the cloud server's database server. Figure 20 shows the sample Data Entry Form page for getting a new record in the acknowledgment receipt.

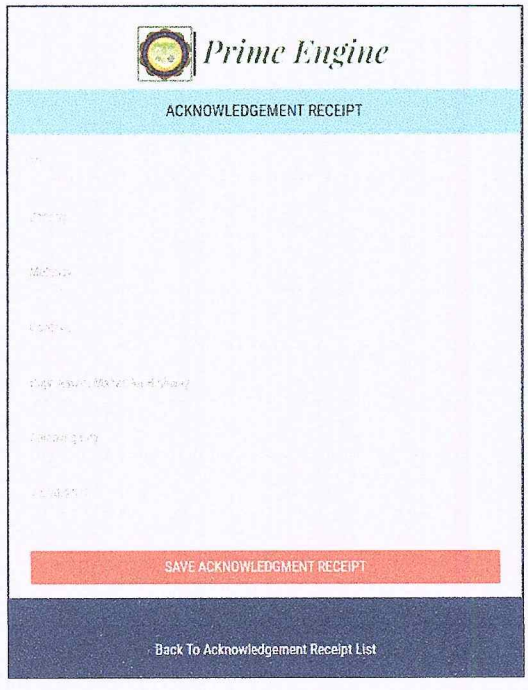


Figure 20. Sample Data Entry Form

How to Add Acknowledgment Receipt New record

1. On the dashboard page, click the "**Acknowledgment Receipt**" icon  or in the sidebar under the **Recruitment, Selection & Placement** menu.

2. On the acknowledgment receipt page, click the "**ADD NEW**" button  located at the upper right corner of the Acknowledgment Receipt Records page.
3. Select the "**Title**" of the applicant (e.g., Mr. or Ms.).
4. Specify the *First Name* of the Applicant in the "**Recipient Name**" input box.
5. Specify the *Middle Name* of the applicant in the "**Recipient Middle Name**" input box.
6. Specify the *Last Name* of the applicant in the "**Recipient Last Name**" input box.
7. Specify the *Barangay or Sub-division & Street* of the applicant in the "**Address**" input box.
8. Specify the *City or Province* of the applicant in the "**City/Province**" input box.
9. Specify the *Received Date* of the applicants' application in the "**Date Received**" input box.
10. Click the "**SAVE ACKNOWLEDGMENT RECEIPT**" button  to **Save** the record or click the "**BACK TO ACKNOWLEDGMENT RECEIPT LIST**" link  to **Cancel**.

4. **Filter / Search Option**

Filter or search option allows the user to select the existing record and use it in another set of forms. This process enables the user to avoid re-encoding the unnecessary data and eventually improve the efficiency in providing input in a particular state. Figure 21 shows the utilization of a search option to retrieve the existing record and use it in another set of forms.

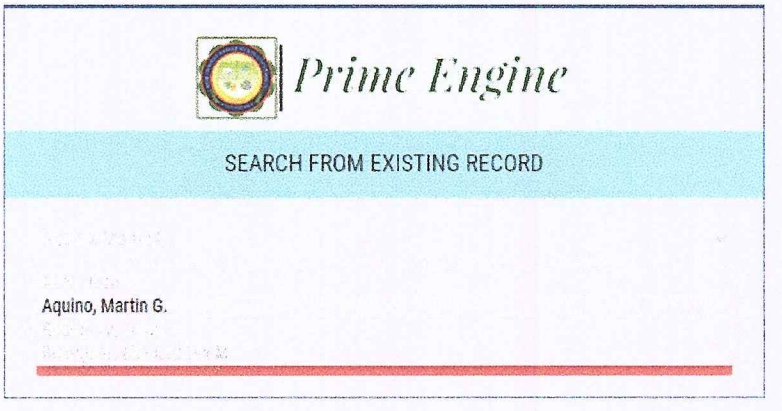


Figure 21. Sample Search Function

How to Add Notice for IQ Test New Record

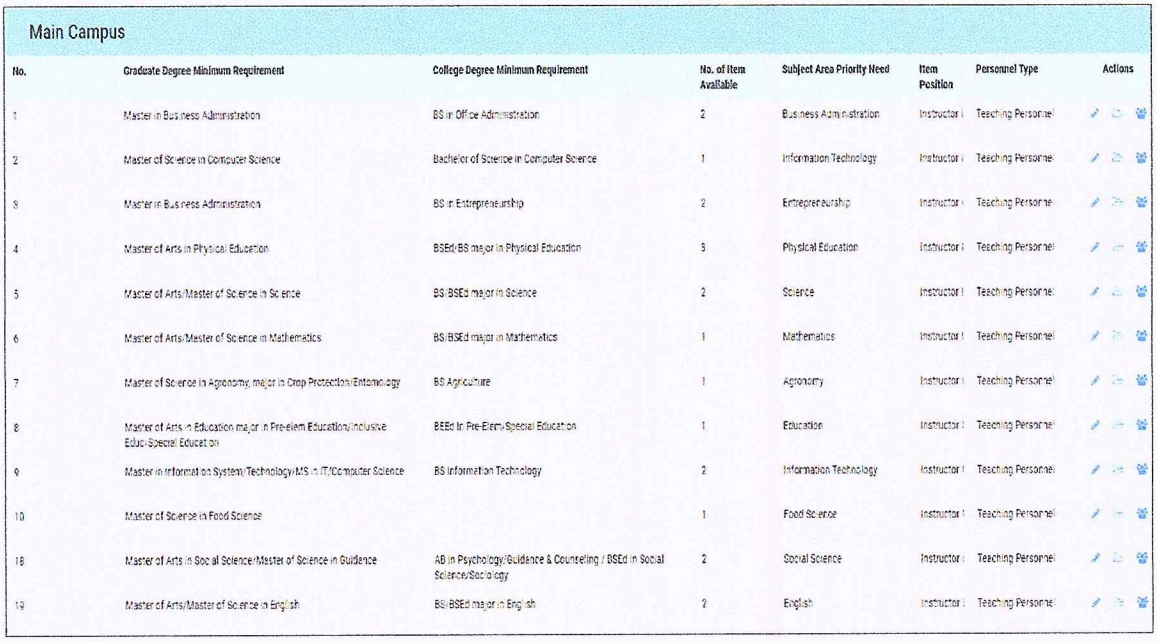
1. On the dashboard, click on the "**Notice for IQ Test**" icon or in the sidebar under the **Recruitment, Selection & Placement** menu.
2. On the Notice for IQ Test page, click on the "**ADD NEW**" button .
3. To add an existing record, click the "**CLICK HERE TO SEARCH EXISTING RECORD**" CLICK HERE TO SEARCH EXISTING RECORD.
    i. Select from the **Dropdown button** of the applicant name list and select the name of the applicant.

ii. Click the "**ADD SELECTED APPLICANT RECORD**" button ADD SELECTED APPLICANT RECORD to use the applicant's information.

4. After adding the selected applicant record, specify the item's position in the "**ITEM POSITION**" input box.
5. Specify the specialization in the "**SPECIALIZATION**" input box.
6. Select a date for the schedule of taking the IQ test in the "**SCHEDULE DATE**" input box.
7. Select a time for the schedule of taking the IQ test in the "**SCHEDULE TIME**" input box.
8. Select the date of posting in the "**POST DATE**" input box.
9. Click the "**SAVE NOTICE FOR IQ TEST DETAILS**" button SAVE NOTICE FOR IQ TEST DETAILS to **Save** the record or click the "**BACK TO NOTICE FOR IQ TEST LIST**" button Back To Notice for IQ Test List to **Cancel**.

5. **Records Organization**

The essential purpose of the system was to sort the records in an organized manner. Every information stored in the database server was automatically viewed and arranged accordingly. Figure 22 shows a sample page that displays the list of records placed in order and group by campus.



Main Campus

No.	Graduate Degree Minimum Requirement	College Degree Minimum Requirement	No. of Item Available	Subject Area Priority Need	Item Position	Personnel Type	Actions
1	Master in Business Administration	BS in Office Administration	2	Business Administration	Instructor I	Teaching Personnel	
2	Master of Science in Computer Science	Bachelor of Science in Computer Science	1	Information Technology	Instructor I	Teaching Personnel	
3	Master in Business Administration	BS in Entrepreneurship	2	Entrepreneurship	Instructor I	Teaching Personnel	
4	Master of Arts in Physical Education	BSEd/BS major in Physical Education	3	Physical Education	Instructor I	Teaching Personnel	
5	Master of Arts/Master of Science in Science	BS/BSEd major in Science	2	Science	Instructor I	Teaching Personnel	
6	Master of Arts/Master of Science in Mathematics	BS/BSEd major in Mathematics	1	Mathematics	Instructor I	Teaching Personnel	
7	Master of Science in Agronomy, major in Crop Protection/Entomology	BS Agriculture	1	Agronomy	Instructor I	Teaching Personnel	
8	Master of Arts in Education major in Pre-elem Education/Inclusive Educ-Special Educat on	BEEd In Pre-Elem/Special Education	1	Education	Instructor I	Teaching Personnel	
9	Master in Information System/Technology/MS in IT/Computer Science	BS Information Technology	2	Information Technology	Instructor I	Teaching Personnel	
10	Master of Science in Food Science		1	Food Science	Instructor I	Teaching Personnel	
18	Master of Arts in Social Science/Master of Science in Guidance	AB in Psychology/Guidance & Counseling / BSEd in Social Science/Sociology	2	Social Science	Instructor I	Teaching Personnel	
19	Master of Arts/Master of Science in English	BS/BSEd major in English	2	English	Instructor I	Teaching Personnel	

Figure 22. Sample View of Records Organization

How to Add Applicant Record to a particular Item

1. On the dashboard, click the "**Applicants Shortlist**" icon or from the sidebar menu, click "**Recruitment, Selection & Placement,**" and click "**Applicants Shortlist,**" and the system will redirect you to the selected menu.
2. On the Applicant Shortlist Records page, click the "**Trophy**" icon to view the Item Details of the selected Hiring Period.
3. To add an applicant, click on the "**Folder**" icon to add a specific applicant to a particular item.
4. Search the applicant record and click "**ADD RECORD**" button ADD RECORD to include the selected applicant in the item chosen.

6. Records Centralization

The system enables the RSP officer to automatically consolidate and view relevant records of all the teaching and non-teaching personnel in the University. Moreover, it provides easy access to the RSP relevant records of any personnel registered in the system. Figure 23 shows a sample page of accessing a centralized record of RSP module.

