Faculty Performance Evaluation System With Application Of Data Analytics

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Abstract

The current system starts with the student form evaluation, Students receive a printed page of the evaluation questions answered in Likert-scaled form. The human resource department normally is responsible in monitoring the attendance and punctuality of the employees. Classroom observation is normally conducted by the college dean with a minimum of two classes handled by each faculty member. The overall performance based on classroom and administrative evaluations which include the grades submission or records management, committee involvement, attendance and punctuality, etc. are manually computed. Identifying the top or outstanding faculty requires time and effort. There is bulk in evaluation forms being distributed to students during the evaluation period. The current process is also prone to human errors and records confidentiality, integrity and availability could possibly be compromised. In summary, it is a complex and paper heavy system. There are many points of failure. Department coordinators may fail to inform the instructors that require evaluations. Evaluation answer sheets can be miscoded. Evaluations may end up unreturned or undistributed. Classes are interrupted. Computing and producing result documents are time intensive and tedious work. Space also is a concern because of archiving the results for a period of time. The proponents' reason in conducting the study is to design and develop a performance evaluation system with the application of data analytics capable of catering the needs of colleges and universities in doing faculty evaluation. The researcher has the desire to find a better approach or to innovate the way to evaluate, monitor and identify the strengths, potentials and weaknesses of teachers with regard their performance to help them become more competent in their field with the help of Data Analytics application. The study utilized the descriptive and developmental method of research. Since the present study was concerned with the design and development of performance evaluation system with application of data analytics, these methods were the most appropriate. The respondents of the study were the faculty members and school administrators of the College of Computer Studies Department of the institution that were involved in the survey. The study used the purposive sampling to define the target respondents for the evaluation. There were 31 faculty members and five school administrators, a total of 36 respondents. A questionnaire was used to determine the response of the respondents towards the developed system over the concept being deliberated. To evaluate the feedback of the respondents, Likert scale was used. Data were gathered through the use of normative survey, library and internet research. Observations and informal interviews were also conducted to get the views of related individuals in the study to help in formulating the conceptual framework, designing the proposed system and other areas of the study. The statistical tool used in the interpretation of data was the arithmetic mean. It was used in determining the average responses of the five options in each item of the questionnaires. Ranking the data was also used in the mean results Based on the data gathered, findings revealed that: The respondents' rate of an average mean of 4.33, the evaluation showed that the majority of the respondents assessed the developed system as "Highly Accepted" in terms of functionality, reliability, usability, efficiency, maintainability and portability. With the usefulness index as another set of evaluation, the respondents showed that the application of data analytics in the developed faculty performance evaluation system is "Moderately Useful" with an overall mean of 4.41.

I. INTRODUCTION

Technology adoption nowadays provides a greater impact in different organizations and as innovation continuously moves at its pace, it continuously helped human to improve his way of life. The introduction of information system in business organizations changed the way they were doing their business transactions and processes, especially in the form of automation. In every industry, senior management is thinking if he is able to get significant benefit from the large volume of data he has within his business or organization. Advance tools and equipment nowadays are available in gathering data but different institutions are still finding ways on how to greatly get full value from those data to play in the industry they belong. There are questions about how best to achieve value from the available data or information. The use of information into business processes nowadays are being integrated with the modern system and innovations such as use-cases, analytics solutions, optimization, work flows and simulations that give more comprehensible and actionable insights.

Performance evaluation is one way to assess the employees during work time. For school institutions, faculty performance evaluation is normally done to assess or measure the effectiveness of faculty members or teachers. These days, higher education institutions are now gathering and keeping huge amounts of data, Analyzing these data can help the institution in data-driven decision making. Also, in colleges and universities, analytics utilization has now been a new field of research and development. One of these is the Academic Analytics, as an institution focused analytics, which is defined as a process for giving higher education organizations with the facts or data required to support financial and operational decision making.

Furthermore, different institutions, from business to higher education, have common business or organizational aims for implementing analytics that include growing financial and operational efficiency; expanding global and local impact; establishing new funding models during changing economic climate; and responding to the demands for greater accountability.

