# USAGE OF BIG DATA IN HIGHER LEARNING INSTITUTION WITH KNOWLEDGE MANAGEMENT

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**Abstract-** In developing countries, higher learning institutions are experiencing a growing gap between their curriculum and the demands of industry. However, preparing the students to meet the challenges of the future needs depends on the higher learning institution's curriculum. A key part of the higher education agenda is to connect cross disciplinary intelligence to improve curriculum, content and delivery, enhance learners' experiences and create an environment that equips them with the skills and knowledge necessary to meet the changes and challenges. While Big Data is not the total remedies for addressing all of the issues and decisions faced by the higher learning institution, it can be part of the solution integrated into higher learning institution functions. The purpose of this article is to examine the evolving of Big Data, with Knowledge Management in HLI to enhance the curriculum review process to produce competent graduate. Specifically, it will look at the nature of these concepts and identify concerns about their operation and growth.

**Keywords**- Big Data, Data-Driven Decision Making, Higher Learning Institution, Knowledge Management.

## I. INTRODUCTION

In the 21st century, there has been a growing concern about the role of Higher Learning Institutions (HLIs) in producing competent graduates and how well they are satisfying the employers' needs. Competency is the capability to choose and use an integrated combination of knowledge, skills and attitudes with the intention to realize a task in a certain context, while personal characteristics such as motivation, self-confidence, and willpower are part of that context [1]. According to the Malaysian Ministry of Human Resources (2014), almost all the universities today focus on how to increase the students' competencies.

KM is an approach used universally in knowledge intensive environments. It could maintain the competitive advantage for an organization. Kidwell et al. [2] found that HLIs have large options to relate KM practices to support their entire educational task. KM is not only about managing the knowledge, but also overseeing the processes that act upon the knowledge. These processes include developing knowledge; preserving knowledge; using knowledge and sharing knowledge.

Today, rather than looking at the data to assess what occurred in the past, institutions need to think in terms of continuous flows and processes. "Streaming analytics allows you to process data during an event to improve the outcome," notes Tom Deutsch, program director for Big Data technologies and applied analytics at IBM. This capability is becoming increasingly important in HLI. The future of HLI normally emphasizes the new technologies. But the most extreme factor shaping the future of higher learning education is something that people cannot actually touch or see which is the Big Data. This study discusses the importance of Knowledge Management (KM) and Big Data in HLI to enhance the curriculum review process to produce competent graduate.

## II. KNOWLEDGE MANAGEMENT IN HIGHER LEARNING INSTITUTIONS

Changing nature of work increases the need for 21st century skills preparation. Malaysian HLIs are under attack from employers and the government for not producing graduates with the skills required by the industries. There is a distinct gap between the expectations of the employers and academics [3]. It was stressed that Universities cannot guarantee employment for their graduates without collaboration with the employers in the IT sector [3]. If the curriculum produced by the Ministry of Higher Education is not accurate, it will be of little impact even how well the HLIs deliver. Today, curricula would be constantly improved. The curriculum needs to go through a continuous improvement process that involves judgment of the curriculum. There are three main types of gaps, viz curriculum gaps, course gaps and program gaps. Curriculum gaps occur when an issue is determined to be essential, but does not present in the current curriculum. When the current curriculum does not meet the needs of its basic, then it is important to design new courses that present essential topics currently lacking from the curriculum. Secondly, course gaps exist when there is a need to introduce new courses to provide coverage of important concepts and skills. Since technology changes rapidly, courses can become out of date.

Besides that, the competency or employability debate added pressure for HLIs to develop curricula that included the teaching of essential discipline skills and general or core competencies addressing workplace needs. It was reported that employers and the business community perceive that HLIs programs are

failing to achieve specific, real-world goals in the preparation of students [4]. Knowledge Management is not only about managing the knowledge, but also overseeing the processes that act upon the knowledge. So, it is important to implement knowledge management concepts in HLIs. It could capture and store the data in the database. It then could be utilized to analyze courses component taught in HLIs against the job database. Knowledge Management system could recommend changes to the course curriculum when there is difference in knowledge and skill components between courses taught and job requirements.