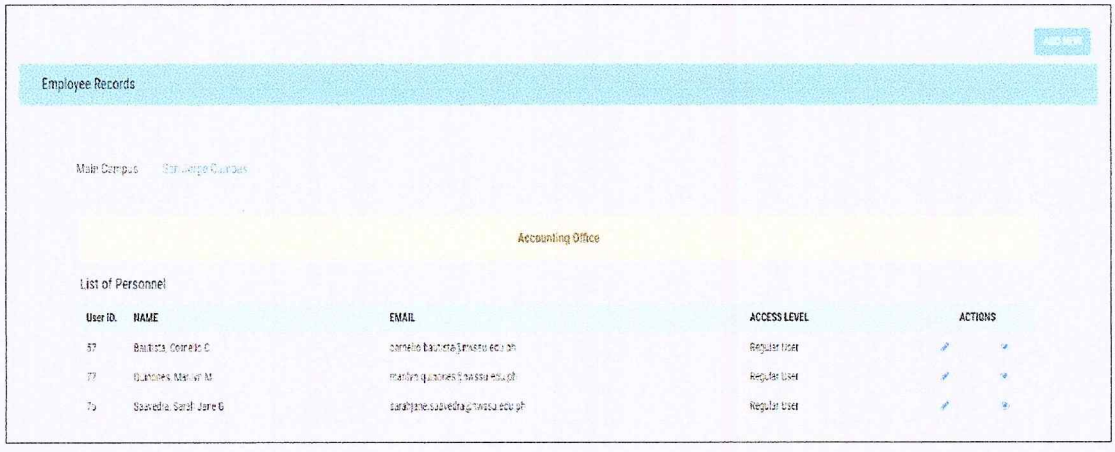
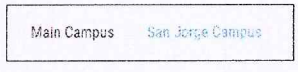


Figure 23. RSP Employee Records Page

How to manage employee records

1. On the dashboard page, click the "**Employee Records**" icon  or on the sidebar, click the "**Employee Records**" menu for the system to redirect you to the Employee Records page.
2. On the employee records page, click on the specific **tab**



to view other personnel in other campuses.

3. On the employee records page, click the "**Pencil**" icon  to update the profile of the personnel.

4. At the same page, click on the "**Eye**" icon  to view the Personal Data Sheet information of a specific personnel.

7. **Reminder system using Email Notification**

The RSP module can automatically send an email notification after accomplishing a particular task. As an example, the applicant for a particular item will receive an email notification upon saving a Notification for IQ test record for that applicant. Figure 24 shows the sample code or programming library (PHP Mailer) used to send automated email notification.

```
//Email start
$mail = new PHPMailer(true);

try {
    //Server settings
    $mail->SMTPDebug = false;                                   //
    Enable verbose debug output
    $mail->isSMTP();                                            // Set
    mailer to use SMTP
    $mail->Host       = 'smtp.gmail.com';  // Specify main and backup SMTP
    servers
    $mail->SMTPAuth   = true;                                   // Enable
    SMTP authentication
    $mail->Username   = 'sucdataengine@gmail.com';              //
    SMTP username
    $mail->Password   = '[redacted]';                           //
    SMTP password
    $mail->SMTPSecure = 'tls';                                  // Enable
    TLS encryption, `ssl` also accepted
    $mail->Port       = 587;                                    // TCP port
    to connect to

    //Recipients
    $mail->setFrom('sucdataengine@gmail.com');
    $mail->addCC('vinzoids@gmail.com');
    $mail->addAddress('ervin.rodriguez@nwssu.edu.ph');
```

Figure 24. PHP Mailer Code for Automated Email Notifications

8. Descriptive Data Analysis

The descriptive data analysis function allows the RSP Personnel to generate the history of record in an organized manner, such as viewing the applicants' descriptive analysis or any information relevant to the University's existing catalog of personnel. **Figure 25 shows the sample output of the utilization of the descriptive data analysis in the University personnel's history of records.**

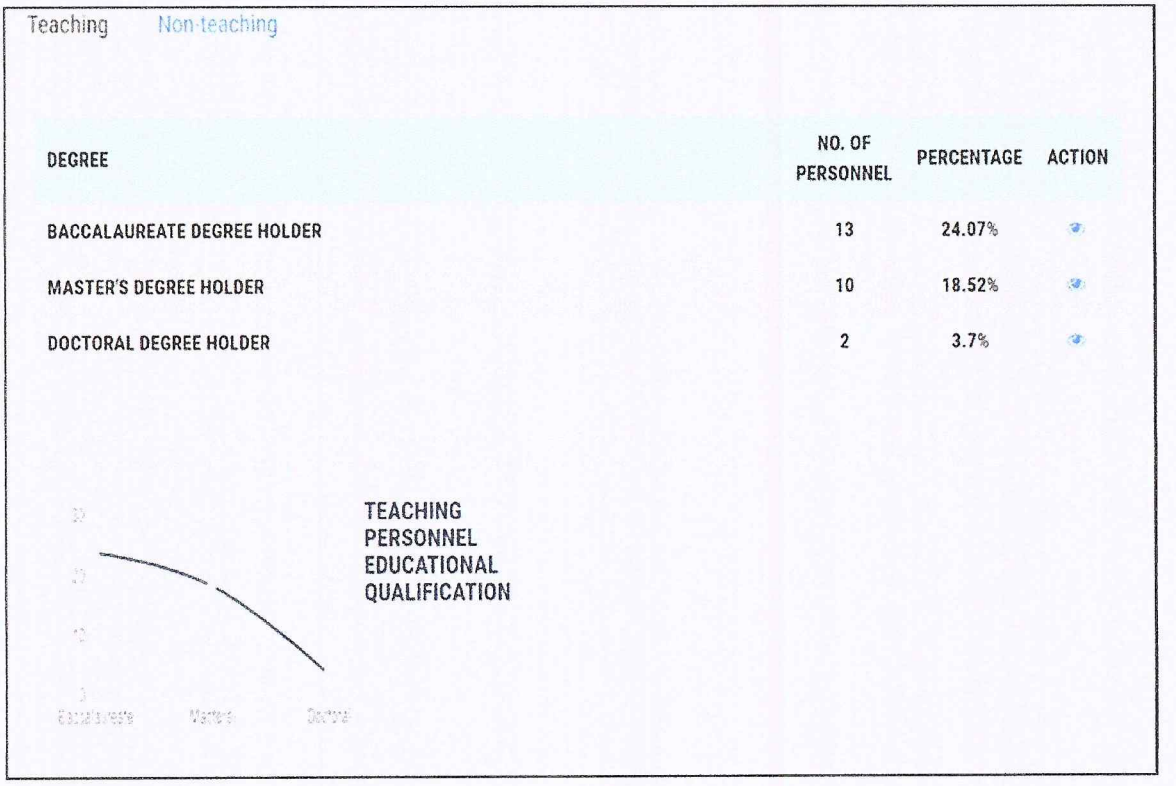


Figure 25. Sample Descriptive Data Analysis of History of Records

How to view the descriptive data analysis page

1. On the dashboard page, click the "Descriptive Analysis" icon or on the sidebar, click the "Analysis" menu.

2. Select a specific sub-menu for viewing University historical record descriptive data analysis.

Learning and Development (L & D) Module

1. Dashboard Homepage

The dashboard homepage of the L & D module includes a navigation icon and sidebars similar to other module. Furthermore, the navigation icons are shortcut links of the sidebar. Sidebar links display the necessary information for viewing the available menu in L & D. Figure 26 shows the dashboard home page of the L & D officer or user.

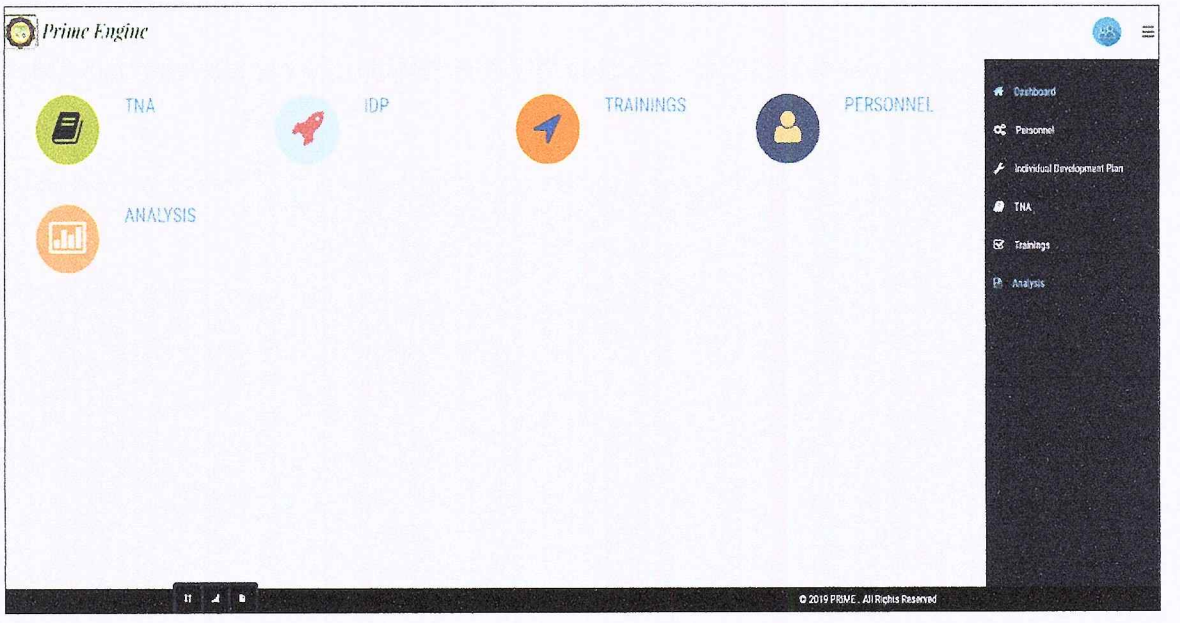


Figure 26. L & D Dashboard Home Page

2. Centralized Dissemination and Consolidation

The module allows all the registered personnel of the University to view the tasks or survey forms which are intended for dissemination. On the other hand, after

accomplishing the survey form for example, the record will be saved directly in the cloud server. Furthermore, the system will automatically provide a tally and interpretation of result on the survey form submitted by the personnel. The system prevents the L & D personnel to conduct manual consolidation of filled-up survey forms, manual tally procedure, and the interpretation of each result. Figure 27 shows the sample of page for viewing consolidated records of all employees in the University.