II. LITERATURE REVIEW

The ideas enriched the researcher's insight on the subject and provided a broader perspective in the pursuit of the study. Hanover Research (2013) mentioned that student perception surveys can provide valuable feedback to teachers that may ultimately help improve their effectiveness. Using student surveys for the purpose of teacher performance evaluation is a relatively recent phenomenon; the gathering of student feedback began as early as 1896 when Iowa students were asked to provide input on effective teacher qualities.

According to Wise (n.d.) in his study, "Teacher Evaluation, A Study of Effective Practices", the most important characteristic for any successful evaluation method is valid; whether a test or procedure measures what it purports to measure. He also stated that successful evaluation methods must be reliable, effective and efficient.

According to Marnie Green in her article "Performance Evaluations Don't have to be Painful", performance management activities need to be integrated into how one accomplished his goals. These should be tools that lead to the accomplishment of the organization's objectives, aligned with the strategic vision. Elliott (2013) in "Analytics in the Philippines talked about Big Data Analytics Drive Data to Decision" explained how companies can take advantage of big data to run their business using forward-looking signals rather than just backwards-looking transaction and financial data; how information frameworks are radically changing, to combine operations and analytics on a single-memory platform, and breaking down many of the barriers that have plagued BI projects; how business should empower business users to freely access information using data discovery tools but without creating new disconnected analytics.

According to Ghazanfari et al. (2011), most organizations still experience a lack of Business Intelligence (BI) in their decision making processes when implementing enterprise systems, such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Supply Chain Management (SCM). Evaluating BI is a necessity to evaluate its competencies and the specifications of enterprise systems, and demonstrates that this evaluation can advance decision-support environments. Consequently, a model of techniques to evaluate and assess the intelligence-level of enterprise systems can improve decision support.

LaValle et al. (2011) found that organizations strongly agreed that the use of business information and analytics differentiates them within their industry were twice as likely to be top performers as lower performers. Top performers approach business operations differently than their peers do. Specifically, they put analytics to use in the widest possible range of decisions, large and small. They were twice as likely to use analytics to guide future strategies, and twice as likely to use insights to guide day-to-day operations. In the study of Kimball (n.d.) "Newport News Teacher Performance Assessment System: A Case Study", the author discussed the effort to enhance professional development through the formative evaluation of teaching evolved into a standards-based teacher evaluation system designed for the purpose of improved teaching and accountability.

A study by Sagum et al. (2015) entitled "Application of Language Modelling in Sentiment Analysis for Faculty Comment Evaluation" discussed the use of sentiment analysis towards faculty evaluation. They have discussed different researches that have different methods of sentiment analysis. And they came with a conclusion that the sentiment analyzer was able to serve its purpose, in determining the sentiment of the students in the faculty comments. Maligat's (2012) thesis entitled "Development of Computerized Qualitative Contribution Evaluation System for the Camarines Norte State College" stated that it is true that the use of the manual system is frequently a problem of the respondents. In his study to answer the required system that will address the problems in manual system of evaluation, the system was developed and intended to run on a server- client setup that could be installed on a personal computer using a Local Area Network setup.

III. RESEARCH METHODOLOGY

The descriptive and developmental methods of research were used in this study. Descriptive method was used in the study to give a clear statement of existing at present understanding. And since the present study or investigation was concerned with the design and development of Performance Evaluation System with application of data analytics, these methods of research were the most appropriate to use.

The researcher developed a web-based system by following steps used in system development.
The respondents of the study were the faculty members and school administrators of the College of Computer Studies Department of the institution that were involved in the survey. Specifically, there were 5 school administrators and 31 faculty members. The researcher used the purposive sampling to define the target respondents for the evaluation of the system. The sample herein reflected the characteristics of the respondents from which they were picked.

Research Instruments

The researcher prepared a questionnaire to determine the usability of the system in terms of functionality, reliability, usability, efficiency, maintainability and portability. These are also the characteristics provided by the ISO/IEC 9126. To help the researcher evaluate the feedback of the respondents, the researcher used the Likert scale method.