The HLIs markets are becoming universal as universities challenge to internationalize their curricula and provide high quality programs to students. Academic sector also faces demands from Industry. Universities also expected to produce people who can lead, who can produce new knowledge, who can see new problems and imagine new ways of approaching old problems. Universities have a role to prepare people to go beyond the present and be able to respond to a future which cannot be imagined [5]. In order to deal with the cutting edge competition, the HLI has to adopt new challenges in the search for excellence. Therefore, HLI should provide the accurate knowledge, skills and expertise students need to succeed at work. This increases the interest towards KM and Big Data in HLIs. The HLIs have realized that KM could play an important role in their organization which helps them to improve their service quality by improving their curriculum that are imparted to produce their graduates. Glenn [6] affirmed that a skills gap exists when there is a difference between the skills taught in HLI and the skills requested by the potential employers. Kidwell et al. [2] highlighted that HLI have significant opportunities to apply KM practices to support every part of their educational mission.

Sallis and Jones [7] claimed that there is as much need for KM in HLI [8]. Martin [9] stressed that KM could support the preservation of organizational assets by optimizing the knowledge in the organization, encouraging a knowledge-creation process and utilizing that knowledge for teaching and learning. Firestone [10] held that KM is useful for the arrangement processes (capture, codification, sharing, and distribution of knowledge) and managing the knowledge production processes (knowledge making, knowledge creation, and knowledge discovery). Kidwell et al. [2] said that HLI are appropriate places to relate KM practices to support their functional and operational processes. Bernbom [11] proposed that applying KM in an HLI should serve the objectives of the academic strategic plan developed by the leadership where a clear vision, goals and objectives are expressed.

According to Malaysian Ministry of Higher Education (2014), KM is a means that could increase institutional innovation as it is the source of new ideas. HLIs could use KM to improve their organizations' mission [12]. Chan and Chau [13] knotted KM and HLI together and gave the HLI a competitive advantage by providing a foundation of storing and using information. The KM method in HLI improves the strategic planning, such as strategy planning decentralization, sharing internal and external information, market-focus strategy plans, and sharing knowledge from a variety of resources. This is supported by Raj, et al. [14] that the infrastructural changes have pervasive consequences on HLI that extend beyond globalization.

## III. BIG DATA IN HIGHER LEARNING INSTITUTIONS

Big Data is not merely a data, rather it has become a complete subject, which involves various tools, techniques and frameworks. Big Data includes huge volume, high velocity, and broad variety of data.Big Data usually include data sets with sizes beyond the ability of commonly used software tools to capture, create, manage, and process data within a tolerable elapsed time. Big Data is a set of techniques and technologies that require new forms of integration to uncover large hidden values from large datasets that are diverse, complex, and of a massive scale [11]. To take advantage of Big Data, it is almost a requirement that transaction processing be electronic rather than manual. So, traditional face-to-face instruction can support traditional data-driven decision-making processes, however, to move into the more extensive, and especially time-sensitive learning analytics applications, it is important that instructional transactions are collected as they occur. For this purpose, Knowledge Management could play a very important role to collect all the requirements of the university and compared the data with the requirements of industry.

In recent years, Big Data have grown in popularity. Big Data is a generic term that assumes that the information or database system(s) used as the main storage facility is capable of storing large quantities of data longitudinally and down to very specific transactions. For example, college student record keeping systems have maintained outcomes information for students such as grades in each course. This information could be used by institutional researchers to study patterns of student performance over time, usually from one semester to another or from one year to another. In a Big Data scenario, data would be collected for each student transaction in a course, especially if the course was delivered electronically online. Every student entry on a course assessment, discussion board entry, blog entry, or wiki activity could be recorded, generating

thousands of transactions per student per course. Furthermore, this data would be collected in real or near real time as it is transacted and then analyzed to suggest courses of action. Analytics software is evolving to assist in this analysis.