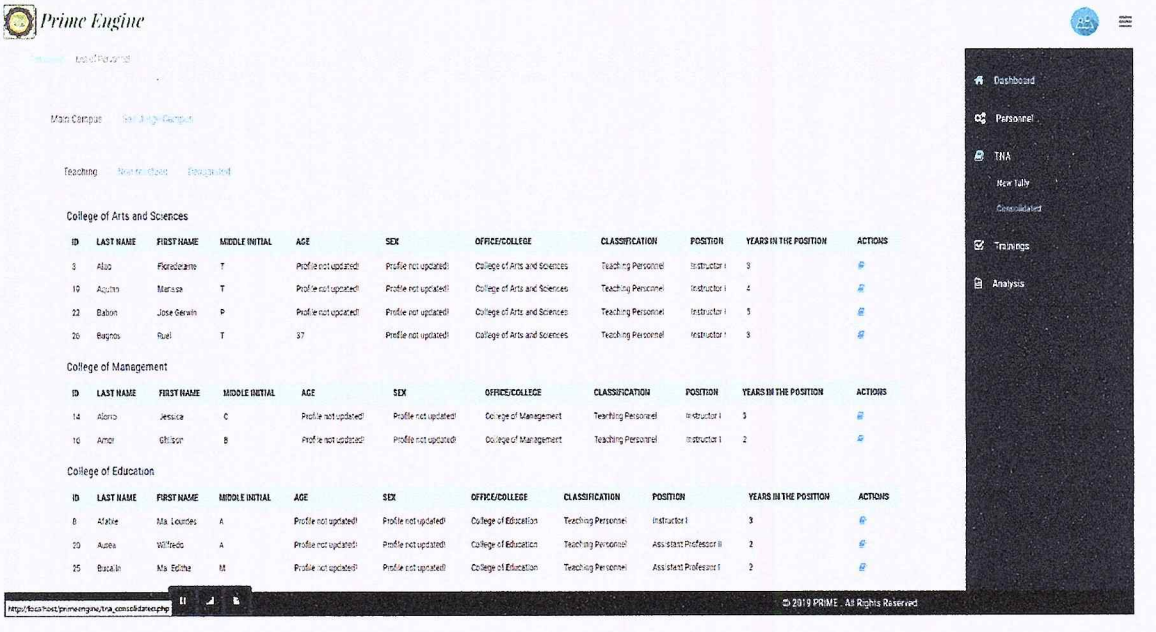
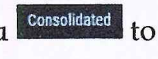


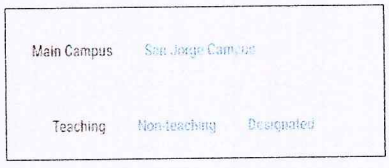
Figure 27. Sample Consolidated Records View Page

How to view consolidated TNA survey result

1. On the dashboard page, click the "TNA" icon  or on the sidebar, click "**TNA**" menu, and select "**Consolidated**" sub-menu  to view the TNA consolidated records page.

2. On the Consolidated Records page, select on the available **tabular menus** to select what *campus* and the *type of personnel* in the University.

   Sample:



3. Select the Department or College or Office where the personnel is assigned then click the "**Book**" icon to view the specific record of the personnel.
4. Click "**Pencil**" icon to update the TNA record.
5. Click "**Trash**" icon to remove the TNA record.
6. Click "**Print**" icon to print the TNA record.

3. Recommender System

The system has the capability to search existing records in the cloud database and compare it to another record for detect similar data. As an example, the system automatically checks the IDP records submitted of all the registered personnel and compare those records whether the training required of the personnel matches the recently added available training. In that way, the system was able to avoid the L & D Personnel to do the same process manually that usually takes a long period of time. Figure 28 shows a sample page in the L & D module that uses recommender system.

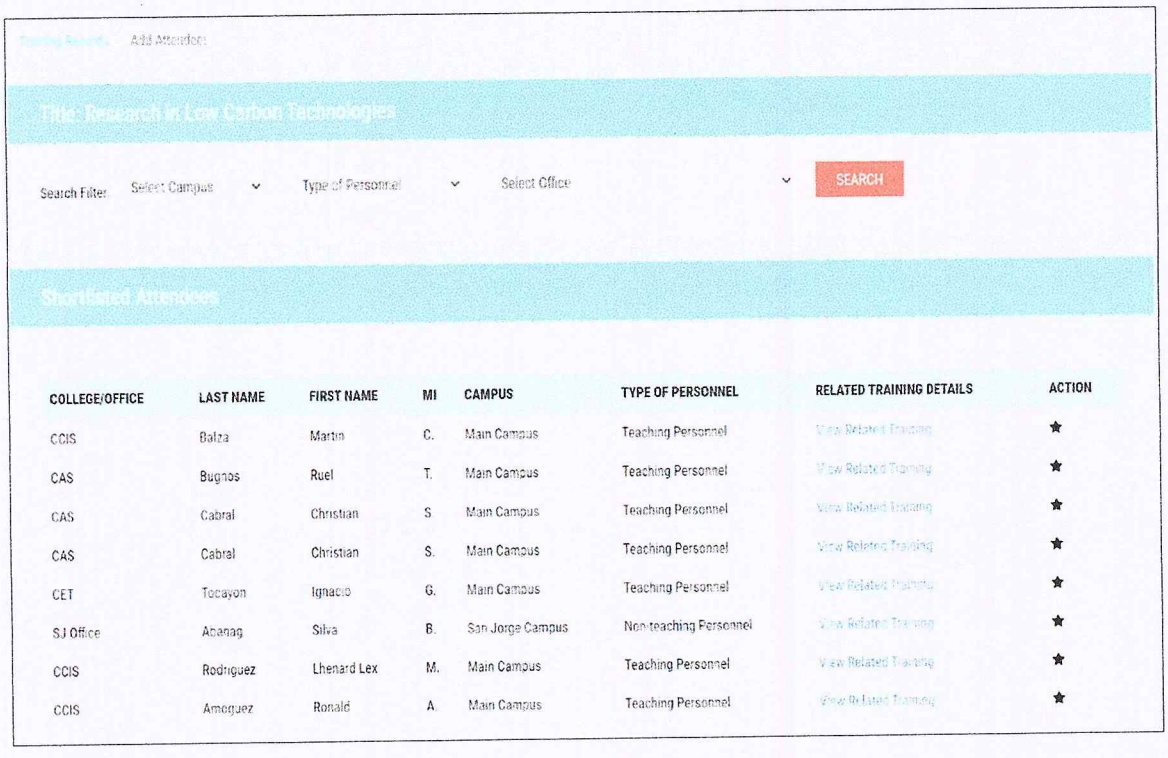
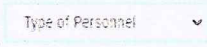


Figure 28. Recommender System Application in Training Attendees

How to Add Attendees

1. On the dashboard page, click the "**TRAININGS**" icon or on the sidebar, click the "**TRAININGS**" menu and select "**Training Records**" sub-menu to view the Training Records page.
2. On the Training Records page, browse in the list of trainings available and click the "**Book**" Icon to attendees for the selected record.
3. On the Add Attendees page, you can Add attendee in the following options:
    a. Using "Search Filter" option
        i. Click "**SELECT CAMPUS**" dropdown box Select Campus and choose a campus.

ii. Click "**TYPE OF PERSONNEL**" dropdown box 

and choose type of personnel.

iii. Click "**SELECT OFFICE**" dropdown box and choose the college/office or department

.

iv. Click "**SEARCH**" button 

to view list of personnel based from the filter specified.

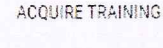
v. Add the personnel by select the checkbox ☐ in the "**ACTION**" column.

vi. Click "**ADD SELECTED ATTENDEES**" 

to proceed adding of the selected personnel.

b. Using "Shortlisted Attendees" based from the submitted Individual Development Plan (IDP)

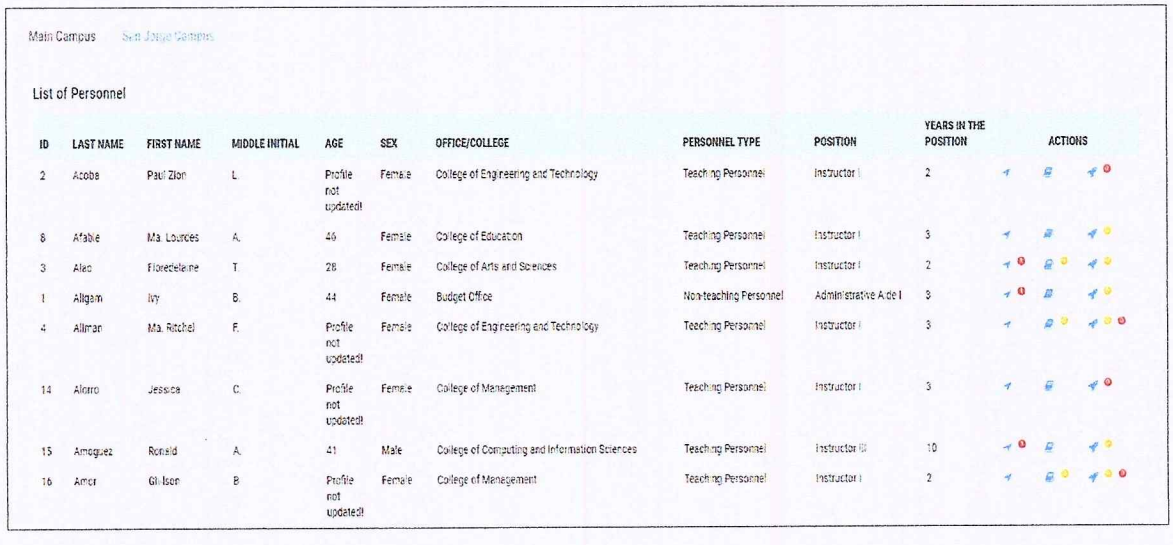
i. On the Shortlisted Attendees table, click "**VIEW RELATED TRAINING**" link to view the determined required seminar from the IDP record.

ii. Click the "**ACQUIRE TRAINING**" button 

to update the IDP record and proceed adding of the selected personnel to the training as attendee.

4. Reminder System

The L & D personnel usually conducts monitoring and doing a lot of follow-up almost all the personnel in the University regarding the deadlines of the necessary documents or records required for submission in the L & D Office. Through the implementation of a reminder system in the L & D module, the office expanded and improved its capability to do the job. The system automatically detects the database of set deadlines and the personnel involved to meet the deadline. The system will send email notification automatically to the personnel reminding the status of their submission. Specifically, sending notification initiate days before the deadline. Similarly, the system also sends notification to those personnel with overdue deadlines. Figure 29 shows the centralized viewing of records of all the personnel wherein upon loading the page, the system automatically detects each personnel that requires email notification.