Table 1
Matrix of Numerical Scales Used in the Respondents' Level of Acceptance on given Software Attributes

Scale	Mean Range	INTERPRETATION						
		Functionality	Reliability	Usability	Efficiency	Maintainability	Portability	
5	4.51 to 5.00	Very Much Accepted	Very Much Functional	Very Much Reliable	Very Much Usable	Very Much Efficient	Very Much Maintainable	Very Much Portable
4	3.51 to 4.50	Highly Accepted	Highly Functional	Highly Reliable	Highly Usable	Highly Efficient	Highly Maintainable	Highly Portable
3	2.51 to 3.50	Accepted	Functional	Reliable	Usable	Efficient	Maintainable	Portable
2	1.51 to 2.50	Less Accepted	Less Functional	Less Reliable	Less Usable	Less Efficient	Less Maintainable	Less Portable
1	1.00 to 1.50	Not Accepted	Not Functional	Not Reliable	Not Usable	Not Efficient	Not Maintainable	Not Portable

Table 1 above shows the rating of evaluation of Faculty Performance Evaluation System in terms of functionality, reliability, usability, efficiency, maintainability and portability. The responses could be Very Much Accepted (VMA), Highly Accepted (HA), Accepted (A), Less Accepted (LA) or Not Accepted (NA).

Table 2 shown on the next page presents the scale used in the level of usefulness of data analytics in the proposed faculty performance evaluation system in terms of monitoring the progress of faculty evaluation, Generating the performance results for the top performing faculty and/or department, presenting the faculty performance's historical reports, and decision making in the institution's management on giving teaching loads.

Table 2
Matrix of Numerical Scales Used in the Level of Usefulness of Data Analytics in the Faculty Performance Evaluation System

SCALE	Mean Range	Verbal Interpretation
5	4.51 - 5.0	Very Useful
4	3.51 - 4.50	Moderately Useful
3	2.51 - 3.50	Useful
2	1.51 - 3.50	Minimally Useful
1	1.00 - 1.50	Not Useful

Statistical Treatment of Data

The statistical tool used in the interpretation of data was arithmetic mean. Arithmetic mean was used to determine the average responses of the five options in each item of the questionnaires. The arithmetic means for each software characteristics; and level of usefulness of data analytics in the developed system was computed. These means were used to derive the overall mean.

Ranking the data was also used in the mean results. The highest value got the number one (1), followed by the lower value and so on. If there are any ties in the data, the tied ranks were averaged. Another statistical tool used was Weighted Mean. It is commonly called as the weighted average. It is defined as the sum of all scores of data divided by the number of scores in the data.

System Architecture
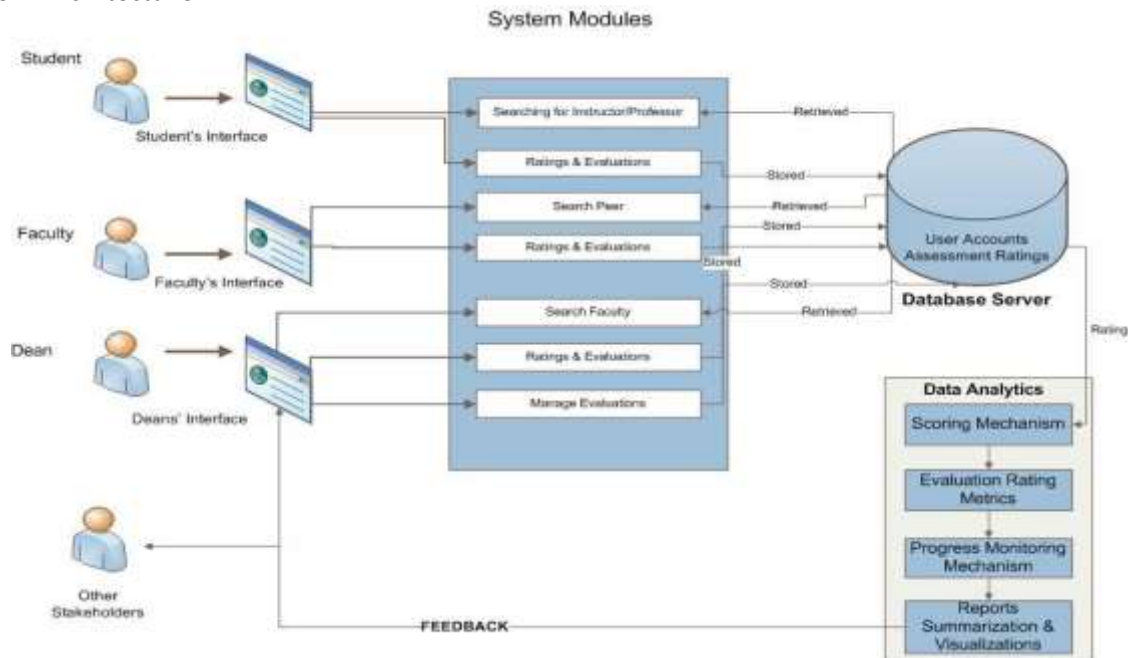
Figure1. System Architecture

