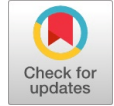


HRIS with Decision Support for Faculty Appraisal and Promotion



Maria Jackie Lou L. Zinampan

Abstract: *Of all the resources of the organization, manpower is the only live generating resource. It is one that utilizes all other resources and as a matter of fact, without which none of the other resources will be able to produce anything. Being such, manpower should be managed properly in such a way that they would be encouraged to be productive and help in the realization of organization's goals. This study aimed to come up with an online decision support system that would aide the management of Cagayan State University manage its human resources particularly in terms of appraisal and promotion by providing relevant and timely information. The system is designed to streamline processes in the HR department so as to simplify generation of needed analytics for decision support. Moreover, the study utilized classification data mining technique to classify faculty members to appropriate ranks and sub-ranks based on their CCE and QCE points and identify faculty members whose rank did not improve in the past 6 years. Decision tree was also used to predict the faculty performance based on the three (3) consecutive NBC 461 cycle results. This decision support information is essential for the management to know so that necessary intervention can be made to help the faculty member improve and get promoted. With the use of ISO/IEC 25010:2011 Software Quality Standards, the system was evaluated by IT Experts with a mean 4.70, qualitatively described as "Very Great Extent".*

Keywords: *Classification Technique, Data Mining, Human Resource Management, Information System.*

I. INTRODUCTION

The development of a decision-making model for Human Resource Management (HRM) in organizations especially for multinational companies can be encouraged considering the fact that HRM plays a lead role in determining the effectiveness of organizations' endurance. The HRM generally maintains evaluation practices and systems impelling employee behavior, commitment, and performance. It is the responsibility of the HRM to dig best talents around the world, look after training, evaluate employee performance, give away rewards and ultimately keep a right environment in the company.[1] HRM is best understood as the "designing formal systems in an organization to manage human talent for accomplishing organizational goals".

Whether you work in a big company with 10,000 employees or a small non-profit organization with 10 employees, employees must be recruited, selected trained, managed and retained.[2] The focus of Human Resource Management (HRM) is on managing people within the employer-employee relationship. Specifically, it involves the productive use of people in achieving the organization's strategic business objectives and the satisfaction of individual employee needs. It adds value by designing and implementing HR policies and practices that motivate employees to translate their know-how into productive behavior.[3]

The use of Human Resource Information System can provide a number of benefits not only to HR function, but also to line managers, and the organization[4]. HRIS allows HR function to become more efficient to provide better information for decision making.[5] and thereby, managing them more efficiently. The use of Human Resource Information Systems plays a vital role in Human Resource Management (HRM) because HRIS functions improve HRM in terms of administrative purposes and analytical purposes. This is certainly true of HR, where the use of technology and the effect it will have on the function is of major concern to senior HR executives. HRIS can make a whole lot of data accessible to employees which help in transparency. The company can follow rules and procedures clearly and can be communicated well to employees. The crucial part of HRIS is the data which is accumulated there. That data will be a lifetime asset for the company and hence HRIS is.[6] In terms of appraisal and promotion, decision makers could easily extract from the human resource information system all data necessary to see if a certain employee's credentials are commensurate to the position, he/she is applying for.

Applying the data mining techniques in the different problem domains in the HRM field is considered as an important and urgent issue. Classification technique can be used to come up with a predictive model for employee's performance through studying and testing the factors that might positively affect it. model, or an enhanced one, can be utilized in predicting the performance of the potential talents that will be promoted, predicting the performance of the recent applicant employees where various actions can be taken for avoiding any risk related to hiring employees with a low performance, or so on[7]. Classification and decision trees have been proven to help HR management in the past. The decision tree algorithm was used to predict the next year's performance of the employee helping the management in their decision making.[8]

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II. AIM OF THE PAPER

A. Statement of the Problem

Specifically, it sought to answer the following questions:

1. What are the practices and challenges encountered by the participants in using the present manual system specifically on the following areas:
 - 1.1 Faculty appraisal and promotion;
 - 1.2 PDS Handling;
 - 1.3 Service Record;
 - 1.4 Research Information;
 - 1.5 Extension Information;
 - 1.6 Trainings and Seminars; and
 - 1.7 Compensation and Benefits
2. What Datamining Technique can be used to generate knowledge discovery for faculty appraisal and promotion in terms of the following areas?
 - 2.1 Identification of Top Performing Faculty members in each area as well as low performing.
 - 2.2 Prediction of Faculty Performance based on CCE and QCE for faculty development.
 - 2.3 Identification of those Faculty members who have not been promoted in the past two (2) cycles or 6 years.
3. What system can be designed to address the problems and issues encountered by the participants.
4. What is the extent of compliance of the developed system to ISO 25010 Quality Standards as assessed by IT expert participants with respect to:
 - 4.1 Functional Suitability
 - 4.2 Performance Efficiency
 - 4.3 Compatibility
 - 4.4 Usability
 - 4.5 Reliability
 - 4.6 Security
 - 4.7 Maintainability
 - 4.8 Portability
5. What enhancements can be done to the developed system?

