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KNOWLEDGE IN ACTION

Faculty of Business Economics
Master of Management

Master's thesis

Data-driven analysis of curricula in higher education

Mercy Adelakun
Thesis presented in fulfillment of the requirements for the degree of Master of Management, specialization Business Process Management

SUPERVISOR :
dr. Gert JANSSENSWILLEN

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Disclaimer

This master thesis was written during the COVID-19 crisis in 2020. This global health crisis might have had an impact on the (writing) process, the research activities and the research results that are at the basis of this thesis.

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Summary

There is an increasing surge in the number of data gathered by higher educational institutions. Analysing this data gathered for evaluation might be difficult with traditional tools like (document review, stakeholder surveys within the institution, pencil and paper forms of questionnaire, interviews, and limited student grades analysis). Therefore, these traditional tools are gradually substituted and complemented by more modern analytics forms that enhance decision-making in strategic areas and improve institutional performance.

Data analytics tools have proven to be of great usefulness for many institutions and their stakeholders. For example, it facilitates monitoring students' learning on the institution's website and evaluating the curriculum. In addition, analysed data helps institutions know their performance level and how they comply with laws regulating the functioning of higher educational institutions.

Data analysis in education is classified into five levels: the course and departmental levels referred to as "learning analytics". The other three are institutional, regional, and national, known as "academic analytics". This thesis focuses on the institutional level, that is, academic analytics.

Academic analytics can be defined as data-driven decision-making practices which are helpful for operational objectives at a higher institution of learning. It also aids the decision about sharing resources, improving the curriculum, enhancing student performance, carrying out research and making the decision(s) that will affect the institution as a whole.

There are works of literature on the evaluation of course curriculum. However, very few research works are available on evaluating the learning process on an institutional level to direct the curriculum's evaluation and modification. As academic analytics becomes widespread and essential in educational institutions, providing a summary of curriculum evaluation is crucial to improve assessment comprehension by higher education stakeholders. This thesis carried out a qualitative review to add to the existing knowledge on higher education curriculum evaluation, including the advantages of using academic analytics in an institution and the disadvantage of using analytics in institutions.

In this research, materials and methods used focused on existing literature and empirical analysis of academic analysis. Data were collected from published scientific articles, conference papers, online publication, including quantitative, qualitative and multi-method research articles. In addition, the method focused on gathering several papers related to data analytics, curriculum evaluation, and higher education to present a summary and relevant review.

This research shed light on the evaluation of the curriculum of higher educational institutions. Moreover, answered - How the evaluation of curriculum in higher education occurs by accessing the evaluation process. The processes found in the research literature are; (1) involving the stakeholder(s), (2) creating a program overview, (3) emphasis on curriculum format to use (4) reliable evidence, and (5) reaching a conclusion.

The second research question intends to identify areas in which data is being used in the institutions. The research findings revealed that data is used to reduce the failure and dropout rate of students. Data is also used to monitor students' performance at the course level and offer useful indicators to improve their results. It was found that students benefited most from the application of better data use in the institutions.

Lastly, the study summarised some of the opportunities and challenges of using academic analytics in higher institutions. First Institutional analytics focuses on improving the institution's efficiency and performance. Academic analytics help the higher institutions to analyse the gathered data in the institution and make meaning from it. It also helps to incorporate technological improvements into the curriculum. Some challenges were summarised so that institutions can take note and plan to reduce the potential risks of inadequate analytics in education.

Keywords: Academic analytics, Curriculum evaluation, Learning analytics, Higher education curriculum

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1 Introduction

University programs aim to keep up to date with changes pertinent to their curriculum by tracking developments in knowledge, industry needs, consumer demands, government and institutional requirements (Bentley et al., 2013). Therefore, evaluating the curriculum in an educational institution plays a vital role in ensuring that all desired objectives are met.

Constant evaluation keeps the system updated, valid, and reliable for the changing situations due to the global development that would need to be reflected in education (Hussain et al., 2011). In addition, evaluation pushes the curriculum in the right direction because the curriculum is flexible. It changes from time to time, so evaluation is essential to develop it and keep it consistent with the present changes (Ladyshewsky and Taplin, 2015).

The main objective of the evaluation processes is to assess the limitations. Apart from accessing limitations, there are other purposes to check out if the teaching program contributes to developing students' skills and understanding (Khan, 2019).

Evaluation is required to investigate and recognise if the curriculum is effective if it achieves its target in an institution or not, and whether it is still significant. Through evaluation, shortcomings of the curriculum can be assessed and corrected to get the desired result. The evaluated outcome is the foundation to refine the curriculum. Recommendations by evaluation for every process impact the curriculum since learning can be achieved only via the appropriate, relevant curriculum and thorough analysis of the mechanism for improving and achieving the required goals (Hussain et al., 2011).

This thesis describes the data-driven analysis of curricula in higher educational institutions, the academic analytics dimension, and how academic analytics is applied on an institutional level. However, analytics can be applied at different levels in a higher educational institution (Mendez et al., 2014).

Analytics in education has five levels and two subgroups (Siemens and Long, 2011). The first subgroup has two levels – the course level and the departmental level, referred to as the learning analytics. The other three are institutional, regional, and national levels, known as academic analytics.