Figure1 Illustrates the Faculty Performance Evaluation System Architecture (FPES). It is the representation of the developed FPES with the application of data analytics. The system provides separate modules to each stakeholder by giving interfaces where they login and perform their intended task or process. Mechanisms are provided below in the illustration for evaluation and scoring; evaluation progress monitoring; and reports, summarization and visualizations that will give feedback to stakeholders.

Software Development

The development strategy used in the research was Agile Development Process. The development followed a continuous improvement cycle, exposing flaws faster and reducing waste. Value is achieved faster as releases arrive at the customer more frequently. Some of its advantages include: shorter development cycle, wider market windows, early customer feedback, and continuous improvement.
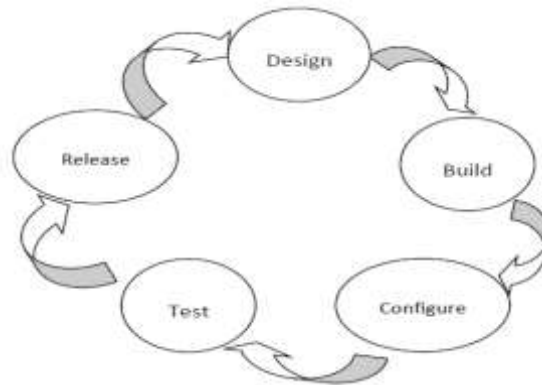
Figure2. Agile Development Process

Agile allows change in the requirements throughout the development cycle and stresses on the close coordination between developer and customer. The central idea is the close involvement and a frequent communication between the development team and stakeholders and delivery of functionality on a regular base. Agile is a flexible approach to development.

IV. FINDINGS AND DISCUSSION

This presents, analyzes, and interprets the data gathered through the questionnaire. The data were arranged following the sequence of the specific problems. The respondent's level of acceptance of the developed Faculty Performance Evaluation System in terms of functionality, reliability, usability, efficiency, maintainability and portability.

Table 3
Respondents' Level of Acceptance of the Proposed Faculty Performance Evaluation System on the following Software Attributes

CRITERIA	OVERALL EVALUATION	INTERPRETATION	Rank
2.1 Functionality	4.28	Highly Accepted	5
2.2 Reliability	4.19	Highly Accepted	6
2.3 Usability	4.44	Highly Accepted	1
2.4 Efficiency	4.39	Highly Accepted	2
2.5 Maintainability	4.30	Highly Accepted	4
2.6 Portability	4.37	Highly Accepted	3
MEAN	**4.33**	**Highly Accepted**	

Table 3 exhibits the result of the evaluation of the thirty six (36) respondents (Faculty and School Administrators) on their acceptance in terms of functionality, reliability, usability, efficiency, maintainability and portability of the system. The developed system was rated 'highly accepted' in all the essential criteria used in the evaluation. Therefore, with the average mean of 4.33, the system proved to be highly functional, highly reliable, highly usable, highly efficient, highly maintainable and highly portable.

The level of usefulness of Data Analytics in the Faculty Performance Evaluation System in terms of monitoring the progress of faculty evaluation; Generating the performance results for the top performing faculty members and/or departments; Presenting the faculty performance historical report/s; and Decision making in the institution's management on giving or distributing teaching load/s.

