Smart University: A University In the Technological Age

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Abstract – **All universities have changed their visions because of developments in the advancement of education and other disciplines which are generally legitimately linked to global education reforms. The learning arena is gradually influenced by technological advances such as e-learning, IoT etc. which are rapidly and absolutely changing the way educators provide instruction and teach students. A Smart University is a university that uses technological innovation within its organization to accomplish its mission. This research focuses on the concept of a Smart University that incorporates within it the concept of big data and e-learning, while showing its impact on teachers, learners and the educational institute in general.**

Keywords – **Smart university, e-learning environment, big data, higher education, smart system.**

1. Introduction

The importance of the use of technology in the field of education has been supported by the studies carried out day by day.

Many technological support trainings have been given in different areas of education and successful results have been achieved [1]. Big data is a new

field of research that utilizes information examination to inform decisions. Business is now largely being investigated as well as government, education and social insurance because of the developing amount of information gathered and stored in these situations [2]. In recent decades, new developments in education, such as flexible classroom plans and massive open online courses are fundamentally reshaping the mode and openness of learning and instructing. Chugh, Sharma and Jain [3] defined big data as large and complex data that need to produce intelligent techniques and smart technologies. Today, big data has become a widely debated issue in relation to numerous different sectors, including business, government and the education sector as it has the potential to bring new technological innovations into their operations. Sorting and analyzing large volumes of information converting this mobile into data that can be utilized to make decisions, improve execution, enhance effectiveness, comprehend institutions' needs, diminish cost, and create services and products [4]. Big data innovation has emerged as a promising innovation for dissecting and dealing with large amount of information created in the digital world. Big data was proposed as a solution to handle this colossal volume of different information delivered by users or technology environments.

Big Data has become one of the fields of study in educational learning that generates a huge volume of data due to the interactions in educational environments between learners, teachers and the administration, which facilitates development in teaching. Big data in higher education such as data collected on students, teachers and administration is stored directly in a database thus forming the big data of an [5]. When students cooperate with learning technologies, there are numerous information trails and the institute can discover their opinions, social connections, expectations and objectives. Big Data could be applied to examine the passage of students on a course, discussion in forums, and blog passages, which could create a large number of exchanges per

student per course and all this information will be collected in order to make recommendations for learning strategies [2]. As a result, smart universities can use this technology to improve the quality of their instructors and particularly the quality of the learning process. The literature review strategy was chosen in this study to facilitate the investigation of the concept of the Smart University while showing its impact on teachers, learners and the institute in general and show also some of the advantages that big data can provide to smart universities.

2. Smart University

In light of the suspicions, known on the planet of smart city ideas, astute business, or even smart homes, it is conceivable to claim that schools and colleges can also obtain an intelligent domain name. Smart University concept came into education arena and has received more attention over the developing countries [6]. A Smart University is a university that utilizes innovation technology (ex. IoT, smart devices, etc.) within its organization to achieve its strategic objectives.
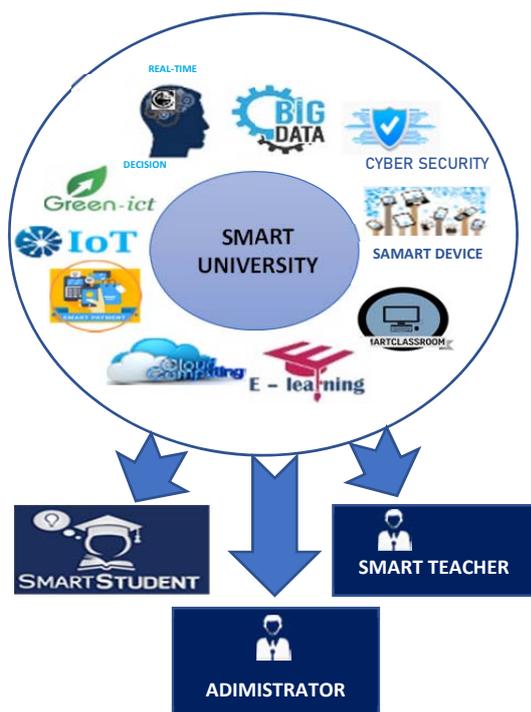

Figure 1. Main components of the Smart University

Technological innovation, particularly computer innovation and data systems, are the primary requirements for turning into a Smart University at the forefront of technological innovations. E-learning at all levels from administrators to executives can work and accomplish objectives and it also lowers labor costs compared to the traditional university model and so smart universities incorporate new technology that allows students, teachers and administrative staff to use automatic systems and tools [7].