III. PARADIGM OF THE STUDY

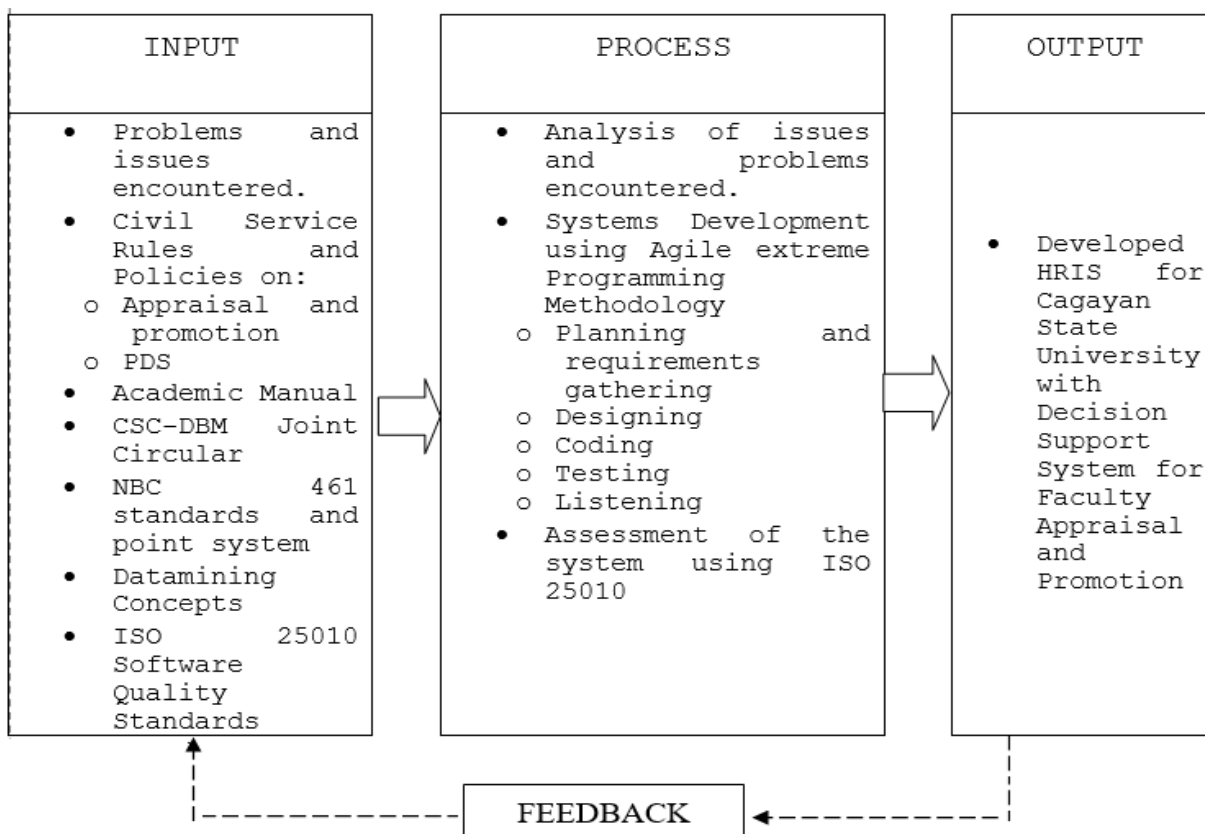


Figure 1. IPO Model

Figure 1 illustrates the IPO model used as research paradigm of the study. The input includes those that are necessary in planning and designing of the system. These are the problems and issues encountered by the end users of the current manual system, policies and guidelines based on Civil Service Rules, Academic Manual, National Budget Circular 461, Data Mining Concepts, and ISO 25010:2011 Software Quality Standards. Process involves analysis of issues and problems encountered through interview and investigation. The results of the interviews were used as guide in the

analysis, design, and development of the proposed system. The system was also assessed by IT experts using ISO 25010:201 Quality Standards. The output is a functioning Human Resource Information System for Faculty Appraisal and Promotion. Datamining methods were applied from the output of the system and were used to derive knowledge that can be utilized for decision making.