Learning analytics can be referred to as evaluation based on students and their learning habits. The data gathered are sourced from course management and aim to improve student's success rate (Oblinger, 2012). In contrast, academic analytics can be defined as the use of data, statistical and quantitative methods, explanatory and predictive models to allow organisations and individuals to gain insights into and act on complex issues (Oblinger, 2012; Wong, 2016).

Academic analytics combines data from the institution, computational interpretation and predicts to build understanding which guides educators and stakeholders mindset (Baepler and Murdoch, 2010). For example, analytics techniques can predict student retention and dropout rates from an institution or program (Morris et al., 2005).

Regular and early evaluation using analytical techniques have a high impact on student retention rate. Hence, with evaluation, the curriculum can be redesigned and improved by considering the students' learning ability to understand the content of the curriculum to improve the teaching method (Crosling et al., 2008). Students need swift feedback, especially students struggling with their program. They need to be guided on the proper steps to help them complete their programs successfully.

Academic analytics uses business intelligence (BI) methods and techniques in educational institutions to influence decision-making processes (Apraxine and Stylianou, 2017). An institutional analytics program aims to help those in charge of the planning process evaluate efficiently, capture, decode, communicate, and exchange data to recognise the strengths and weaknesses of activities, programs, and the students.

Several studies have been conducted in higher learning institutions relating to learning analytics techniques in evaluating courses within the department and curriculum design. However, very little research is done on evaluating the learning process (academic analytics) on an institutional level relating to the direct curriculum's evaluation and modification (Armatas and Spratt, 2019; Komenda et al., 2015; Mendez et al., 2014)

As academic analytics become widespread and essential in educational institutions, this study summarises how curriculum evaluation is carried out, the advantages and challenges of using academic analytics for curriculum stakeholders. Therefore, the thesis carried out a qualitative review to contribute to the few existing literature works and increase the higher educational (academic analytics) curriculum evaluation.

To address the research problem, the researcher draws on existing literature and empirical analysis of academic analytics. Data were collected from published scientific articles, conference papers, online publication, including quantitative and qualitative research articles. The method focused on gathering several papers related to data analytics, curriculum evaluation and higher education to present a summary and relevant review. Academic analytics, data analytics, evaluation of curriculum methods, benefits, and challenges were the keywords used in searching for articles.

1.1 Research Questions

The following questions guided the research:

1. How does the evaluation of the curriculum in higher education take place?

2. What are the areas in which data is already being used in higher education?

3. What are the opportunities and challenges facing academic analytics in higher education?

1.2 Relevance of the research

There is high interest in expanding and exploiting the value of increasing data within the higher education setting. However, there is little work addressing academic analytics in higher education (Mendez et al., 2014). This study will add to the empirical knowledge within educational institutions using academic analytics. Furthermore, it will outline the opportunities brought to higher education by academic analytics and the significant challenges with its discovery and application.

2 Literature Review

Data analytics is majorly classified into two major groups; academic analytics and learning analytics. Academic analytics and learning analytics have some significant differences. Academic analytics evaluates data from an institutional, regional and national level. Learning analytics relates to evaluation on course and the department level (Siemens and Long, 2011). Another difference is that those that benefit from the evaluation process differ. For Learning analytics, the students, and the departments, benefit from the results of the evaluation. While for the academic analytics, the institution, nation, region and the stakeholders, research funding institute, the institution's administrators and the top management benefits from it (Siemens and Long, 2011).

Academic analytics can be defined as data-driven decision-making practices, which is helpful for operational objectives at a higher institution of learning (Baepler and Murdoch, 2010). In addition, it can be adapted to student teaching and learning concerns. Findings show that stakeholders use academic analytics to source for funds, engage in business activities and finance, estimate and plan research in the institution, run academic affairs, and help manage resources and assets judiciously (Goldstein and Katz, 2005).

Conversely, learning analytics is "the measurement, gathering, analysis, and reporting of data about students and their studies. The aim is to understand and advance learning and the learning environments." (Siemens and Long, 2011). Learning analytics is evaluating student performance by checking their progress and comparing it with the previous performance of the students who offer the course and the curriculum content of their courses (Elias, 2011). Using a learning management system will make this easier or any other learning platform or tools adopted by the institution.

Chapter Overview

To better understand this research discussion, the next section will elaborate on the research objectives stated in chapter one. This section is split into three parts. The first part answers the first research question, which addresses curriculum evaluation in higher education: the process involved in the evaluation. Next, it discusses where the data are gotten from for the evaluation process and why curriculum evaluation occurs. The second part discusses areas in which data is being used. Finally, the third segment explains the opportunities generated from using academic analytics and the challenges in using learning analytics in higher educational institutions.

2.1 How does the evaluation of the curriculum in higher education take place?

Over the years, the educational curriculum has drawn considerable attention in higher education globally (Blackmore and Kandiko, 2012). Thus, there have been some significant changes in the curriculum of the higher institutions (Annala et al., 2016). In addition, it is suggested that educational curriculum should be among the fundamental concepts in discussion in higher learning institutions.

Doll (1992) describes evaluation as a comprehensive and continuing inquiry into the effects of using learning materials and processes to achieve clearly defined objectives. Evaluation is a process of gathering and providing data to promote strategic decisions at different phases of curriculum design (Armatas and Spratt, 2019; Shiundu and Omulando, 1992).