Main Campus San Jose Campus

List of Personnel

ID	LAST NAME	FIRST NAME	MIDDLE INITIAL	AGE	SEX	OFFICE/COLLEGE	PERSONNEL TYPE	POSITION	YEARS IN THE POSITION	ACTIONS
2	Acoba	Paul Zion	L	Profile not updated!	Female	College of Engineering and Technology	Teaching Personnel	Instructor I	2	
6	Afable	Ma. Lourdes	A.	46	Female	College of Education	Teaching Personnel	Instructor I	3	
3	Aleo	Floredeliene	T.	28	Female	College of Arts and Sciences	Teaching Personnel	Instructor I	2	
1	Allgam	Ivy	B.	44	Female	Budget Office	Non-teaching Personnel	Administrative Aide I	3	
4	Allman	Ma. Ritchel	F.	Profile not updated!	Female	College of Engineering and Technology	Teaching Personnel	Instructor I	3	
14	Alorro	Jessica	C.	Profile not updated!	Female	College of Management	Teaching Personnel	Instructor I	3	
15	Amoguez	Ronald	A.	41	Male	College of Computing and Information Sciences	Teaching Personnel	Instructor III	10	
16	Amor	Gil-Ison	B	Profile not updated!	Female	College of Management	Teaching Personnel	Instructor I	2	

Figure 29. Reminder System Application to the Centralized Personnel Records of L & D Office

How to Manage Personnel Records

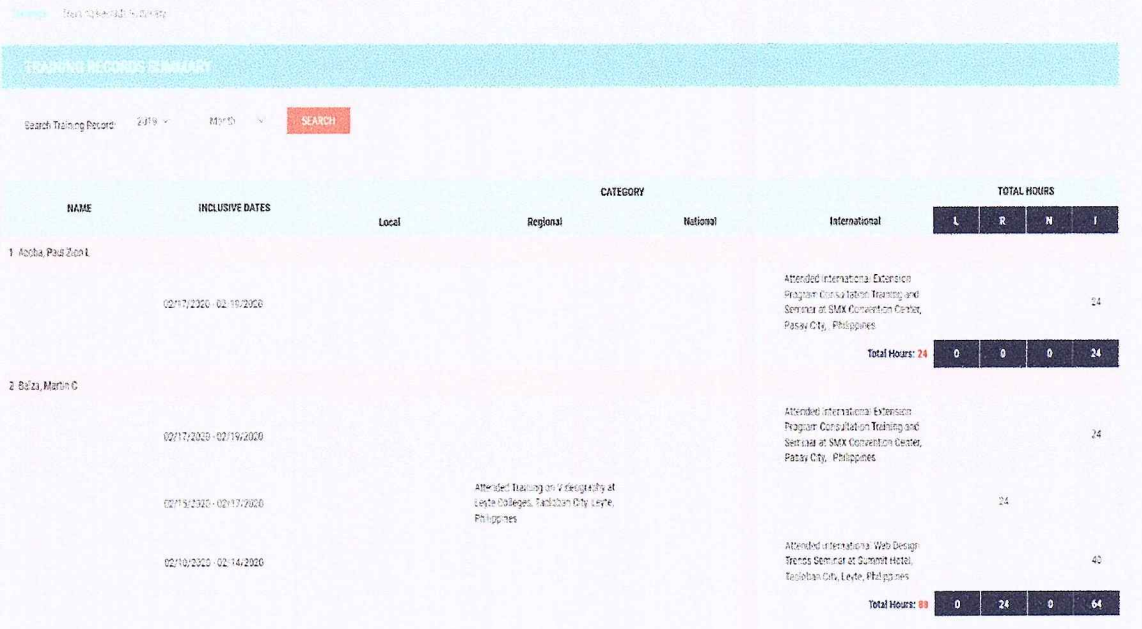
1. On the dashboard page, click the "PERSONNEL" icon  or on the sidebar, click the "PERSONNEL" menu.
2. Choose a tab 

to select personnel by campus.
3. In the Action column, click the "**ARROW**" icon  to view the list of trainings attended by the selected personnel. **Note: Red color pop-up badge*  *for the arrow icon means that the personnel has attended a training but not complied with the requirements to the HR after the training.*
4. In the Action column, click the "**BOOK**" icon  to view list of filled-up survey forms by the selected personnel. **Note: Yellow colored pop-up badge*  *for the book icon means that the personnel has not submitted neither filled-up required survey form.*
5. In the Action column, click the "**ROCKET**" icon  to view IDP records of the selected personnel. **Note: Yellow colored pop-up badge*  *mean that the personnel has not submitted 3 year IDP record while Red colored pop-up badge means no submission of 5 year IDP record.*

5. Descriptive Data Analysis

The descriptive data analysis allows the L & D officer to easily generate a descriptive analysis to the historical data of the system either in percentage result, graph, or summarized result. Figure 30 shows the sample of descriptive data analysis using summarized result in tabular form.

Prime Engine



TRAINING RECORDS SUMMARY

Search Training Record: 2019 March SEARCH

NAME	INCLUSIVE DATES	CATEGORY				TOTAL HOURS			
		Local	Regional	National	International	L	R	N	I
1 Acoba, Paul Zion L									
	02/17/2020 - 02/19/2020				Attended International Extension Program Consultation Training and Seminar at SMX Convention Center, Pasay City, Philippines				24
					Total Hours: 24	0	0	0	24
2 Baza, Martin C									
	02/17/2020 - 02/19/2020				Attended International Extension Program Consultation Training and Seminar at SMX Convention Center, Pasay City, Philippines				24
	02/15/2020 - 02/17/2020		Attended Training on Virology at Leyte Colleges, Tacloban City, Leyte, Philippines				24		
	02/10/2020 - 02/14/2020				Attended International Web Design Trends Seminar at Summit Hotel, Tacloban City, Leyte, Philippines				40
					Total Hours: 88	0	24	0	64

Figure 30. Sample Descriptive Data Analysis of the Summary of Trainings of all Personnel for a specific Month and Year

Figure 30 shows the sample descriptive data analysis of all the personnel which contains the summary of filtered historical data of all the trainings attended with automated calculation of the number of hours either in Local, Regional, National, or International training. With this analysis, the L & D personnel has saved a lot of time extracting training records of each personnel within a specified period. On the other hand, figure 31 shows the descriptive analysis using percentage and graph.

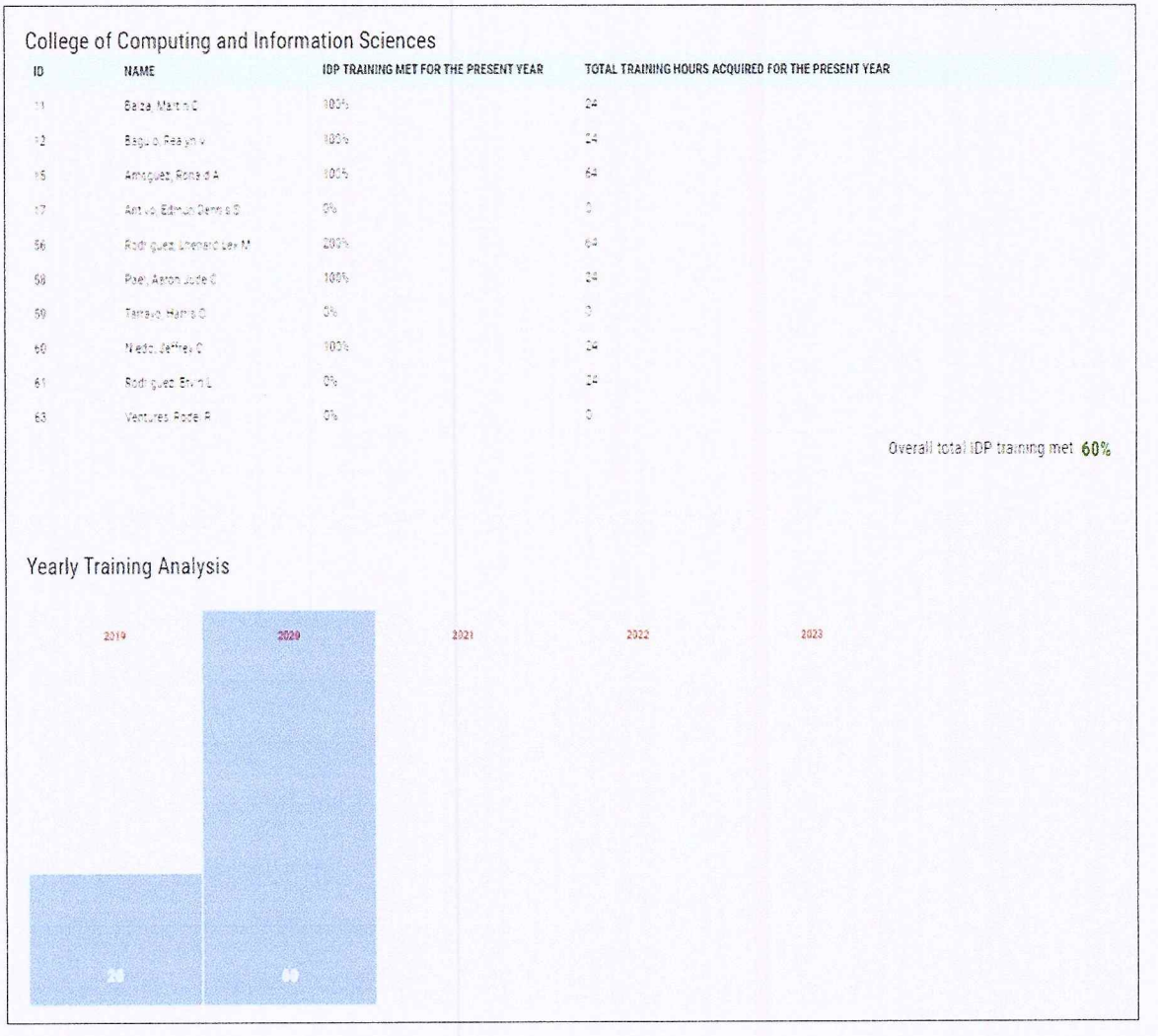


Figure 31. Descriptive Data Analysis in Percentage and Graph

Figure 31 shows the sample generated descriptive data analysis for a particular college. The analysis includes automated computation of the number of trainings met based from the IDP record of each personnel presented in percentage. Another column also shows the number of hours of trainings acquired per personnel regardless of the IDP record. Furthermore, an overall total number of trainings helps the Dean of the college to easily determine the total percentage of trainings acquired by the college within the year. Lastly, the graph presents total percentage of acquired trainings per year in five (5) years.