Table 4
Usefulness of Data Analytics in the Faculty Performance Evaluation System

CRITERIA	MEAN	INTERPRETATION	Rank
3.1 Monitoring the progress of faculty evaluation.	4.56	Very Useful	1
3.2 Generating the performance results for the top faculty and/or department.	4.22	Moderately Useful	4
3.3 Presenting the faculty performance historical report/s.	4.36	Moderately Useful	3
3.4 Decision Making in the institution's management on giving teaching load/s.	4.50	Moderately Useful	2
MEAN	**4.41**	**Moderately Useful**	

Table 4 displays the level of usefulness of data analytics in the developed faculty performance evaluation. The overall mean of 4.41 signified 'moderately useful'. Monitoring the progress of faculty evaluation got the highest rating of 4.56, verbally interpreted as 'very useful'. It means that analytics is 'very useful' in monitoring the evaluation progress. Followed by the three criteria that obtained high ratings, verbally interpreted as 'moderately useful'.

Appropriate features of the prototype used in the proposed Faculty Performance Evaluation System. The proposed Faculty Performance Evaluation System with application of Data Analytics provided different modules for its intended users. The system has separate interfaces for students, faculty members, College dean, and other stakeholders. The system provided evaluation progress monitoring; individual reporting; top employee and/or department reporting and summarization; and historical performance reporting mechanisms. Information Visualization (IV) using graphs and charts were integrated as part of the innovation.

Findings
Based on the data gathered, the following were drawn:

1. With an average mean of 4.33, the evaluation showed that the majority of the respondents assessed the developed system as "Highly Accepted" in terms of functionality, reliability, usability, efficiency, maintainability and portability. The highest rating was given on the usability of the system which proved that the system can be understood, learned and operated. The result was followed by efficiency with the rate of 4.39 that strongly indicated that the system has better thru put or processing time for transactions and was also able to accommodate the processing of all the transactions of the system; portability with the rate of 4.37, maintainability 4.30, functionality 4.28, and reliability 4.19 which were all rated highly accepted.
2. With the usefulness index as another set of evaluation, the respondents showed that the application of data analytics in the developed faculty performance evaluation system was "Moderately Useful" with an overall mean of 4.41. Having the highest rating of 4.56 on monitoring the progress of evaluation followed by decision making in the institution's management with a 4.5 rating; presenting historical performance report with a 4.36 rating; and generating performance results for the top performing faculty and/or department with the rating of 4.22.
3. The study found appropriate features of a proposed system

V. CONCLUSION AND FURTHER RESEARCH
Based on the findings of the study, the following subsequent conclusions were obtained:
The respondents accepted the criteria of the system by giving "Highly Accepted (HA)" rating in terms of functionality, reliability, usability, efficiency, maintainability and portability.

The level of usefulness of data analytics application in the developed system was rated "Moderately Useful" by the respondents. The findings showed that the integrated innovation was really useful in the

system. The appropriate features of the prototype were identified using Agile Development Process. It followed a continuous improvement cycle, exposing flaws faster and reducing waste. It was suitable in developing the system for shorter development cycle and continuous improvement. Templates for the user interface were also defined to make the look standard in many aspects. Different modules were provided for the involved stakeholders.

Recommendations

Based on the findings and conclusions made, the recommendations are as follows:

1. The system can be integrated to the current Information System of the institution-- the current enrollment system and human resource department so that data across the system will be consistent and entering of students and employees' information will be easier and flexible.

2. The system is recommended for implementation in the institution so that the management can easily identify the top performing teachers and departments. Monitoring of the evaluation progress can be seen graphically or visually. Generation of individual performance and historical reports enables the viewing, keeping and monitoring of the faculty members' latest and previous performance to identify their strengths, potentials and weaknesses.

3. Continuous system improvement by looking at the needs of the institution as well as the stakeholders. This way, users will be more delighted in using the system where opportunities for improvement are also prioritized.

4. The future researchers may use the results of this study as their basis for further studies on the improvement of the system or for other research relevant to this study. Mobile developers could create an application similar to the system so that users will be able to access it and enjoy using mobile devices. Since mobile technology is in great usage nowadays.

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