Curriculum evaluation is described as collecting and analysing relevant data to evaluate and quantify the effect of curriculum design goals (Sukirman et al., 2017). This description shows quite clearly that curriculum evaluation is a method that systematically tests the efficacy of the curriculum (Assel et al., 2007). Curriculum evaluation, in short, is a procedure and not a product.

Curriculum evaluation is a necessary process that ensures adequate planning, implementation, and continuous development of a program's curriculum. It is crucial because it measures whether the curriculum's goals have been achieved (Hutchinson et al., 1987), ensures continuous improvement (McGinley, 1984), and the advancement of the curriculum (Swan, 1986). Therefore, in evaluating the curriculum, the evaluator and stakeholders should collect appropriate data to understand how academic goals are achieved.

2.1.1 Process involved in carrying out evaluation

Analytical tools used in evaluating curriculum at course level will be employed in this thesis and applied to evaluating the institution's curriculum because different courses make up a program. All the programs together make up the institution. Moore, (2018) and Milstein et al., (2000) listed some processes involved in evaluating a program's curriculum, which can also be applied to an institution as a whole. They involve - stakeholders, creating a program overview, emphasising evaluation format to use, reliable evidence, and reaching a conclusion on data gathered and keeping the report. Other researchers like (Vera, n.d.; Wolf, 2007) listed similar processes.

2.1.1.1 Involving stakeholders

The evaluation process – "involving stakeholders" is critical because it is necessary to get information from various contributors through different forms. Stakeholders involved in carrying out curriculum evaluation in higher educational institutions are the current students and graduates of the institution, the faculty staff, heads of faculty, administrative staff, senior management members, and sponsors, namely, research funding institutions. They contribute their views and necessary information that facilitates the success of the curriculum evaluation process without concealing any vital facts.

The primary stakeholders are curriculum developers in the institution who are experts in their fields. They define the purpose and focus of the evaluation to determine the types of information to gather. These goals might vary from improving the program to increasing student retention rates in the institution or reducing dropout rates from a program. The stakeholders also determine the necessary resources needed to bring about enhancement and changes in the curriculum. Thus, the stakeholder's goals influence curriculum evaluation.

2.1.1.2. Creating a program overview

A program overview should first be created before the evaluation process can take place. The stakeholders need to agree and create a logical analysis to explain the overview of the curriculum. This program overview set the goals for the evaluation process. There is a close link between the curriculum's goals and the resources needed to achieve them. To achieve the curriculum evaluation goal, the resources needed are; stakeholders, intellectuals, and monetary resources. All these are put together to make the evaluation a success. Next, the curriculum evaluators are tasked with defining the goals the evaluation process wants to achieve. The goals can be short or long-term. Finally, the evaluation determines the program that needs improvement, courses that need to be split, materials that need to be changed, or the teaching method that needs refinement.

After creating a logical overview of the curriculum, the curriculum evaluator's stakeholders design a questionnaire or questions for an interview or any other preferred method to elicit information from the student (the present student and graduates of the institution) and the program's instructors. The analysis of the feedback gotten from the respondent will lead to the achievement of the curriculum evaluation goal.

2.1.1.3. Emphasis on evaluation format to use

The logical analysis of the curriculum overview will set the format to follow in carrying out the evaluation process. Focusing on the evaluation format to use means the stakeholders need to have determined this when describing the program overview before gathering data. Once the data has been gathered, using another format might not generate the needed result. The format used must elicit the necessary information from the key stakeholders when carrying out the evaluation process. The curriculum evaluator needs to set the right question in alignment with the evaluation's goal. The latter can only be achieved with adequate preparation by designing the questionnaire or any other methods to incorporate all the curriculum components.

2.1.1.4. Reliable evidence

All data gathered from stakeholders involved in the evaluation process must be seen as reliable evidence that can be further analysed. Then, a decision can be taken on the data analysed. Data reliability depend on where the information was gathered from, the methods of eliciting the data, and how it was managed. Respondents anonymity and confidentiality improve data quality and quantity. For students, they must be guaranteed that the information given will not negatively impact their results. Hence, their feedback will be kept anonymous. The questionnaire given to the students must be relevant to their program(s).

2.1.1.5. Reaching a conclusion on data gathered

The process – "reaching a conclusion" is linked to the already explained evaluation steps. A conclusion can only be reached after the reliable data collected in line with the purpose of evaluation - defined by the curriculum evaluator stakeholders - is analysed to make meaning from it. Then, the analysed data is interpreted to know the implication to the curriculum evaluated. Finally, the

necessary recommendation can be made and shared across the institution and ensure the outcome is implemented. The data gathered and analysed for the evaluation and the decision taken, and action plans to be implemented must be stored accurately to retrieve it for future purposes.

2.1.2 Sources of data for the evaluation process

Curriculum evaluation should be a continuous process as inputs are gathered from students and instructors in the faculty. In addition, it should be integrated into the curriculum to improve the program and teaching process and enhance students' retention rate and overall performance.