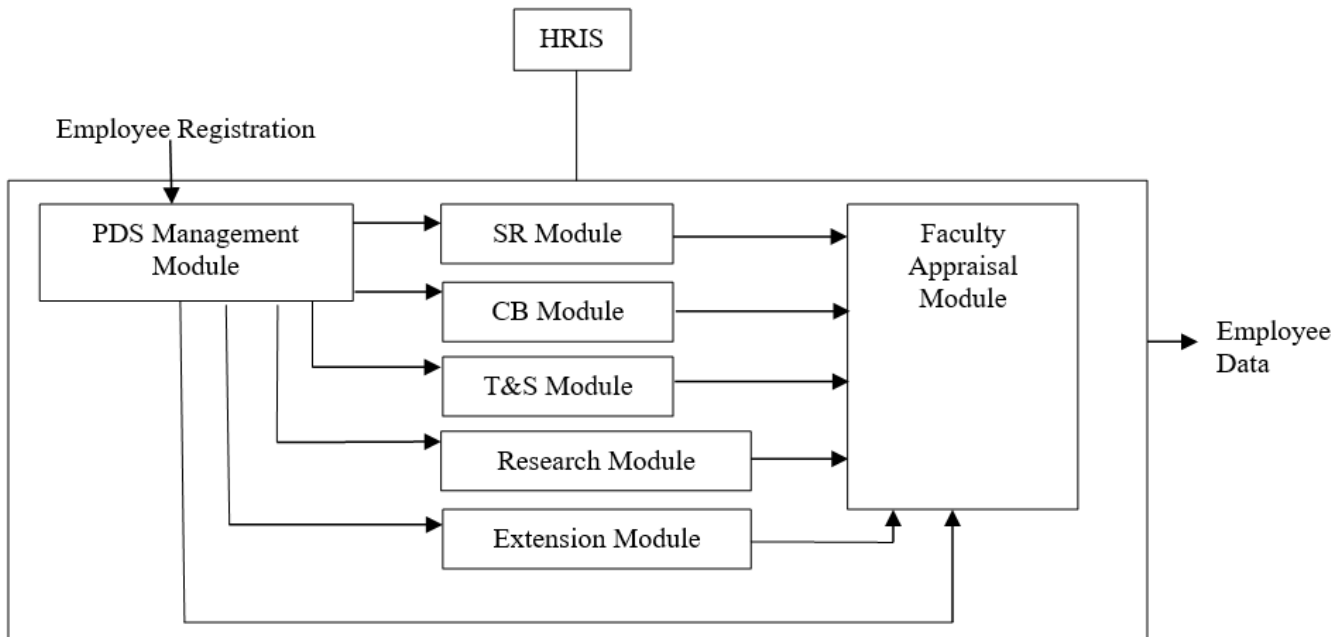


Figure 2. HRIS Diagram

The HRIS diagram as shown in [Figure 2](#) presents how the different modules of the HRIS connect to each other in order to come up with a comprehensive information regarding the employee particularly the faculty performance. It begins with employee registration during the initial stages of hiring. All data in the Form 212 or Personal Data Sheet submitted by the employee are encoded into the PDS management module of the system. After this, all other modules are activated by adding the employee to the different modules. All modules extract personal data from the PDS Management Module. The faculty Appraisal Module extracts some needed data from the different modules for the evaluation. At the end of the process, a timely, accurate, and comprehensive information is produced to aide the management for decision making.

IV. METHODOLOGIES

A. Research Design

The study used descriptive-quantitative and descriptive-developmental method of research which utilized the agile method extreme programming. The descriptive-developmental method and agile method extreme programming was used by the researcher to gather information regarding the status of the present system, the difficulties and challenges encountered by the participants with the existing manual system particularly on producing timely and relevant information that can be used for appraising and promoting of faculty members. It also adopted the agile method extreme programming in the systems analysis and development life cycle. The descriptive-quantitative method was used in the assessment of IT experts using the ISO 25010:2011 Software Quality Standards.