With this functionality, every personnel in every college, department, or offices can easily monitor the status of training acquisition of the college or the personnel.

REFERENCES

Abran, A. (2010). Software Metrics and Software Metrology. IEEE Computer Society. Retrieved on September 21, 2020. Retrieved from https://www.academia.edu/16848977/ISO_9126_Analysis_of_Quality_Models_and_Measures

Akanmu, S. A., & Jamaludin, Z. 2016. Students' Data-Driven Decision Making in HEI: The Explicit Knowledge Involved. Retrieved on September 9, 2020. Retrieved from http://www.ijiet.org/vol6/661-F1000.pdf

Alfy, S. E., Dani, A. (2018). Exploring the benefits and challenges of learning analytics in higher education institutions: A systematic literature review. Retrieved on October

1, 2020. Retrieved from https://www.researchgate.net/publication/327753925_Exploring_the_benefits_and_challenges_of_learning_analytics_in_higher_education_institutions_A_systematic_literature_review

Amadi, E. C. 2008. Introduction to Educational Administrations: A Module. P.1. Retrieved on November 18, 2019. Retrieved from https://www.researchgate.net/publication/273143560_Introduction_to_Educational_Administration_A_Module.

Analytics Vidhya (2015). 13 Amazing Applications / Uses of Data Science Today. Retrieved on November 9, 2019. Retrieved from https://www.analyticsvidhya.com/blog/2015/09/applications-data-science/

Anderson, J., & Rainie L. (2018). The positives of digital life. Pew Research Center. Internet & Technology. Retrieved on March 1, 2019. Retrieved from https://www.pewinternet.org/2018/07/03/the- positives-of-digital-life/

Angrave, D., Charlwood, A., Kirkpatrick, I., Lawrence, M., & Stuart, M. (2016). HR and analytics: Why HR is set to fail the big data challenge. Human Resources Management Journal, 26, 1-11.

Antsaklis, P. (2000). Scanning the Issues/Technology. Special Issue on Hybrid Systems: Theory and Applications. A Brief Introduction to the Theory and Applications of Hybrid Systems. Retrieved on September 24, 2020. Retrieved from https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=871299

Archer, T. S. 2010. The Efficiency Theory. P.1. Retrieved on November 17, 2019. Retrieved from http://www.theefficiencytheory.com/The_Efficiency_Theory.pdf

Armstrong, M., Taylor, S., (2014). Armstrong's Handbook of Human Resource Management Practice. 13th edition. London: Kogan Page; 2014

Arroway, P., Morgan, G., O'Keefe, M. and Yanosky, R. (2016), "Learning analytics in higher education", EDUCAUSE, available at:

https://library.educause.edu/~/media/files/library/2016/2/ers1504la.pdf (accessed 28 February 2017). Retrieved on September 7, 2020. Retrieved from https://www.emerald.com/insight/content/doi/10.1108/AAOUJ-01-20170009/full/pdf?title=learning-analytics-in-higher-education-an-analysis-of-casestudies

Beaudouin-Lafon, M. and Mackay, W.E., 2017. Prototyping Tools and Techniques. Chapter 52. Retrieved on February 19, 2020. Retrieved from https://www.lri.fr/~mackay/pdffiles/Prototype.chapter.pdf.

Bevan, N., Kirakowski, J., Maissel, J. 1991. What is Usability? Retrieved on February 21, 2019. Retrieved from https://www.researchgate.net/publication/239609271_What_is_Usability.

Binder, P., Kessler, A., Mair, M., Stummer, K. (2013). Organizational innovativeness and its results: a qualitative analysis of SME hotels in Vienna. J. Hosp. Tour. Res. 40(3), 339-363. Retrieved on February 6, 2019. Retrieved from http://www.sciencedirect.com/science/article/pii/S0278431917307363.

Blanks, K., (2019). Three types of HR Analytics: Descriptive, Predictive, and Prescriptive. Retrieved on September 24, 2020. Retrieved from https://employeecycle.com/three_types_hr_analytics_descriptive_predictive_prescriptive/

Brynjolfsson, E., McAfee, A., 2017. The business of Artificial Intelligence: What it can and cannot do for your organization. Retrieved on March 6, 2019. Retrieved from http://vedpuriswar.org/Readings/The%20business%20of%20artificial%20intelligence.pdf

Buckner, R. B. 1983. Accuracy and Precision. P.2. Retrieved on March 7, 2020. Retrieved from http://folk.uio.no/treiken/GEG2210/accuracy_vs_precision.pdf.

Chen, H., Chiang, R. H. L.,& Storey, V. C. (2012). Business Intelligence and Analytics: From Big Data to Big Impact. MIS Quarterly, 36 (4), 1-24. Retrieved on September 14, 2020.

Chernicoff, D., Murphy, R. M., 2017. Hybrid IT Operations an Expert Guide. Hewlett

Packard Enterprise. Retrieved on March 6, 2019. Retrieved from https://h20195.www2.hpe.com/v2/Getdocument.aspx?docname=a00006639ew

Chiehyeon Lim, Ki-Hun Kim, Min-Jun Kim, Jun-Yeon Heo, Kwang-Jae Kim, Paul P. Maglio (2018). From data to value: A nine-factor framework for data-based value creation in information-intensive services. International Journal of Information Management. Vol. 39, 2018, P. 121-135. Retrieved on March 28, 2019. Retrieved from http://www.sciencedirect.com/science/article/pii/S0268401217300816.

Côrte-Real, N., Oliveira, T., & Ruivo, P. (2017). Assessing business value of Big Data Analytics in European firms. Journal of Business Research, 70, 379–390.

Daniel, B. (2015). Big data and analytics in higher education: Opportunities and challenges. British Journal of Educational Technology, 46, 904–920. doi:10.1111/bjet.12230.

Das, S. R., (2016). Data Science: Theories, Models, Algorithms, and Analytics. Retrieved on January 18, 2020. Available at https://srdas.github.io/Papers/DSA_Book.pdf

Davenport, T., Barth, P., & Bean, R. (2012). How big data is different. MIT Sloan Management Review, 54(1), 21-24. Retrieved on September 14, 2020.

Davenport, T. H., Bean, R., 2019. NVP - New Vantage Partners. Big Data and AI Executive Summary 2019. Executive Summary of Findings. Available at https://newvantage.com/wp- content/uploads/2018/12/Big-Data-Executive-Survey- 2019- Findings-Updated-010219-1.pdf

Dawa, D. G., & Corcino, R. (2018). A Logistic Function for Hiring University Professors. Journal of Educational and Human Resource Development. Vol. 6, 2018, p. 190-198. Retrieved on February 19, 2019. Retrieved from https://www.ijterm.org/index.php/jehrd/article/view/94

Davis, M., (2015). What is an MVC Framework? Future Hosting. Retrieved on September

22, 2020. Retrieved from https://www.futurehosting.com/blog/what-is-an-mvc-framework/

Definitions, (2020). Definitions of Hardware. Retrieved on September 20, 2020. Retrieved from https://www.definitions.net/definition/Hardware

Duffield, B., Stowe, G., Shankar, A., 2017. Presentation and Analysis of User Interaction Data. Available at https://patentimages.storage.googleapis.com/c2/3a/02/282cf1be4820bf/US9785317.pdf

Election Systems & Software, 2015. System Functionality Description. Document Revision 1.0. ES&S Voting System 5.2.0.3. p. 6. Retrieved on November 19, 2019. Retrieved from https://www.sos.state.co.us/pubs/elections/VotingSystems/systemsDocumentation/ESS/EVS5203-C-D-0200-SFD.pdf

Ehnert, I., Parsa, S., Roper, I., Wagner, M., & Muller-Carmen, M. (2016). Reporting on sustainability and HRM: A comparative study of sustainability reporting practices by the world's largest companies. Int. J. Hum. Resour. Manage. 27 (1), 88-108.

Fagan, D. (2018). Wake Up – The Nine Hashtags of Digital Disruption. St. Lucia: University of Queensland Press.

Fahey, M., 2012. Remote Data Monitoring and Collection System with Multi-tiered Analysis. Retrieved on May 24, 2019. Retrieved from https://patentimages.storage.googleapis.com/a2/be/aa/6d94fba9718a11/EP2696750B1.pdf

Fleck, C. (2016). Data and Hard Judgement. Using Algorithms to Build a Better Workforce. Retrieved on September 16, 2020. Retrieved from https://www.shrm.org/hr-today/news/hr-magazine/0616/pages/using-algorithms to-build-a-better-workforce.aspx

Gašević, D., Dawson, S. and Pardo, A. (2016), "How do we start? State and directions of learning analytics adoption", International Council for Open and Distance Education, available at: https://icde.memberclicks.net/assets/RESOURCES/dragan_la_report%20cc%0licence.pdf (accessed 28 February 2017).

Ghasemaghaei, M. (2019). Does Data Analytics Use Improve Firm Decision Making Quality? The Role of Knowledge Sharing and Data Analytics Competency. Retrieved on March 9, 2019. Retrieved from https://www.sciencedirect.com/science/article/pii/S0167923619300429?via%Dihub.

Ghasemaghaei, M., Hassanein, K., & Turel, O. (2017a). Increasing firm agility through the use of data analytics: The role of fit. Decision Support Systems, 101, 90-105.

Ghasemaghaei, M., Ebrahimi, S., & Hassanein, K. (2017b). Data analytics competency form for improving firm decision making performance. The Journal of Strategic Information Systems, 27, 101-113.

Glosbe, 2020. Web Package in English. Glosbe. Retrieved on September 22, 2020. Retrieved from https://glosbe.com/en/en/web%20package

Heale, R. and Twycross, A. 2015. Validity and reliability in quantitave research. July 2015, Vol. 18, No. 3. P. 66. Retrieved on March 7, 2020. Retrieved from https://www.researchgate.net/publication/280840011_Validity_and_reliability_in_quantitative_research

Hecklau, F., Galeitzke, M., Flachs, S., Kohl, H. (2016). Holistic Approach for Human Resource Management in Industry 4.0, Procedia CIRP, Vol. 54, 2016, P.1-6. Retrieved on February 6, 2019. Retrieved from http://www.sciencedirect.com/science/article/pii/S2212827116308629.