There are different sources from which data can be gathered for the curriculum evaluation process. However, Armatas and Spratt, (2019); Cleaver et al., (2017) stated that evaluation of curriculum in higher education stems from input gotten from present and past students of the institution and the faculty.

2.1.2.1 Evaluation data from the current students

Findings revealed that most data collected for curriculum evaluation are from students (Armatas and Spratt, 2019; Le and Tran, 2021). Moreover, this is applicable in all educational settings, not only higher education institutions. These are carried out through questionnaires and semi-structured interviews. Using an online questionnaire is the easiest, but a paper-based questionnaire can also be used. It is easier to collect feedback from the current students because their institutions mandate them to give feedback on their courses (Armatas and Spratt, 2019). Therefore, current students give feedback by filling questionnaires through their learning platforms (blackboard, toledo, or various sites used by the institution). The questionnaire must be designed to incorporate different aspects of the learning objectives.

The curriculum evaluation aims to determine if the curriculum meets the students' needs and can easily comprehend the teaching materials. In that case, the instructor's teaching model and the curriculum content must be included in the designed questionnaire. It should cover five components of the curriculum listed by Le and Tran, (2021), which are "Education objectives, content, material, teaching methods, and assessment."

These five components of the curriculum evaluation are primarily assessed from the student's viewpoint to know if the objective of the curriculum is achieved. They are explained as follows;

1. Education objectives: can also be referred to as curriculum concepts. It concerns if the learning objective is appropriate to the course or not. For example, if the teaching style is acceptable to the course, some courses need more practical classes than theoretical classes (Luo et al., 2020).

2. Curriculum content: the designed questionnaires probes the curriculum's content to see if the content is in-depth enough to aid knowledge acquisition and clarity. Curriculum content includes the value (knowledge, attitudes and skills) the instructor is trying to pass across to the student (Vera, n.d.)

3. Teaching method: the teaching style should be in line with the content and objectives of the curriculum. It should educate the students because this is a significant aim the curriculum intends to fulfil. Therefore, teaching style needs to be indicated in the curriculum objective. The instructors should ensure they build on existing knowledge of what the students know or complement their previous academic background by introducing new topics and a lesson in a logical manner.

4. Assessment: this has to do with how students are assessed to know if the students have acquired sufficient knowledge about the program. It also gauges the students understanding levels such as practical's assessment, case studies practice, homework, presentation and term paper, and examination.

5. Material: the material used for the course is also an aspect that can be asked whether the student can easily understand it.

All the feedback from various students must be collated together and analysed to improve the curriculum. This will ensure that the next intake of students does not face the same problem. However, other means can also elicit information from the students, like checklists or observation (Anderson and Rogan, 2011). In addition, using students performance (grades) of various programs is an indirect approach to evaluating the curriculum (Tom-Lawyer, 2014).

According to Bafaraj and Elkhadir (2021), the curriculum evaluation process and judgment should not be based on student feedback and grades only. Berk (2005) opined that other methods should be used alongside student feedback. Students might be biased in their feedback, especially if they did not like the lecturer or if the feedback is given before their result is released. When they are not sure their identity will be kept anonymous, they might be reluctant to give accurate feedback about their program. Also, an instructor may manipulate student grades to avoid being questioned in a situation of mass failure (Anderson and Rogan, 2011).

The institution can improve the curriculum evaluation by ensuring all stakeholders are involved in getting a better result. This improvement in higher education curriculum can be made by ensuring regular evaluation of their curriculum without waiting for years to gather significant data before carrying out the evaluation. Again, they do not need to wait for a professional evaluator to carry out the curriculum evaluation process. The evaluation should not be carried out only when there is a need for accreditation of a program but by using available evaluation templates suitable to the institution and implementing the result. Improvement in curriculum evaluation can also be enhanced by not wasting time debating the reason and timing of implementation. For example, suppose there is any discovery identified in the pattern of student learning during the evaluation process. In that case, they gather more information on it and go ahead to amend the curriculum.

Other institutions better in performance and have outstanding curriculum can also be used as a benchmark to evaluate and improve one's curriculum.

2.1.2.2 Evaluation data from the graduates of the institution

The graduate feedback on their program can significantly impact the curriculum evaluation report. Most of the time, the students may not know the relevance of a course in their program until they start their career. So, it is helpful to seek feedback from the program graduates as it aligns with the findings of (Bafaraj and Elkhadir, 2021). Data can be gathered from graduates through surveys using emails or organising an interview (Bafaraj and Elkhadir, 2021; Watmough et al., 2009) or a close-ended questionnaire (Zhou, 2016).

The questionnaires or interviews designed are aimed to seek an answer from graduates to know if the skills and knowledge acquired in the learning course benefit them in their career (Watmough et al., 2009). The world is fast-changing, and the student needs to stay relevant in their program. The feedback from graduates can help incorporate new knowledge and technological innovation into the curriculum and improve the program (Zhou, 2016). In addition, the feedback from the graduate will allow the evaluator to split overload courses, and irrelevant courses can be removed (Watmough et al., 2009).

However, getting a response from the graduate of an institution might be quite challenging because some might not respond, or getting across to them might be very difficult. Therefore, the institution should maintain a cordial relationship with the graduates for this purpose.