B. Research Methods

Before gathering and collecting data, the researcher sought the proper authorization and permission from the University President to conduct the study. Upon approval of the request, the members of the University/Campus RSC comprising of

the Deans and faculty members who were designated as members of the committee as well as the Administrative personnel, training officer, and Research & Extension coordinators were informed of the consent and at the same time requested to be interviewed at their most convenient time.

Upon the completion of the above-mentioned activities, the researcher proceeded with the interview. Some members of the University/Campus Recruitment and Selection Committee who were available were interviewed regarding the implementation of NBC 461 standards in appraising faculty applicants. Also, the staff of the HR, Research, Extension, and Training office were interviewed regarding records management and retrieval of data in their respective offices. An interview sheet containing the guide questions were developed to systematically retrieve descriptions of practices and problems encountered by the participants in the manual system.

Moreover, the results of the interview were summarized and analyzed to produce the design of the system which was developed by module. Using the Agile extreme programming method, once a module is completed, the researcher consulted the end user of the particular module who acts as the administrator for approval. Once the module is approved, the next module is started. This is done until all modules are developed and integrated.

Finally, the questionnaires were floated after the demonstration of the developed system to the IT experts to test its compliance to ISO 25010 standards.

C. Data Analysis

The result of the interview of the participant were analyzed and served as basis for the identification of deliverables and development of the Human Resource Information System (HRIS). The data collected were tabulated, summarized, analyzed, and interpreted.

A five-point Likert Scale and weighted mean were utilized to measure the IT experts' assessment of the developed system in compliance to ISO 25010:2011.

V. RESULTS AND DISCUSSION

Based on conducted interviews, observations and responses of IT experts to the ISO/IEC 25010 questionnaire the following results were generated:

A. The current practices and challenges confronting end-users of the present manual system in terms of PDS Handling, Service Record, Research information, Extension information, Trainings and Seminars, Compensation and Benefits, Faculty Appraisal and Promotion

Having done all the scheduled interviews with the participants of each module particularly the HR personnel, Training Officer, Research Coordinator, Extension Coordinator, and members of the Recruitment and Selection Committee, the following are the current practices and challenges of end users using the present manual system.

A.1 Current Practices

All data are derived from the submitted documents given by the employee. Once an employee is hired, he/she submits a hardcopy of a filled up Personal Data Sheet or form 212 to the HR department. The same document is forwarded to the records section for inputting in the CSU-DBMS while a service record and compensation and benefits are created. For the PDS to be constantly updated, all employees are required to submit one every start of the year. The service record is also updated once promotion happens as well as the compensation and benefits. In the cases of trainings and seminars attended, research, and extension information, once the activity is done, the employee submits a report to the concerned office together with supporting documents. Same report is recorded and consolidated with other data to come up with needed information for reporting and decision making. Faculty appraisal and promotion is done with faculty members expressing their intentions to join the NBC 461 evaluation. This intention is coupled with bulk of papers to support all claims of credentials and achievements by the faculty member. The Campus Recruitment Committee evaluates the faculty member and produces a report of evaluation which is further evaluated and finalized by the University Recruitment Committee. Same report is signed and submitted by the University to the Regional Zonal Center of evaluation. Once it is approved, the official document of evaluation is forwarded back to the University for implementation. From here, process of promotion is started.

A.2 Challenges

As evidenced by the series of interviews, document reviews, and actual observation, problems really exist in the current manual system. Each office assessed their current manual system with varying perspective. These include difficulty collecting, updating, and retrieving of records, absence of central storage for human resource data, difficulty providing comprehensive and on the dot

information, underutilization of available employee data, time consuming generation of reports, and unsynchronized data of the concerned offices with the MIS department.

B. The use of Classification and Decision Tree as Data Mining Techniques in the Study

In today's dynamic environment, an appropriate performance evaluation method for industries is a complex problem considering its funding scale. Performance evaluation in present industries has become a key part of the strategic approach. Existing performance evaluation approaches are based on manual estimations. These are prone to bias and nepotism, and hence, these manual evaluation schemes may demotivate the employees.[9] In order to make the employees' enthusiasm, sense of responsibility, and sense of belonging stronger, high-standard and high-quality performance management is a key step in enterprise human resource management. The application of data mining technology to employee performance appraisal is an effective method to improve management level and promote management efficiency.[10]

Classification is one of the methods in data mining for categorizing and determining classes of given objects based on their characteristics, where semantic classes are known beforehand [11]. It is a popular machine learning technique for knowledge discovery and future prediction. This method is categorized as supervised learning, where the class level or classification goal is known[12].