Henke, N., Bughin, J., Chui, M., Manyika, J., Saleh, T., Wiseman, B., Sethupathy, G., 2016. McKinsey Global Institute. The Age of Analytics: Competing in a Data-driven World. p.4-7. Retrieved on March 1, 2019. Retrieved from https://www.mckinsey.com/~/media/mckinsey/business%20functions/mckinsey%20analytics/our%20insights/the%20age%20of%20analytics%20competing%20in%20a%20data%20driven%20world/mgi-the-age-of-analytics-full- report.ashx

Hoffman, R. (2016). Using artificial intelligence to set information free. MIT Sloan Frontiers. Available at https://sloanreview.mit.edu/article/using-artificial-intelligence-to- humanize- management-and- set-information-free/

Holmes, E., Gibbons, I., Young, D., Michelson, S., 2011. Integrated Health Data Capture and Analysis System. Available at https://patentimages.storage.googleapis.com/a1/0d/a9/42f161f0a1e4b7/US210093249A1.pdf

IBM (2018). Hybrid Data Management Guide. Retrieved on March 9, 2019. Retrieved from https://www.ibm.com/analytics/data-management/resources/what-ishybriddata-management.

Ifenthaler, D. (2017). "Are higher education institutions prepared for learning analytics?", TechTrends, Vol. 61 No. 4, pp. 366-371.

Informatica, 2020. What is Cloud Integration? Retrieved on September 22, 2020. Retrieved from https://www.informatica.com/services-and-training/glossaryofterms/cloud-integration-definition.html

James, F. E., 2003. System and Method for Analyzing Data. Retrieved on May 24, 2019. Retrieved from https://patentimages.storage.googleapis.com/09/d2/45/73bfacafbbbab5/US7487148.pdf

Jarrahi, M.H. (2018). Artificial intelligence and the future of work: Human-AI symbiosisin organizational decision making. Business Horizons, Vol. 61, Issue 4, 2018, P. 577- 586. Retrieved on March 28, 2019. Retrieved from http://www.sciencedirect.com/science/article/pii/S0007681318300387.

Jha, S. (2009). Management Philosophy of Peter Drucker. A Critique. Apeejay Business Review. A Journal for the Strategic Decision Makers. Vol. 10.,No. 1 & 2, 2009. 54-61. Retrieved on September 13, 2020. Retrieved from https://www.researchgate.net/publication/256033828_Management_Philosophyf_Peter_F_Drucker_A_Critique

Janssen, M., van der Voort, H., & Wahyudi, A. (2017). Factors influencing big data decision- making quality. Journal of Business Research, 70, 338-345.Jili'ow, A.2016. An Overview About Finance & Financial Management: Corporation & Shareholders, Goal of Financial Management and Goal of Financial Manager. P.3. November 19, 2019. Retrieved from https://www.academia.edu/34888534/AN_OVERVIEW_ABOUT_FINANCE_d_FINANCIAL_MANAGEMENT.pdf

Johnson, R., & Kavanagh, M., 2018. Human Resource Informaiton Systems. Basic Applications, and Future Directions. Retrieved on September 22, 2020. Retrieved from https://www.researchgate.net/publication/337826993_Human_Resource_Informatio_Systems_Fourth_Edition

Kardar, S., 2015. July 07. Privatization of DISCOS, DAWN. Retrieved from http://www.dawn.com/news/1192863/privitasation-of-discos.

Karmarkar, U. S., & Apte, U. M. (2007). Operations management in the information economy: Information products, processes, and chains. Journal of Operations Management, 25(2), 438-453.

King, K.G. (2016). Data Analytics in Human Resources: A Case Study and Critical Review. Retrieved on September 24, 2020. Retrieved from http://u.camdemy.com/sysdata/doc/a/a0eabde691d9d6f3/pdf.pdf

Kwok, K. (2020). "Academic" Research at University. P. 1. Retrieved on March 7, 2020. Retrieved from https://www.cuhk.edu.hk/clear/rs/academic_research.pdf.

Lane, J. (Ed.). (2014). Building a smarter university: Big data, innovation, and analytics. Albany, NY: SUNY Press. Retrieved on September 16, 2020.

Li, G., Hou, Y., & Wu, A. (2017). Fourth Industrial Revolution: Technological drivers, impacts and coping methods. Chinese Geographical Science, 27(4), 626-637.

Mehta, N., & Dvarakonda, M.V. (2018). Machine Learning, natural language programming, and electronic health records: The next step in the artificial intelligence journey? Beyond the Frontiers. Journal Allergy Clinical Immunology, (June), 2019-2021.

Mohammed, L.M., 2016. Assessing the effects of transformational leadership: a study on Egyptian hotel employees. J. Hosp. Tour. Manage. 27 (2), 49-59.

Momin, W.Y., & Momin, A. (2015). HR analytics Transforming Human Resource Management. Retrieved on October 1, 2020. Retrieved from

https://www.researchgate.net/publication/335320255_HR_analytics_Transforing_Human_Resource_Management

Miller, K. (2015). "What Gets Measured Gets Managed". SMART Recovery. Self-management and Recovery Training. Retrieved on September 14, 2020. Retrieved from https://www.smartrecovery.org/what-gets-measured-gets-managed

Murumba, J. & Micheni, E. (2017). Big Data Analytics in Higher Education: A Review. Retrieved on September 24, 2020. Retrieved from https://www.researchgate.net/publication/317799370_Big_Data_Analytics_in_Higher_Education_A_Review

Müller, O., Junglas, I., vom Brocke, J., & Debortoli, S. (2016). Utilizing big data analytics for information systems research: challenges, promises and guidelines. European Journal of Information Systems, 25(4), 289-302.

Myrick, M.L., Priore, R.J., Freese, R.P., Blackburn, J.C., 2007. Data Validation and Classification in Optical Analysis System. Retrieved on May 24, 2019. Retrieved from https://patentimages.storage.googleapis.com/fc/83/a4/63ccc6609538bc/US910154.pdf.

Nagpal, T., & Mishra, M. (2020). Analyzing Human Resource Practices For Decision Making in Banking Sector using HR Analytics. Materials Today: Proceedings.

Retrieved on April 20, 2021. Retrieved from https://www.sciencedirect.com/science/article/pii/S2214785320401774

National Research Council (2006), Learning to Think Spatially. Tools for Thought: The Concept of a Support System. P. 135.136. Retrieved on January 20, 2020. Retrieved from http://en.bookfi.net/book/1189871.

Olhede, S., & Wolfe, P. (2018). The AI Spring of 2018. Significance, 15(3), 6-7.

Peersman, G. (2014). Overview: Data Collection and Analysis Methods in Impact Evaluation. Methodological Briefs Impact Evaluation No. 10. UNICEF, September 2014. Retrieved on March 28, 2019. Retrieved from https://www.unicefirc.org/publications/pdf/brief_10_data_collection_analysis_eng.pdf

Queensland Department of Agriculture (2013). Queensland's Department of Agriculture, Fisheries, and Forestry (DAFF) Agricultural research, development, and extension plan. Contributing to the 2040 vision to double Queensland's agricultural production. Retrieved on September 19, 2020. Retrieved from https://www.daf.qld.gov.au/__data/assets/pdf_file/0003/86223/DAFF-RDE-draft-plan.pdf

Ransbotham, S. (2016). Can artificial intelligence replace executive decision making? MIT Sloan Management Review. Available at

https://sloanreview.mit.edu/article/can-artificial- intelligence- replace-executive-decision-making

Reyes, M. M., & Redoña, B. M. (2021). Personal attributes and behavioral response ofacademic heads of private higher education institutions: Basis for human resource intervention development model, Asia Pacific Management Review. Retrieved on April 20, 2021. Retrieved from https://www.sciencedirect.com/science/article/pii/S1029313221000348

Reinitz, B. T. (2015). "Building Institutional Analytics Maturity" (Summit report). Louisville, CO: Educause Center for Analysis and Research. Retrieved on September 11, 2020.

Rouse, M., 2008. Data Analytics. Retrieved on September 23, 2020. Retrieved from https://searchdatamanagement.techtarget.com/definition/data-analytics

Shahzad, K., Bajwa, S.U., Ansted, R.B., Mamoon, D., Khaliq-ur-Rehman, (2016). Evaluating human resource management capacity for effective implementation of advanced metering infrastructure by electricity distribution companies in Pakistan, Utilities Policy, Volume 41, 2016, Pages 107-117. Retrieved on February 6, 2019. Retrieved from http://www.sciencedirect.com/science/article/pii/S0957178716301606.

Siegel, Eric (2013). Predictive Analytics. The Power to Predict who will Click, Buy, Lie, or Die. John Wiley & Sons, Inc. Retrieved on January 8, 2020. Retrieved from

http://userbooks.bookfi.net/1/7b963951968b07810818cef1c7b81abe/_as/[Eric_Siegel]_Predictive_Analytics_The_Power_to_P(BookFi).pdf

Spooner, J. (2020). Hybrid analytics: why and how to make them work for you. Retrieved on September 20, 2020. Retrieved from https://www.sas.com/content/dam/SAS/en_gb/doc/whitepaper1/viya-povhybrid-analytics-why-and-how-to-make-them-work-for-you.pdf

Techtarget (2018). Cloud Server. Retrieved on September 21, 2020. Retrieved from https://searchcloudcomputing.techtarget.com/definition/cloud-server

Titthasiri, W. (2014). A Strategic Decision-Making Framework For E-Learning System: Based on Strategic Planning Process and ISO 9126 Model. International Journal of Engineering Sciences & Research Technology, 3(7), 590. Retrieved February 2, 2020. Retrieved from https://www.academia.edu/7876904/A_Strategic_DecisionMaking_Framework_For_ELearning_System_Based_on_Strategic_Planning_Process_and_ISO_9126Model.

Tulasi, B. (2013). Significance of Big Data Analytics in Higher Education. Retrieved on September 7, 2020. Retrieved from https://www.researchgate.net/publication/271070362_Significance_of_Big_Data_and_Analytics_in_Higher_Education/link/550fb9ec0cf2752610a0f82c/download

Vocabulary.com (2020). Hybrid. Retrieved on September 20, 2020. Retrieved from https://www.vocabulary.com/dictionary/hybrid

Webber, K. L. (2019). Data Analytics and the Imperatives for Data-Informed Decision-Making in Higher Education. Retrieved on September 11, 2020. Retrieved from https://ihe.uga.edu/sites/default/files/inlinefiles/Webber_2019004_paper_2.pdf

Wikhamn, W. (2019). Innovation, sustainable HRM and customer satisfaction, International Journal of Hospitality Management, Vol. 76, Part A, 2019, P. 102-110.