2.1.2.3 Evaluation data from Faculty head and staffs

In planning the evaluation process, the curriculum evaluation stakeholders should consult with the faculty head first for his opinion, as this will determine the goal of the evaluation process. Faculty heads and staff need to be carried along. The institution's current and graduate students' feedback is not enough to act upon, and faculty staff input is needed. The evaluation process can not be complete without the faculty's input because they are in charge of the program. Any decision taken in the curriculum will be implemented by them and not the student (Jones and Froom, 1994)

The goal of the evaluation process will determine the curriculum component to be included in the questionnaire and interview given to both current and graduate students of the institution. After the evaluation process, the report will be handed over to the faculty head, who will discuss with the faculty staff for necessary implementation.

2.1.2.4. Professional evaluator and neutral observer

Some universities have a board of executives who are responsible for designing and evaluating the curriculum. The board members are the appropriate bodies to carry out the evaluation process. The curriculum evaluation board members should be experts who know about designing and evaluating curriculum (Guenther and Falk, 2007). The institution can also seek the help of professional evaluators from other institutions to avoid being biased and compromise in giving accurate reports (Miller, 1984). A neutral observer who knows about the program and can offer his/her view can be an expert in that field.

However, it is not advisable to use professional evaluators only because they may not have adequate knowledge of the activities and performance of each faculty in the institution. As a result, they can only act on the information given to them, which might not be enough. Furthermore, when their service ends after the evaluation process, they might not be available to monitor the implementation of the changes.

Curriculum evaluators can make use of various combinations of sources in the evaluation process. For example, the evaluation process may be at the beginning of the semester or the end of the semester. However, it is advisable that the evaluation process should be at the end of the semester. Then the students can give feedback if their instructors follow the content of the curriculum. More so, qualitative and quantitative methods of evaluation can be used together.

2.1.3 Reasons for carrying out curriculum evaluation

The reason for evaluating curriculum varies by stakeholders. However, it might be an issue noticed in the program that gives rise to the evaluation to assess how difficult a program is and improve its curriculum. Evaluation is not to improve program performance for student benefit alone but also to improve instructors' performance as well (Anderson and Rogan, 2011).

Evaluation of the curriculum to understand the performance will help stakeholders better understand the present performance of the institution's curriculum and give hints on any issues that could arise. The most common reason is to improve the course learning experience and student performance as well (Kogan and Shea, 2007). It entails more, they are;

1. Course improvement

The principal reason for evaluation by stakeholders is to improve the program and student learning experience. Also, to spot any loopholes that the instructors may not notice in the curriculum (Kogan and Shea, 2007). The strengths and weaknesses of the curriculum need to be identified. Course improvement involves modifying recurrently used materials and methods. The curriculum was first introduced to improve the course. When students are asked to give feedback on their courses for course improvement, evaluators are only trying to find out if the course is fulfilling its goal or not and to ascertain its impact on the student. That is, assessing the student's overall educational progress (Cronbach, 2000).

Feedback from the current students and graduates of the institution will help achieve this goal of evaluation. For example, suppose the institution notices the increase in student dropout rate or high rate of failure in a program. Evaluation of the curriculum can be carried out to detect the program's difficulty and split it for easy understanding. Identifying loopholes, causes of failure, and dropout rate will help the evaluator know the program curriculum area that needs improvement. Hence, the negative feedback will be worked on and can be used to improve the curriculum.

2. Reorganisation of teaching material and teaching styles:

The curriculum is evaluated to gather information from the students to determine if they can easily comprehend the teaching materials. It also gathered information to determine the educational materials and procedures that are ineffective and need to be changed. Moreover, the topics need to be arranged logically from the introductory part to the advanced level for easy understanding and assimilation to avoid confusion.

So in the course of the evaluation process, topics can be rearranged by arranging them in a logical order, merging related topics or courses. The teaching styles can be worked on by structuring course aspects more practically by taking the student on a field trip or visiting sites to experience real-life practices. The student tends to remember what they practice rather than mere theory and gives room for group discussions or practices in the laboratory (Močinić, 2012). Some courses are better with practicals than just theory.

Feedback from the student can be used to improve the content of a program by changing the textbook used or teaching material and teaching styles. For example, when students are finding it hard to understand the content.

3. Accreditation purpose

The evaluation is also carried out for accreditation. Accreditation means that the governing bodies that regulate a program or institution in a country have given authorisation to award certificates to the programs' student after completing their program (leading to an award of degree).

The curriculum can be evaluated to ensure the curriculum aligns with the goals, teaching materials, course content, and questions set with the regulatory bodies' standards. By ensuring the institution is conforming to all the practices and regulations to meet accreditation requirements. The accreditation team is external to the institution. They examine the curriculum objective of each program, content, teaching material, and assessment method.

4. Assessing the effect of innovative ideas introduced into the curriculum

The curriculum can be re-evaluated after some new teaching content, teaching styles, or teaching methods have been introduced into the program's curriculum. To see the effect on the students and know if it has improved their learning skills and knowledge. It is essential to know the impact, whether it is negatively or positively impacting the student.

Another possible reason for evaluation is to know how an institution is generally performing, compared to previous evaluation results, and to know if the institution is making any progress. Moreover, the investigation of mass failure is essential in determining reasons for the high failure rate in a course or program over several years, especially in courses offered by many students. The evaluation process will enable departments involved to address the issues of mass failure, having known the causes. Curriculum evaluation has also proved to be of help in curriculum development (Fu, 2016).