Figure 1 shows the representation of the Smart University and the new technologies that distinguish it from a traditional university. As can be seen, the distinction lies in the integration of new technologies, including e-learning, Internet of Things (IoT), Cloud computing, big data, Green-ICT and etc. With the integration of these new technologies, a university is considered a Smart University. A smart learning framework uses IoT as a part of new technology that it could partner with to improve the quality of its services by providing a personalized learning environment [8]. Every day, more smart objects are tailored to different scenarios and are becoming more ubiquitous in different areas of education. Amongst the smart services supported by the emergent technologies such as IoT, smart education is one of the main elements in the implementation of IoT smart cities, which are enabled by virtual learning and digitalization [9]. Smart institutions not only use IoT to personalize learning, but also use it in association with big data to manage difficulties related to data size, processing speed, etc. [10]. As Figure 2 shows below [11], the basic IoT design is partitioned into three layers: Application, network and perception layers.
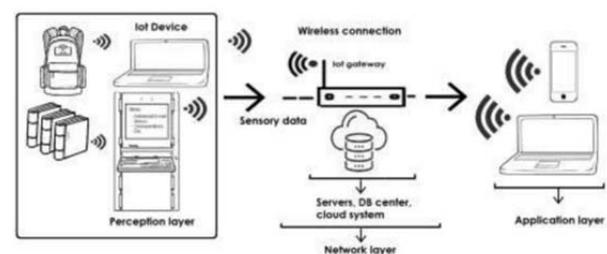

Figure 2. Basic framework architecture of IoT in Education [11]

3. Impact of E-learning

The state-of-the-art online learning structure is usually coordinated with different segments of new online learning systems. Complex e-learning data contains interactive information formats such as sound, video, diagrams, content, movements, 3D models, which usually consume vast amounts of storage. The access and confirmation strategy involved in the online learning system stimulated the exchange of explicit information desired between students. Mixing data frameworks and database instruments consolidates and manages online learning information using content organization frameworks [12]. The integration of e-learning into the traditional university has broadened the boundaries of such universities by providing portable learning [10],[13]. With the introduction of ubiquitous gadgets in

technological evolution, the limits of learning have been expanded from cable connections to remote correspondence [14]. Through consistent data transmission in e-learning, constant updates between student, teacher and administration data are made possible by technological innovation. Changes in learning today have transformed it into a new technological age in which universities are adapting to the new concept of online learning [15]. Ubiquitous or portable gadgets such as smartphones, tablets or laptops reinforce the e-learning in smart universities. E-learning involves the use of advanced tools for educating, e-learning and appraisal permits students to concentrate anyplace and whenever. Such an education framework promotes the preparation, education and motivation of students without reducing communication and cooperation between students [16]. E-learning, with its advantages and disadvantages, strongly affects the educational process. By embracing it, various institutes have improved students' access to the data needed to improve their learning while maintaining rich collaboration between students and teachers [9]. Rusu and Brindusa [17] stated that the analysis of students' perceptions of the use of electronic resources included 12 variables: The freedom to choose access time; the freedom to choose the place of access; access costs; the quality of the internet connection/networks; device performance complexity of the platform menu; time required to complete a task/activity electronic resources offer an alternative in the e-learning system.

4. Big Data

The big data phenomenon is in the outcome of many years of advancement in data management technology. The area of big data comes with the pervasiveness of web crawlers, interpersonal organization, online business sites, smartphones, and the internet of things [18]. Arumugam and Bhargavi [19] described big data by the three V's, namely the increasingly immense volume of information, the variety of information that incorporates raw, unstructured and semi-organized information, and the velocity of the information that indicates that the increase in data requires communication equipment capable of disseminating information collected and analyzed in real time. There are also different properties of big data including data validity, which alludes to the exactness of information, and volatility, a concept related with the life span of information and its significance to investigation results, as well as the size needed to store the information in a useful structure for analyzing it with appropriate added value [2]. Big data is presented as immense, perplexing and constant data that requires solid organization of information and logical strategies to separate

important experiences [20]. Consequently, experts had developed intelligent systems to evaluate, analyze and to make a decision in a variety of domains from collected big data in any organization especially educational institutes.