Woodie, A. (2014). Hybrid Analytics Yield Big Data Flexibility. Datanami. Retrieved on April 1, 2019. Retrieved from https://www.datanami.com/2014/11/05/hybridanalytics-yield-bigdataflexibility

Yass, Ahmed, 2015. The Impact of Cloud Based Information Systems on Organization's Performance. Retrieved on September 10, 2020. Retrieved from https://www.researchgate.net/publication/315599421_The_Impact_of_Cloud_rmation_Systems_on_Organi zation%27s_Performance

Zeleny, M. (2020). Technology Support Net. Retrieved on September 19, 2020. Retrieved from https://en.wikipedia.org/wiki/Technology_support_net

APPENDICES

APPENDIX A

January 6, 2020

DR. BENJAMIN L. PECAYO
University President
NwSSU, Calbayog City

Sir:

I, Ervin L. Rodriguez, a doctorate student of Doctor of Philosophy in Technology Management with the approved proposed dissertation title "**Development of Human Resource Hybrid Descriptive Data Analytics System**" in Samar State University. The scope of the study includes the core functions of PRIME HR office namely: 1.)Recruitment, Selection, & Promotion(RSP); 2.) Learning & Development(L&D); 3.)Performance Management (PM); and 4.) Rewards & Recognition(R&R). The system functionalities of the prototype in the proposed study requires the common operations of the said core functions to store, process, and analyze data.

With this, I would like to request from your good office the permission to conduct a prototype testing to the selected personnel of PRIME HR or HRD office. This part of the study will help the researcher to identify the necessary data analytics functions for the PRIME HRD office. Moreover, the said data analytics procedure will also be implemented in other significant areas of the University such as the Academe, Research, Extension Services, and other administrative offices to form a Hybrid Data Analytics System for the University. The outcome of this study is deemed to be beneficial to an Institution like your University to efficiently manage historical data and eventually facilitate reliable decision making.

The prototype testing will require the personnel to fill-up the evaluation form to document the result of the said testing. Attached herewith is the sample questionnaire to evaluate the functionalities of the said prototype. Thank you very much for considering this request with favor. God Bless and more power!

Respectfully yours,

(Sgd.)ERVIN L. RODRIGUEZ, MSIT
Ph.D. TM Student

Noted:

(Sgd.)FELISA E. GOMBA, Ph.D.
Dissertation, Adviser

Approved:

(Sgd.)BENJAMIN L. PECAYO, Ed.D.
University President

APPENDIX B

January 6, 2020

DR. MARILYN D. CARDOSO
University President
SSU, Catbalogan City

Madam:

I, Ervin L. Rodriguez, a doctorate student of Doctor of Philosophy in Technology Management with the approved proposed dissertation title "**Development of Human Resource Hybrid Descriptive Data Analytics System**" in Samar State University. The scope of the study includes the core functions of PRIME HR office namely: 1.)Recruitment, Selection, & Promotion(RSP); 2.) Learning & Development(L&D); 3.)Performance Management (PM); and 4.) Rewards & Recognition(R&R). The system functionalities of the prototype in the proposed study requires the common operations of the said core functions to store, process, and analyze data.

With this, I would like to request from your good office the permission to conduct a prototype testing to the selected personnel of PRIME HR or HRD office. This part of the study will help the researcher to identify the necessary data analytics functions for the PRIME HRD office. Moreover, the said data analytics procedure will also be implemented in other significant areas of the University such as the Academe, Research, Extension Services, and other administrative offices to form a Hybrid Data Analytics System for the University. The outcome of this study is deemed to be beneficial to an Institution like your University to efficiently manage historical data and eventually facilitate reliable decision making.

The prototype testing will require the personnel to fill-up the evaluation form to document the result of the said testing. Attached herewith is the sample questionnaire to evaluate the functionalities of the said prototype. Thank you very much for considering this request with favor. God Bless and more power!

Respectfully yours,

(Sgd.)ERVIN L. RODRIGUEZ, MSIT
Ph.D. TM Student

Noted:

(Sgd.)FELISA E. GOMBA, Ph.D.
Dissertation, Adviser

Approved:

(Sgd.)MARILYN D. CARDOSO, Ph.D.
University President

APPENDIX C

January 6, 2020

DR. CHERRY I. ULTRA
University President
UEP, Catarman

Madam:

I, Ervin L. Rodriguez, a doctorate student of Doctor of Philosophy in Technology Management with the approved proposed dissertation title "**Development of Human Resource Hybrid Descriptive Data Analytics System**" in Samar State University. The scope of the study includes the core functions of PRIME HR office namely: 1.)Recruitment, Selection, & Promotion(RSP); 2.) Learning & Development(L&D); 3.)Performance Management (PM); and 4.) Rewards & Recognition(R&R). The system functionalities of the prototype in the proposed study requires the common operations of the said core functions to store, process, and analyze data.

With this, I would like to request from your good office the permission to conduct a prototype testing to the selected personnel of PRIME HR or HRD office. This part of the study will help the researcher to identify the necessary data analytics functions for the PRIME HRD office. Moreover, the said data analytics procedure will also be implemented in other significant areas of the University such as the Academe, Research, Extension Services, and other administrative offices to form a Hybrid Data Analytics System for the University. The outcome of this study is deemed to be beneficial to an Institution like your University to efficiently manage historical data and eventually facilitate reliable decision making.

The prototype testing will require the personnel to fill-up the evaluation form to document the result of the said testing. Attached herewith is the sample questionnaire to evaluate the functionalities of the said prototype. Thank you very much for considering this request with favor. God Bless and more power!

Respectfully yours,

(Sgd.)ERVIN L. RODRIGUEZ, MSIT
Ph.D. TM Student

Noted:

(Sgd.)FELISA E. GOMBA, Ph.D.
Dissertation, Adviser
Approved:

(Sgd.)CHERRY I. ULTRA, Ph.D.
University President

APPENDIX D

EVALUATION QUESTIONNAIRE

(Internal & External Software Quality Metrics)

Recruitment, Selection & Placement (RSP) Personnel

DEVELOPMENT OF HUMAN RESOURCE HYBRID DESCRIPTIVE DATA ANALYTICS SYSTEM

Name _____ **Position/Designation** _____

Name of School _____ **Office/Department**

_____

Instruction: Please put a check in the box of the answer of your choice. Below is the equivalent rating scale guide.

Rating	Description	Interpretation
5	Highly Acceptable	If the condition is highly extensive and functioning excellently.
4	Acceptable	If the condition is extensive and functioning well.
3	Moderately Acceptable	If the condition is lightly extensive and functioning moderately.
2	Slightly Acceptable	If the condition is lightly extensive but functioning fairly.
1	Not Acceptable	If the condition is not extensive and functioning poorly.

A. Functionality	**5**	**4**	**3**	**2**	**1**
• The module were able to accept necessary inputs to produce Applicant Acknowledgment Receipt report consistently.	☐	☐	☐	☐	☐
• The module were able to accept necessary inputs to produce Notice for IQ Test report consistently.	☐	☐	☐	☐	☐
• The module is able to accept necessary inputs to produce Notice for Interview and Screening report consistently.	☐	☐	☐	☐	☐
• The module is able to accept necessary inputs to produce Applicants Shortlist report consistently.	☐	☐	☐	☐	☐
• The module is able to accept necessary inputs to produce Individual Assessment report consistently.	☐	☐	☐	☐	☐
• The module is able to accept necessary inputs to produce Comparative Assessment report consistently.	☐	☐	☐	☐	☐
• The module were able to accept data entry for new personnel record consistently.	☐	☐	☐	☐	☐
• The module were able to interoperate to User's module data entry.	☐	☐	☐	☐	☐
• The module were able to provide data analysis.	☐	☐	☐	☐	☐
• The module were accessible to an authorized RSP Personnel only.	☐	☐	☐	☐	☐
	___	___	___	___	___

- The module were able to adhere the standards, conventions or regulations in laws similar prescriptions relating to functionality.

B. Reliability

- User accounts were uniquely accessed.
- Records were viewed precisely according to how it were previously saved.
- Records were not allowed to be saved unless necessary data entries were filled.
- Data entries were precisely accepted.
- Information were accessed and viewed consistently in other browsers available.
- Option to recover files or records were provided.
- Option to backup files or records were provided.
- The module were capable to adhere to standards conventions or regulations relating to reliability.

C. Usability

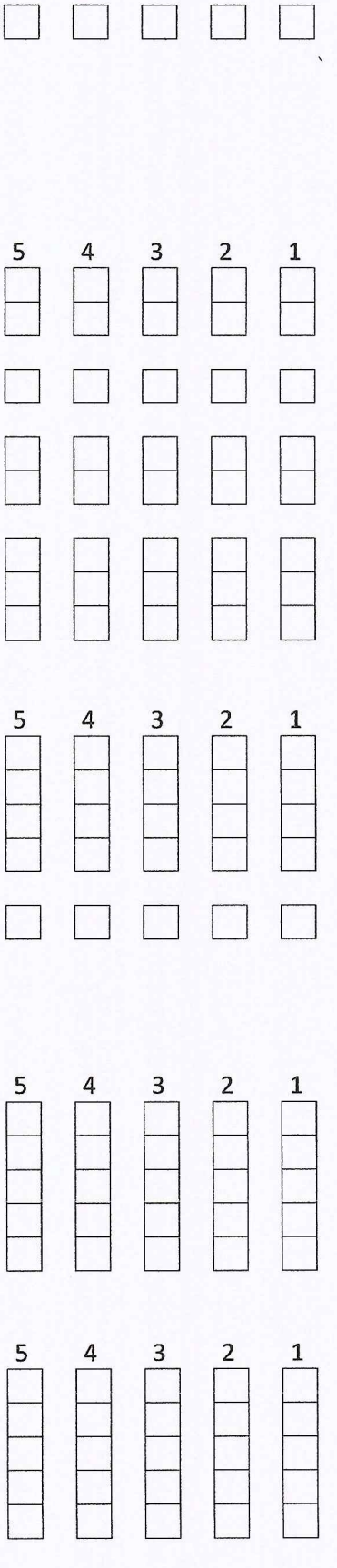
- User-friendliness were practically observed.
- Easy to learn process of using the module were implemented.
- Module were designed to be easily operated and controlled.
- User recommends to use or implement the newly designed module.
- Module were capable to adhere standards, conventions, style guides or regulations relating to usability.

D. Efficiency

- Data entry of records were secured efficiently.
- Records were efficiently searched and viewed.
- User interface were designed to be navigation efficient.
- Reports were efficiently generated.
- Module were capable to adhere standards or conventions relating to efficiency.