2.2. What are the areas in which data is already being used in higher education?

Over the years, institutions have been generating many data, and it keeps increasing daily. In order to manage it, the higher institutions have adopted some systems to manage their data, for example, a Learning Management System (LMS). If the data is efficiently analysed and managed, it will improve its performance and the student's learning performance (Tsai and Gasevic, 2017). The decision can be based on the data analysed without basing their decision on presumptions.

Learning analytics is not a new concept in higher education. It has been used in improving the student learning success rate. Learning analytics has been used to provide feedback to the students to increase their success rate and advise them when necessary (Abdous et al., 2012). The institution does not need to wait until the end of the semester to give feedback to the students or get feedback from them. As they can easily access this information and analyse it, improving teaching content and teaching styles makes the teaching easy to understand for the student (Dziuban et al., 2012). Learning analytics provides real-time information. The key players in learning analytics are students, instructors, the course contents, and the institution.

Learning analytics deals with the assessment of student performance (grade) and progress. It is more about student learning, using techniques to understand better how and what students achieve in their courses (Greller and Drachsler, 2012). Tutors used a learning analytics report in advising students generally about their performance. In comparison, the students use learning analytics to reflect on their learning activities and performance. It has been used in various institutions in advising students on their academic performance.

Learning analytics is being used to take notes of students at risk of dropping out of their courses and performing poorly. It can be corrected early, thereby reducing the rate of dropout and poor student performance (Viberg et al., 2018). Learning Analytics tools have been of great help because students learn online on the institution websites, which can note students' attendance and login details. Students who participate in the online group discussion, students who did the assignment and submitted it on time.

Learning analytics is not just for reflecting on students' academic performance and attitude toward learning and helping educators in their teaching. However, higher institutions use it to strengthen inter-institutional collaboration and provide a platform for the vast population of learners and lecturers (Atif et al., 2013). In addition, the management of institutions uses learning analytics to abide by all regulation within the institution and outside the institution (external) (Dziuban et al., 2012). Finally, learning analytics is used in formative and summative assessments of students in their learning process at the course level and the department level.

Formative evaluation: it is used to increase the curriculum's robustness. It requires standardised processes to provide evidence and highlight issues (Richards, 2013). Such changes can be done during the development and implementation of the curriculum, but only when it is still in the development phase. The focus is on the procedure rather than the outcomes (Sukirman et al., 2017). This assessment's primary objective is to give curriculum designers specific expert advice about

development aspects that meet the requirements. To enhance these areas or results, data gathered from this type of assessment is applied. It can offer a person, a faculty member, or a program affirmation and reinforcement (Afsahi, 2016).

Summative evaluation: This form of assessment occurs at the end of the semester to record the accomplishment or competence of students and staff. At the end of the educational curriculum, summative assessment involves making a conclusion or decision. It is a capstone evaluation, the result, or proficiency certification at the end of the course (Afsahi, 2016). Individual learners, faculty members, and programs will benefit from a summative assessment (Afsahi, 2016). Summative assessment is directed at considering the outcomes of curriculum design, curriculum records, learning outcomes, and the curriculum's effect on education and environment may all disclose these findings (Sukirman et al., 2017). With 'summative assessment', evaluators will decide whether a course should be continued if it is still adequate and relevant to students' learning, or whether it should be removed or improved in the case of consistent failure and irrelevance (Richards, 2013).

Other areas are;

Advising

With learning analytics, instructors have access to information related to each student on their courses. Therefore, they know each student's performance in their various courses. This information about the students is used to advise those who need help in their academics, who perform poorly in their courses (Papanagnou et al., 2016). In most institutions, all students have a course adviser, which he or she can quickly meet for any advice. For example, suppose the student keeps failing. In that case, the course advisor can organise a meeting to find out the cause of failure and offer needed advice. Learning analytics tools can also be used to know areas where students are weak, thereby increasing student performance. Sometimes, advice is given on time management and being productive. However, it is always tailored to improve students' performance and learning skills (Uhm et al., 2015).

Student remediation

Instructors can use learning analytics to know areas in which the student needs remedial courses for their program. Some institutions call it preparatory courses. Especially if they find the main course very difficult to pass, the student must show adequate knowledge of the remedial course before enrolling for the main course. However, the grade in the remedial course may not count.

Steps involved in analysing student data with learning analytics

Campbell et al., (2007); Leitner and Ebner (2017) listed five steps involved in analysing data. They are;

1. Capturing: students data is obtained and gathered automatically from various sources depending on the platform used by the institution, like Learning Management System (LMS), toledo, blackboard, virtual learning environment, institution portals (Tseng et al., 2016).

2. Reporting: the student data gathered from the institution portal is analysed, and a report is generated. The report is used to develop a reliable framework for defining and assessing the progress rate of students (Leony et al., 2013).

3. Predicting: the report of the analysed data generated can be used as predicting factors to identify students who are on the verge of dropping out or failing their courses (Akhtar et al., 2017). Stakeholders in the higher institution also make use of it to make decisions on student courses, and this will influence the student's performance and in allocating resources (Lonn et al., 2012).