In the study, the classification technique was used by the HRIS to assign faculty members to appropriate ranks and sub-ranks based on their total points earned in the evaluation. The system cross-checks the total points earned by the faculty in all the areas of evaluation with points that fall within the range assigned to every rank and sub-rank in the NBC 461. The resulting rank shall then be the one displayed as the report of the system.

Moreover, this technique was also employed by the system to come up with Faculty members who have not moved up professionally in the past 6 years. All faculty members are classified by the system based on their movement in terms of the date of the last entry in the service record. This data is then compared if this date belongs to the range set depending on the current year. Those who have not been promoted even once are displayed by the system while those who have, are reported with details of their promotion.

The other data mining technique used was a decision tree. Decision tree, as a necessary data mining technology, is a very useful fuzzy mathematics evaluation tool for dealing with enterprise performance evaluation with a lot of descriptive data and provides a broad space for reasonable quantification of evaluation.[13] Decision tree is one of the easiest and popular classification algorithm to understand and interpret. It belongs to the family of supervised learning algorithms and can be used for solving regression and classification problems too[14]. Hybrid procedure based on Data Clustering and Decision Tree of Data Mining method may be used by the authority to predict employee's performance for the following year.[15]

C. The Human Resource Information System for Cagayan State University

The developed system is a decision support system that aides in the management of human resources particularly in faculty appraisal and promotion by automating and integrating the services of the HR department and providing accurate, timely, and comprehensive information. It uses classification and decision tree to produce decision support reports that helps management in monitoring and predicting employee performance, thereby also helping them decide on necessary intervention to help the faculty improve for promotion.

D. Extent of Compliance of the Developed System to ISO 25010:2011 Software Quality Standards

Table 1: ISO/IEC 25010 Evaluation

Criteria	Category Mean	Description
1. Functional Suitability	4.78	Very Great Extent
2. Performance Efficiency	4.56	Very Great Extent
3. Compatibility	4.67	Very Great Extent
4. Usability	4.78	Very Great Extent
5. Reliability	4.75	Very Great Extent
6. Security	4.70	Very Great Extent
7. Maintainability	4.70	Very Great Extent
8. Portability	4.70	Very Great Extent
Overall Mean	4.70	Very Great Extent

The goal of ISO 25010 standards is to describe and evaluate software quality. The developed system was subjected for evaluation by IT Experts using ISO 25010 with various characteristics such as Functional Suitability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability, and Portability. Each characteristic is composed of multiple sub-characteristics that provide consistent terminology for specifying, measuring, and evaluating system and software product quality [16].

The table above presents the aggregated evaluation result of the IT experts on the compliance to ISO 25010 Software Quality Standards of the HRIS. The eight attributes were all assessed by the IT Experts as compliant to a “Very Great Extent” with category means ranging from 4.56 to 4.78. The attributes with the highest category mean are usability and functional suitability which both garnered 4.78. On the contrary, the attribute that has the lowest category mean of 4.56 focuses on performance efficiency.

Generally, the developed HRIS was rated by the IT Experts with an overall category mean of 4.70 which implies that it is compliant to ISO 25010 software quality standards to a “Very Great Extent”.

E. Suggested Enhancements that can be made to the Developed System

To enhance the system, the researcher recommends that evaluation criteria should be made dynamic, employee leave credits should be included, and development of module that will link to the payroll and biometric system of the University should be done. Also, some other analytics should be added

as reports of the system depending on the need of the management.

VI. CONCLUSION

Based on the findings of the study, the features and functionalities of the developed system have generally complied with ISO 25010:2015. It may serve as an efficient decision-support tool for human resource management particularly on providing comprehensive, timely, updated, and accurate information that can be utilized for faculty appraisal and promotion of Cagayan State University. Moreover, the system forecast faculty performance to provide management decision support on what necessary intervention can be made to help improve the faculty. Furthermore, the development of modules that provide data on leave credits, link to payroll and biometric attendance system, and more predictive analytics application are recommended.

DECLARATION

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Conflicts of Interest/ Competing Interests	No conflicts of interest to the best of our knowledge.
Ethical Approval and Consent to Participate	No, the article does not require ethical approval and consent to participate with evidence.
Availability of Data and Material/ Data Access Statement	Not relevant.
Authors Contributions	I am only the sole author of the article.

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