Based on the published paper by IBM entitled Analytics for Achievement, eight categories of instructional applications were described. While developed for education in general, the eight categories discussed in this article are Monitoring individual student performance; disaggregating student performance by selected characteristics such as major, year of study, ethnicity, etc.; identifying outliers for early intervention; Predicting potential so that all students achieve optimally; Preventing attrition from a course or program; identifying and developing effective instructional techniques; analyzing standard assessment techniques and instruments and finally for testing and evaluation of curricula [15].

Big Data are becoming very critical in HLI and it is developing as one of the most important technologies in this modern world. Big Data using the data regarding the previous education management that is providing better and quick service for the current and future patients. Since Big Data technologies are providing accurate analysis, this lead to a more concrete decision-making resulting in greater operational efficiencies, cost reductions, and reduced risks for the business in HLI.

More data about education system help HLIs in various different ways to find the best curriculum, method of teaching and it also help to identify the HLIs' weaknesses in ways that are not possible earlier. Impact of Big Data on to the Education sector can play a really vital role, in the normal case generally school boards decide which topics, skills and knowledge need to be covered for their particular subjects and all, but do we know which topics, skills and knowledge is actually the best for the students? No, we depend upon expert opinions. So, the HLIs need to browse the Internet to check on the topics, skills and knowledge other HLIs are teaching. Besides that, there are also HLIs that consult the employers to get feedback on the latest skills and knowledge that they are expecting from the current students. So, with the help of KM and Big Data, HLIs could gather all the information that they need to revise their curriculum to provide the best skills and knowledge the students' need to produce competent graduate at the end of their studies.

### *3.1 Characteristics of Big Data*

Big Data can be described by the following characteristics:

3.1.1**Volume** – In Big Data, the quantity of data that is produced is very significant. The data size decides the value and possible of the data under consideration and whether it can actually be considered Big Data or not. The term Big Data itself associated to the size and the characteristic.

3.1.2**Variety** – this is an important aspect of Big Data because it explains the category to which Big Data belongs to. This is very crucial fact that the data analysts need to know. This helps the people or user who is thoroughly analyzing the data and are associated with it, to effectively use the data to their advantage and thus protection the importance of the Big Data.

3.1.3**Velocity** - in Big Data this refers to the speed the data is generated or how fast the data is generated and processed to convene the demands and the challenges in terms of the growth and development.

3.1.4**Variability** – when the people or user analyze the data, this can be a factor which can be a problem. This is because, it refers to the inconsistency the data may show at times, thus hindering the process of handling and managing the data effectively.

3.1.5**Veracity** – in Big Data, the data quality that is captured can be greatly diverge. Accuracy of the investigation depends on the reliability, accuracy or veracity of the source data.

3.1.6**Complexity** –in Big Data, the data management can become a very complex process, especially when a large volume of data come from numerous sources. In Big Data, it need to be linked, connected and correlated in order to be able to grasp the information that is supposed to be conveyed by these data. That is the reason why we consider Big Data as complexity.

### *3.2 Big Data Challenges*

Although there are many benefits of Big Data, there are also a number of challenges that HLIs need to face while handling Big Data, such as how much data to store, the cost incurred, how secure is the data that we have, and how long it must be maintained.

Big Data also offerings new ethical challenges. HLIs are using Big Data to learn more about their workforce and increase the number of graduates from the institutions. However, these improvements come at a cost by tracking their employees' every move and continuously measuring their performance against industry benchmarks. Such monitoring might be in the best interest of an industry, but is not always in the best interest of the people who make up that industry [16].

There is a multi-step pipeline required to extract value from data. Heterogeneity, incompleteness, scale, timeliness, privacy and process complexity give rise to challenges at all phases of the pipeline. Furthermore, this pipeline is not a simple linear flow rather there are frequent loops back as downstream steps suggest changes to upstream steps. There is more than enough here that we in the database research community can work on [17]

It is challenging to automatically generate the right metadata to describe what data is recorded and how it is recorded and measured. This metadata is likely to be crucial to downstream analysis. Usually, there will be many alternative ways in which to store the same information. Certain designs will have advantages over others for certain purposes, and possibly drawbacks for other purposes [18].