4. Acting: the report from the analysed data is used to determine the best course of action in helping students who are on the verge of dropping out from their course and failing (De Freitas et al., 2015).

5. Refining: the report generated from the data gathered is used consistently to improve the teaching method and styles to enhance student learning (Pistilli et al., 2014).

Benefits from using data by higher education

The primary benefit of using learning analytics in higher education is improving student academic performance. It is also used in reducing dropout and failure rates and helping tutors monitor student performance with real-time information. Siemens and Long (2011) explained some advantages institutions enjoy using learning analytics. They are;

Institutions enjoy using learning analytics to make decisions by higher education stakeholders. Having real-time information enhances quick and realistic decisions. It also influences the sharing of resources in the institution to various faculties. The use of learning analytics in the department has helped the instructors predict students' learning outcomes early and advise the student to increase student performance (Bhardwaj and Pal, 2011). This increases the efficiency and effectiveness of the institution's performance (AlShammari et al., 2013).

The faculty staff in charge of student courses have access to their learning data on the institution website (learning management system, blackboard, toledo). The instructors can see each student interaction on the website. They can use it to detect students who have the lower capability and can drop out from their courses when identified early and corrected (Hung and Zhang, 2012). The student is advised, thereby averting the risk of failure and dropout. So this increases the retention rate in the department. Feedback can be given to the students to know their performance progress continuously before the end of the semester (Arnold and Pistilli, 2012). It is the access to data that enhances this tailored-made advice to each student's needs.

Learning analytics can also help department staff and heads identify areas where almost all students have difficulties with learning and where they have learning differences (Greller and Drachsler, 2012). With these difficulties and learning differences identified, the staff will know the student's area needs help and ensure improvement in that area (Dietz-Uhler and Hurn, 2013).

Challenges higher education experience with using data

There are several challenges higher education face despite the numerous benefits enjoyed. One of the challenges faced by higher education with learning analytics is the legal and ethical problem of obtaining and analysing learners data (Sclater, 2014).

Data privacy is a big problem, as most students may not be comfortable with the institution monitoring and recording their activities on the school website and using their data (Campbell et al., 2007). Though it is for the students benefit, unauthorised use of peoples data is a considerable risk in Europe and most countries. Therefore, the school authority may need to request student authorisation before using the data by signing some agreement document (Greller and Drachsler, 2012). Another problem is the willingness to participate by faculty members because they have a huge role in successfully implementing learning analytics in the institution.

Another problem encountered while using data in an institution is classifying students into different categories (creating a personal profile). That is, categorising them into those performing well and those who are not performing well academically. Again, there are issues with deciding on the criteria to use in categorising the student, meeting their needs individually, and using all the data gathered most of the time by the institution, data about the logging details, the frequency of student login, and the online group discussion.

2.3 What are the opportunities and challenges facing academic analytics in higher education?

The benefits and challenges of using academic analytics are almost similar to learning analytics. The difference is just those that benefit from it. Those who benefit from academic analytics are the institution, nation, region and stakeholders, research funding Institute, institution administrators, and top management (Siemens and Long, 2011).

2.3.1 Benefits of applying Academic analytics in higher education

Academic analytics is beneficial to higher educational institutions. The benefit includes how the stakeholders have made strategic decisions guided by an analysed result in strategic areas and not presumption. In addition, another benefit entails the use of academic analytics techniques in improving the curriculum, thereby improving student learning. The stakeholders that benefit from academic analytics are institutions, stakeholders, and instructors in different ways by evaluating institution data.

Analysing various data in the institution and evaluating the curriculum allows instructors and different higher education stakeholders to change or redesign the curriculum entirely and improve it. This is of benefit to the whole faculties in the institution. Through analysis and evaluation of curriculum and feedback from students (current and graduates), changes to the curriculum and lapses in student learning are corrected. Instructors and stakeholders can strategically plan the curriculum to ensure it meets students' learning needs to maximise their learning (Van Harmelen

and Workman, 2012). In addition, academic analytics can reduce the dropout rate (increase retention).

Academic analytics can also be used to appraise instructor's work and enhance their performance (Mardikyan and Badur, 2011). The use of analytics in the appraisal allows enhancing the instructor's development, thereby allowing instructors to prepare thoroughly to use technological tools to enhance the learning environment. In addition, academic analytics can determine areas where instructors need to work more on their performance to deliver well and create a rapport between them and the student in the learning process. This makes instructors enjoy teaching because the technological tools have enhanced the teaching process.

Academic analytics gives the institution a detailed analysis of their staff work, curriculum effectiveness, administration, resources, fund, and student performance. It allows researchers and instructors to spot disparities in what has been taught in school and what will be needed in the industry from the student when they graduate and start their career. Research can reduce this discrepancy in the course by making it more practical and including all necessary things to reduce it. With this discrepancy identified and research done to reduce it to the barest minimum, valuable ideas and insight generated can improve the teaching content, curriculum, teaching material, tools used in the teaching and learning process. As a result, the institution can keep up with the constant changes and stay relevant.