E. Accuracy

- Records were accurately searched and viewed.
- Records were accurately saved or stored in the database.
- Reports were accurately generated.
- Accounts were accurately accessed.
- Module were capable to adhere standards or conventions relating to accuracy.



Comments/Suggestions:

_____

_____

_____

_____

_____

_____

Thank you and God Bless!

ERVIN L. RODRIGUEZ, MSIT
Researcher/Ph.D. TM Student

APPENDIX E

EVALUATION QUESTIONNAIRE

(Internal & External Software Quality Metrics)

Learning and Development (L&D) Personnel

DEVELOPMENT OF HUMAN RESOURCE HYBRID DESCRIPTIVE DATA ANALYTICS SYSTEM

Name _____ **Position/Designation** _____

Name of School _____ **Office/Department**

_____

Instruction: Please put a check in the box of the answer of your choice. Below is the equivalent rating scale guide.

Rating	Description	Interpretation
5	Highly Acceptable	If the condition is highly extensive and functioning excellently.
4	Acceptable	If the condition is extensive and functioning well.
3	Moderately Acceptable	If the condition is lightly extensive and functioning moderately.
2	Slightly Acceptable	If the condition is lightly extensive but functioning fairly.
1	Not Acceptable	If the condition is not extensive and functioning poorly.

A. Functionality	5	4	3	2	1
• The module were able to accept necessary inputs to add Training Details.	☐	☐	☐	☐	☐
• The module were able to identify and add personnel to a specific training.	☐	☐	☐	☐	☐
• The module were able to detect personnel's IDP training need relevant to the available training.	☐	☐	☐	☐	☐
• The module were able to check the necessary requirements of the personnel to be submitted after attending a particular training.	☐	☐	☐	☐	☐
• The module were able to consolidate the Training Needs Assessment of all the Personnel.	☐	☐	☐	☐	☐
• The module were able to consolidate the Individual Development Plan of all the Personnel.	☐	☐	☐	☐	☐
• The module were able to interoperate to User's module data entry.	☐	☐	☐	☐	☐
• The module were able to provide data analysis.	☐	☐	☐	☐	☐
• The module were accessible to an authorized L&D personnel only.	☐	☐	☐	☐	☐
• The module allowed the L&D Personnel to change his/her own password.	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

- The module were able to adhere the standards, conventions or regulations in laws similar prescriptions relating to functionality.

B. Reliability

	5	4	3	2	1
• User accounts were uniquely accessed.	☐	☐	☐	☐	☐
• Records were viewed precisely according to how it were previously saved.	☐	☐	☐	☐	☐
• Records were not allowed to be saved unless necessary data entries were filled.	☐	☐	☐	☐	☐
• Data entries were precisely accepted.	☐	☐	☐	☐	☐
• Information were accessed and viewed consistently in other browsers available.	☐	☐	☐	☐	☐
• Option to recover files or records were provided.	☐	☐	☐	☐	☐
• Option to backup files or records were provided.	☐	☐	☐	☐	☐
• The module were capable to adhere to standards conventions or regulations relating to reliability.	☐	☐	☐	☐	☐

C. Usability

	5	4	3	2	1
• User-friendliness were practically observed.	☐	☐	☐	☐	☐
• Easy to learn process of using the module were implemented.	☐	☐	☐	☐	☐
• Module were designed to be easily operated and controlled.	☐	☐	☐	☐	☐
• User recommends to use or implement the newly designed module.	☐	☐	☐	☐	☐
• Module were capable to adhere standards, conventions, style guides or regulations relating to usability.	☐	☐	☐	☐	☐

D. Efficiency

	5	4	3	2	1
• Data entry of records were secured efficiently.	☐	☐	☐	☐	☐
• Records were efficiently searched and viewed.	☐	☐	☐	☐	☐
• User interface were designed to be navigation efficient.	☐	☐	☐	☐	☐
• Reports were efficiently generated.	☐	☐	☐	☐	☐
• Module were capable to adhere standards or conventions relating to efficiency.	☐	☐	☐	☐	☐

E. Accuracy

	5	4	3	2	1
• Records were accurately searched and viewed.	☐	☐	☐	☐	☐
• Records were accurately saved or stored in the database.	☐	☐	☐	☐	☐
• Reports were accurately generated.	☐	☐	☐	☐	☐
• Accounts were accurately accessed.	☐	☐	☐	☐	☐
• Module were capable to adhere standards or conventions relating to accuracy.	☐	☐	☐	☐	☐

Comments/Suggestions:

_____
_____
_____
_____
_____

Thank you and God Bless!

ERVIN L. RODRIGUEZ, MSIT
Researcher/Ph.D. TM Student

APPENDIX F

EVALUATION QUESTIONNAIRE

(Internal & External Software Quality Metrics)

Regular User : Teaching and Non-teaching Personnel

DEVELOPMENT OF HUMAN RESOURCE HYBRID DESCRIPTIVE DATA ANALYTICS SYSTEM

Name _____ **Position/Designation** _____

Name of School _____ **Office/Department**

_____

Instruction: Please put a check in the box of the answer of your choice. Below is the equivalent rating scale guide.

Rating	Description	Interpretation
5	Highly Acceptable	If the condition is highly extensive and functioning excellently.
4	Acceptable	If the condition is extensive and functioning well.
3	Moderately Acceptable	If the condition is lightly extensive and functioning moderately.
2	Slightly Acceptable	If the condition is lightly extensive but functioning fairly.
1	Not Acceptable	If the condition is not extensive and functioning poorly.

A. Functionality

	5	4	3	2	1
• The module were able to accept necessary inputs of the Personal Data Sheet.	☐	☐	☐	☐	☐
• The module were able to accept necessary inputs of an Employee Profile.	☐	☐	☐	☐	☐
• The module were able to accept necessary inputs for Training Needs Assessment record.	☐	☐	☐	☐	☐
• The module were able to accept necessary inputs for Individual Development Plan record.	☐	☐	☐	☐	☐
• The module allowed the user to view the list of Trainings attended.	☐	☐	☐	☐	☐
• The module were able to provide data analysis of the Training Records of the Personnel.	☐	☐	☐	☐	☐
• The module allowed the user to change profile password for security.	☐	☐	☐	☐	☐
• The module were able to adhere the standards, conventions or regulations in laws similar prescriptions relating to functionality.	☐	☐	☐	☐	☐

B. Reliability

	5	4	3	2	1
• User accounts were uniquely accessed.	☐	☐	☐	☐	☐
• Records were viewed precisely according to how it were previously saved.	☐	☐	☐	☐	☐
	___	___	___	___	___

- Records were not allowed to be saved unless necessary data entries were filled.
- Data entries were precisely accepted.
- Information were accessed and viewed consistently in other browsers available.
- Option to recover files or records were provided.
- Option to backup files or records were provided.
- The module were capable to adhere to standards conventions or regulations relating to reliability.

C. Usability

5 4 3 2 1

- User-friendliness were practically observed.
- Easy to learn process of using the module were implemented.
- Module were designed to be easily operated and controlled.
- User recommends to use or implement the newly designed module.
- The module were capable to adhere standards, conventions, style guides or regulations relating to usability.

D. Efficiency

5 4 3 2 1

- Data entry of records were secured efficiently.
- Records were efficiently searched and viewed.
- User interface were designed to be navigation efficient.
- Reports were efficiently generated.
- The module were capable to adhere standards or conventions relating to efficiency.

E. Accuracy

5 4 3 2 1

- Records were accurately searched and viewed.
- Records were accurately saved or stored in the database.
- Reports were accurately generated.
- Accounts were accurately accessed.
- The module were capable to adhere standards or conventions relating to accuracy.

Comments/Suggestions:

_____

_____

Thank you and God Bless!

ERVIN L. RODRIGUEZ, MSIT
Researcher/Ph.D. TM Student

CURRICULUM VITAE

Curriculum Vitae

ERVIN L. RODRIGUEZ

Assistant Professor 1
Northwest Samar State University
Email Address : ervin.rodriguez@nwssu.edu.ph

PERSONAL INFORMATION

Date of Birth:	January 20, 1986	Place of Birth:	Calbayog City
Sex:	Male	Civil Status:	Married
Citizenship:	Filipino	Address:	Brgy. West Awang, Calbayog City, Samar

EDUCATIONAL ATTAINMENT:

Graduate:
Doctor of Philosophy in Technology Management(Ph.D. TM)
Samar State University
Catbalogan City, Samar, Philippines

Master of Science in Information Technology(MSIT)
Northwest Samar State University
Calbayog City, Samar, Philippines

College:
Bachelor of Science in Information Technology(BSIT)
Tiburcio Tancinco Memorial Institute of Science and Technology
Rueda St., Calbayog City, Samar, Philippines

Secondary:
Tiburcio Tancinco Memorial Institute of Science and Technology
Rueda St., Calbayog City, Samar, Philippines

Elementary:
Calbayog Pilot Central School
Rosales Blvd., Calbayog City (1992-1998)

WORK EXPERIENCE:

November 2014-Present	**Assistant Professor I(NBC 7TH Cycle Implementation-approved)**
Company:	Northwest Samar State University
Address:	Calbayog City
May 2011 – October 2014	**Academic Head/Programming Instructor/IT Administrator**
Company	AMA Computer Learning Center, Calbayog
Address:	Maharlika Highway, Calbayog City

April – September, 2010	**Web Developer**
Company	Prestige Real Estate, UAE
Address:	UAE, Dubai

SEMINARS/TRAININGS/CONFERENCES ATTENDED

TITLE	YEAR	SPONSORED by
Community Empowerment through Science and Technology Forum	2020	Department of Science and Technology
2ND International Conference on Poverty Alleviation and Sustainable Development	2020	Samar State Univeristy
Seminar Workshop for the Establishment and Adaptation of Site-Specific Precision Agricultural Systems for Samar Island	2018	Northwest Samar State University
2nd Recoletos National Research Congress	2018	University of San Jose-Recoletos
Visayas Regions Training-Workshop on the Development of Research-Based Extension Projects	2018	Negros Oriental State University
Seminar Workshop on Agribiotech Funding Opportunities	2017	University of Eastern Philippines
28th Joint ViCAARP and RRDEN Regional Research, Development and Extension Symposium	2016	Visayas State University, Baybay City, Leyte
Coding Bootcamp Trainers	2016	International Telecommunication Union
Preparing Cybersecurity Educators of Region VIII	2016	Philippine Society of Information Technology Educators, Reg. VIII
Achieving Excellence in IT Education: Seminar Workshop	2016	Siliman University

LIST OF TABLES

LIST OF TABLES

Table Page

Table Page

LIST OF FIGURES

LIST OF FIGURES

Figure Page