As we know, extracting knowledge from Big Data is a high-touch business today. So, it requires a human expert who deeply understands the application domain as well as a growing ecosystem of complex distributed systems and advanced statistical methods. So, it shows that, Big Data is highly dependant on skilled developers and computer programmers at present.

Having the ability to analyze Big Data is of limited value if users cannot understand the analysis. Data analysis is considerably more challenging than simply locating, identifying, understanding, and citing data. For effective large-scale analysis all of this has to happen in a completely automated manner. This requires differences in data structure and semantics to be expressed in forms that are computer understands, and then robotically resolvable [19]. Having the ability to analyze Big Data is of limited value if users cannot understand the analysis [20]. Besides that, Big Data require exceptional technologies to efficiently process large quantities of data within tolerable elapsed times [21].

Poor data quality can significantly impact the effectiveness of BD projects. As analysis on BD grows, so too will the need for validation, standardization, enrichment and resolution of the data. There is a lack of a common language across platforms that should be addressed to ensure clear data governance and strong communications.

## IV. BIG DATA AND KNOWLEDGE MANAGEMENT ROLE IN HLI TO ENHANCE THE CURRICULUM REVIEW PROCESS.

In this study, the main concern is how KM goes to support HLIs with Big Data in the curriculum review process. This could be achieved by developing a stronger relationship between industry(employer), HLIs and students. This could help HLIs to improve the curriculum review process and support the employability. Figure 1 shows how knowledge could be communicated and managed between the external user (employer) and the internal user (HLI members and students) to enhance the curriculum review process. It illustrates how well communication link is built to connect among the students, HLI and Industry using KM as shown in Figure 1.

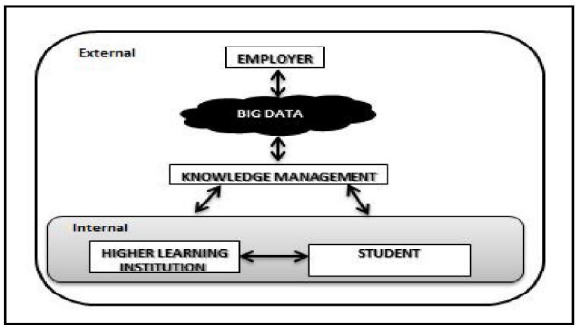



**Figure 1 KM and Big Data in HLI**

The main function of KM is to capture the employer's requirements on the type of students' competency in the job market. By doing so, HLIs could access to the KM and get them updated on the type of competency required by the employers. The KM could compare the skills and knowledge taught in the current curriculum in the HLIs against what are the competencies required by the employers in the job market. KM could show the uppermost skill and knowledge required in the job market. It may also able to trace the subject that is affected. KM should be able to provide suggestions on the type of action to be taken to improve the curriculum by adding new modules in their syllabus or removing some topics or module from their current curriculum design. Besides benefiting the HLIs, the KM also could benefit the students. Students can be updated by their HLIs on the latest job market requirements and they can get themselves prepared accordingly on both the hard skills and soft skills. Besides that, the KM also lets the employers to post the part-time and full-time job vacancies for the current students and graduated students through the Big Data. This gives opportunities for the current students and graduated students to apply for a job placement that eventually build up their experience and skills. By doing so, the HLI will be able produce competent graduated to the industrial market.

## CONCLUSION

Knowledge Management in Higher Education Institutions could help in the movement from closed to open-knowledge systems and extensive development in computer-based communication technologies. By joining the power of Big Data and KM, the HLIs would require an infrastructure that could manage and process the huge volumes of structured and unstructured data in real time and can protect data privacy and security. Big Data allows HLIs to see their students' competencies pattern they have never seen before. It also uncovers the interdependence and connections that will lead to a new way of doing curriculum review process, or engaging the employers' feedback, do proper analysis or research on knowing what their students need before they even know themselves, and develop next curriculum and services accordingly. This is

supported by a study that the students have much more information on where to study, and study choices are not limited to national boundaries; academic staff have an easier access to sources, materials, and colleagues across the world; and many higher education institutions themselves experience that the days of competition at solely a regional and national level are over [22].

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