With data gathered daily in the institution, it can be analysed and accessible by the institution. A tactical decision can be made with ease when making strategic decisions of importance to the school, which can have a short-term or long-term impact. They can plan for the future with the analysed data. The analysed data can help the institution discover tools and information to help them do something different and improve all areas (Siemens and Long, 2011).

Academic analytics is simply data cleansing. It helps in data filtering, removing duplicate and unwanted information to improve data quality, thereby saving memory space. Academic analytics also mitigate fraud and risk by securing storage, tracking, and analysing data to track student progress. As a result, academic analysts can develop and improve an Intelligent curriculum that can be modified and suited to every student's academic requirement.

Data tracking is a strategy used to identify new opportunities available to improve learning activities for the students. Then, the new opportunities are implemented into the higher education system. With data tracking, the institution can keep up with the constant changes in the education sector and the world (van Halema et al., 2020). For example, the school website for student learning is used as the monitoring system to monitor students and their interaction on the platform and how frequently they use the site. In addition, this monitoring system helps the stakeholders understand how interactive and exciting students find the curriculum and areas that students avoid or find challenging (Brown, 2012).

The researcher in higher educational institutions also benefits from data analytics. Knowledge and ideas can collaborate more effectively. In addition, valuable data collection is a critical feature of

researchers' potential to produce information and advance in their fields of study (Sharda et al., 2013). Researchers can easily generate and have access to data for their research.

2.3.2 Challenges of applying analytics in higher education

Ethical and privacy issues are the major challenge in academic analytics and the risk of using data unauthorised. Recently, the activities of computers and website hackers have increased, and the university system is not left out. Furthermore, because of rapid technological development and advancement, information can be easily stored in the cloud. As a result, the privacy and control of the institution data are no longer guaranteed as they can become vulnerable when their system and website are hacked (Avella et al., 2016).

Another area is privacy from the student. For example, students might refuse to give their consent for their data to be used for non-academic purposes. On the other hand, students might insist that their consent must be sought before the institution can use their data and ensure their information is accurate.

The institution has a challenge with handling personal information with care, keeping the owner's anonymity, and using the information gathered. Furthermore, the information gathered and analysed may be misinterpreted when the institution lacks experts who understand how academic analysis works or keep the analysed data for easy reference. More so, the institution's staff members do not have adequate knowledge on data handling and data sharing with external bodies (Sclater, 2014).

The problem of data ownership does arise in the institution. Due to the ownership problem, the institution must ensure they strike a balance between data security and usage of the data for the institution's benefit. In addition, the institution should ensure they keep to the law concerning ethical and legal consent of data usage. They should ensure there is clear communication with their staff to take proper care of every information they have access to and follow standard procedures before using any information (West, 2012).

Furthermore, the styles in which the data are displayed on the website poses additional difficulties when analysing data. Any error included in the analysis will distort the information leading the institution to make a wrong decision. The mixed-up of some information on the learning platform does cause this. When analysing, technological tools may not detect or re-categorise them, giving room for some marginal error in the overall analysed result.

Another issue is encouraging institutions to carry out curriculum evaluations on their own. Sometimes, the evaluation process needs a specialised expert who can evaluate, analyse, and interpret the report.

3 Conclusion and recommendations for future research

This study concludes that evaluation of curriculum can be done on an institutional level. When evaluating the curriculum, it is essential to figure out what kinds of improvements it makes in the students and where improvement is necessary. In seeking feedback from students and staff, the right question should be asked in other to meet the evaluation's goals. Evaluation is an integral aspect of the curriculum design process. The feedback is used to change the curriculum, which can lead to a better educational curriculum. Therefore, the evaluation report needs to be implemented to effect the necessary changes for the evaluation process.

Curriculum evaluation for an institution is a field that is yet to be fully explored in research. In an evaluation process, areas identified that need improvement is worked on to improve student and the institution performance. The first part of the research is on how the evaluation of curriculum in a higher institution occurs, and it was answered by following the steps listed by Moore (2018) and Milstein et al., (2000). The article explained five steps to follow; involving the stakeholder, creating the goal of the evaluation process, emphasising the evaluation format to use to determine the question to be set, ensuring data is gathered from a reliable source to avoid error and analysing the data gathered to reach question and generate a report to be implemented in the institution. Finally, correct any lapses, update the curriculum to standard, reorganise teaching materials and style, and accreditation purposes.

Suppose data gathered and analysed is managed well in the institution. In that case, it will lead to a general improvement in all aspects and improve the institution's curriculum and not only concentrate on the course level. In addition, it was found that academic analytics benefits the institution in tracking data and analysing it with different technical tools. Furthermore, it helps in sourcing funds and sharing resources, complying with regulations governing the institution, and improving the curriculum evaluation process. Academic analysts should have a sense of responsibility to make institution evaluation of curriculum a continuous process and ensure new technological advancement is introduced to each program. The evaluation report should be implemented and preserved for future reference. The instructor needs to be trained and encouraged to do more research in their field to stay abreast of all changes.

The second part of the research question shows the area the institution has been using data. For example, institutions use data in the learning process to predict and monitor student performance. The issue encountered using data is privacy challenges.

Future research may critically look at a case study of an institution by evaluating the entire curriculum of the institution. The researcher recommends future research to find out if the process listed for evaluating the curriculum of an institution is successful in using it as a case study for an institution.

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