Chapter 15
Future Teaching and Learning Applications in the Smart Campus:
A Review on Higher Education Institutions

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ABSTRACT

As the population of cities rise, environmental concerns become a greater issue owing to the exponential increase in the use of natural resources. This raises further issues regarding the sustainability of environments wherein individuals perform different activities. ICT, for example, plays a key role in the sustainability of resources, which presents an obstacle for large areas of a city and its societal structure. University campuses and cities can easily be compared in terms of size and represent environments that are challenging to replicate in another ecosystem. The idea is conceived by transforming a conventional campus into a smart campus based on a smart city model, where the incorporation of technologies or innovative developments meets individual needs (e.g., teaching and learning) with power over resource use. This chapter explores prospective applications for teaching and learning in a scaled environment or university campus.

INTRODUCTION

The population of cities as well as migration from rural areas is growing exponentially. The persistent growth in population demonstrates a number of environmental concerns, mostly in terms of an increase in the consumption of natural resources. (Kumar, 2016). Consumption of resources has indeed been extensively studied, with a lot of emphasis on the sustainability of environments wherein individuals perform different activities. Executing a sustainability study assisted by the use of information and communication technologies (ICTs) is a significant obstacle for large areas of the city, and also for variations

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in the societal structure. This chapter explores prospective applications for teaching and learning in a scaled environment or university campus. University campuses can be as large as cities and represent environments that are usually difficult to recreate in another ecosystem. The idea is conceived by transforming a conventional campus into a smart campus based on the principles and experiences of smart cities, where the incorporation of technologies or innovative developments meets the needs of people with power over resource use.

Smart cities are partly the result of developments in the ICT sector, where, thanks to the Internet of Things (IoT), numerous devices can connect to the Internet and produce information that enables them to communicate effectively with other members. However, moving from a traditional city to an intelligent city requires a great deal of technical and sociocultural effort, as well as a high level of investment in physical and economic resources. Before considering the smart city environment, the problems to be tackled are wide-ranging and require experts in various fields to work together to optimise resources (Morales Lucas et al., 2018).

The university campus conforms to the previous definition, so having this kind of ecosystem is the ideal starting point for this study. Geographical distribution, administration and the number of people who attend them are ideal environments for the demonstration of smart campus techniques or processes (Vasileva et al., 2018). However, the issue of what the "smart and sustainable campus" is and what it contains remains. Other more concrete questions emerge from this initial question: is ICT capable of solving sustainability problems on a smart campus? Which changes does the smart campus give in terms of sustainability over the conventional campus? Moreover, do traditional campuses meet, at least in part, the requirements of smart and sustainable campuses? Not all of these questions can be answered on the basis of a single experience; therefore, they should be addressed in cooperation with the various fields that make up the administrative and academic part of the university campus and on the basis of the experience of related work. Several of these works do not cover a study such as the one proposed, where the objective of creating a smart campus goes hand in hand with the sustainability of the campus and the environment.

The centralisation and analysis of data on the smart campus are essential for their contribution to the process of recognising events and needs, provided that universities make decisions on the basis of the data they have about students and their administrative structures. However, traditional decision-making needs developing methods of data processing and performance in a shorter timeframe. The problem is that the amount of data far exceeds the processing capacities of the traditional research platforms (Villegas-Ch & Luján-Mora, 2017). Having techniques that detect the needs of the university population and produce results on the basis of trends is the basis of a smart campus. The alternative, therefore, which is currently the trend in data science for its superior results, is the use of big data. These platforms offer alternatives for data management and learning about students that are flexible, cost-effective and shorter in duration. Traditional techniques such as business intelligence (BI) and data mining may perform data analysis. However, due to their nature and the limitations of the data, many of them are omitted or eliminated in the preparation process; it is important to keep most of the data on a smart campus while looking for alternative cleaning techniques so that the efficiency of decision-making is not affected (Chen et al., 2012).

This chapter proposes to view smart campus deployments through emerging innovations such as blockchain that have the potential to foster teaching and learning practices in higher education institutions. Adequate usage of resources in a sustainable setting is made possible by being able to handle the different devices from a previous review of the data collected from the setting (Kim & Lim, 2019). The outcomes of this research make it possible to create supportive spaces where students and teachers have fulfilled their needs in complete harmony with the community.