Big data systems for smart learning begin with distinctive data source evidence and use this data to assess students' progress while looking for potential learning problems [21]. Here, information is made accessible from all e-learning sources including file frameworks, learning management systems, Web, social network sites, etc. The extraction structure separates the data from the data system utilizing scientific categorization, coordinated effort, faceting, labeling Intelligence extraction [22]. Once the extraction process is complete, the administration can use this information to provide necessary learning advice or suggestions, and provide support tools to students when necessary in an appropriate manner [23].

Large data analysis is a mass collection of data that has a huge effect on technical and logical space because of its volume and its importance, from which it is imperative to have exceptionally large and complex information warehouses [21]. The right size of information is not the key to big data, but information procurement is the first step in analyzing such data. Information procurement is an important part of the exploitation of big data because surveys depend on it. The noteworthiness of big data is not to have an idea of the size of the information, but rather to be aware of its importance during investigations. Most organizations have problems making decisions about information that will eventually come from strategic information resources, so even the major information administrators cannot provide a conclusive answer [24]. Paul et al. [25] stressed that the administration should understand the specific stages such as acquisition, organizing, analysis, and solution prediction. Big data analysis does not involve entering a large amount of data into a computer and trusting that the required results will be generated. In the case of a few specific cases, information investigation follows a stepwise procedure of information extraction (in light of questions), information separation (removing non-contributory information), information change (changing the structure, properties, and presence of the information), and information scaling (catching the conduct of information in an equation), for the most part ending in a fairly simple position [26]. Information effectively used in contemporary higher education depends on the nature of the instructive procedure and the relationships between the university and students. Nazarenko and Khronusova [27] defined that the objective of Big Data is to acquire an elevated level of instruction and

information, and turn it into a huge mass of information that can be useful for the university in general. For Smart Universities, it is imperative to utilize information from students' online networking to build up their level of learning. This new technology brings various advantages to students, teachers and educational institutions.

4.1. The Main Advantages

Big data provides teachers with a large and necessary amount of information about their students [28] so that they can follow up on each student. With such a mass of detailed information about a student, the teacher will be able to examine the evolution and engagement of the student in a precise and concrete way in order to help him/her according to his/her own shortcoming in terms of participating in courses, completing homework, and the time spent doing research in the online library for example.

On the other hand, we can also see the benefits that the students will be able to draw such as the flexibility courses allowing them to access them at anyplace and at any time to his courses [29]. Students can maintain communication with other students or teachers in real time and have the freedom to participate in discussions or scientific forums. Student also have free and unlimited access to study materials [30], [31] and can log in at a time suitable for them. Students experiencing difficulties will be able to benefit from personalized follow-ups that will allow them to improve their intellectual level.

Finally, the advantages at the level of the educational institute are not negligible because with this mass information, it will not only be able to monitor the evolution of each student individually [32], but can also closely monitor how teachers take care of their students' learning. By having accurate information that can be accessed as quickly as possible, it is possible to analyse the progress of each student in a fast, precise and intelligent way. In terms of infrastructure, the institute can also spend less than a traditional institute.

5. Conclusion

New information and data are constantly being provided through technological development. Information and data are used by many organizations in their operations to improve the way they operate intelligently. Various advances such as innovation in Big Data, IoT etc. are valuable for converting traditional universities to smart universities. As students are currently evolving and growing with the world of new technology, it is essential for universities around the world to adapt and evolve the way they motivate today's students by providing them with a state-of-the-art learning environment that will not only motivate students, but also improve the quality and reputation of the university. In today's world, it is crucial for traditional universities to adapt and become smart (modern and intelligent) universities because as can be seen with the pandemic that has impacted the whole world, smart universities continue to function while traditional universities have closed their doors.

Consequently, researchers should focus on the aspect of information security. Information collected on students, teachers and administration is precious and it is very important to be able to secure this mass of information, which is critical in the evolution of smart universities.

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