Chapter 14

Big Data-Driven Smart University Architecture and Strategy Development: A Case Study

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ABSTRACT

The university’s main objectives go around excellence in teaching, research activities and both university and community services. These pillars are supported by a number of important resources and functional systems such as complex student’s life-cycle management system that must be considered in any strategy development process. This paper discusses the role of the big data in the smart university campus architecture and strategies development process, and how it could be utilized in various stages of strategy development. Additionally, it highlights the university’s ICT architecture, the foundation of the knowledge management system that has been implemented, to help the university harness knowledge out of the big data that is generated by various parties and scattered systems around the university. Furthermore, the chapter highlights some of the successes on how, with help of a BI tool, the university was able to make critical and quick decisions by tapping into the big data of more than 35 years of student records; one of the pillars of the smart university strategy.

INTRODUCTION

In the last 10 years, big data and data analytics has evolved from a concept to a multibillion business. Recently the universities started following the trend to reap the benefit as well. Among the many uses, some institutions have employed data analytics to create more personalized approaches to advising. Others have leveraged predictive analytics to estimate the likelihood of student progress through courses and majors. Still others have used such analytics to combine data with teaching and advising to help improve student outcomes, particularly among underserved students (Gagliardi & Wilkinson, 2017).

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From the bigger perspective, when developing a strategy and architecture for a Smart University, big data plays a major role in providing insight for various strategy domains such as predictive analytics, virtual campus, IoT and management dashboards, as described in the coming section.

Over their academic service lifetime, faculty members produce huge amount of information and knowledge as a result of various activities such as teaching, research activities, university and community services. Unfortunately, and for cultural, technical and management reasons, this information is never captured and maintained, and hence the opportunity of creating value and knowledge is lost. Furthermore, lots of effort are wasted in gathering and aggregating such information every time the management to either measure the progress and achievements of the university, or even when faculty members would like to apply for their promotion need it (Anirban, 2014; Ling, 2011). To be more specific, the current challenges are summarized as follows:

- Loss of faculty member’s activities tracking over their service lifetime.
- Huge efforts are required, to gather the needed info, every time the university annual report is required to develop.
- The strategy stays on paper and never cascaded down properly to the execution level, hence, no feedback is received on what and how much of the strategy has been implemented and objectives met.
- The previous point leads to disconnection between the developed university objectives and the annual objectives in the personal development plans (PDP) assigned to the faculty and other members.
- Faculty members are never aware of the complexity of the promotion cycle and information required until the time of application. Most of the time it is based on assumptions that they are ready. However, when the time comes, they hit a hard wall and face a major challenge in putting together a huge amount of promotion bylaw requirements and supporting evidence.

Objectives and Scope

This research tries to overcome the above pain areas of University of Bahrain (UOB), which in many ways are similar to many universities around the world, these are:

1. Harness knowledge out of the big data that is generated by various scattered entities and functional systems, and specifically faculty members. Hence help driving the strategy of the University.
2. Identify how big data could play a role in the development process of Smart University campus architecture and strategy.
3. How faculty’s knowledge management system could be built, and how it can play an integral part of a larger faculty life cycle management eco system.

While the first objective focuses on the approach that was taken to develop an eco-system of data capturing method so that management would benefit as an ongoing operation of the university, the second and third objectives focus on the big data and knowledge management as one of the driving forces in the center of the strategy and architecture development processes. Both emphasis on the importance of data capturing processes that eventually converted in knowledge in a later stage as it will be elaborated in the later sections of the chapter.