WOULD SMART SOLUTIONS LEAD TO SUSTAINABILITY WITHIN UNIVERSITY?

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Abstract

This article starts from an analysis in the scientific literature of sustainable university and of smart university particularities in relation with sustainability, our main purpose being to identify whether Smart technologies are vital for the sustainable development of universities. By using a quantitative research, online questionnaire based, we evaluated the usefulness of various potential smart solutions among more traditional solutions, in the sustainable development of the university. 292 students enrolled in Business and Tourism Faculty – Bucharest University of Economic Studies provided answers to the questionnaire, during the first semester of 2019-2020 academic year. The analysis presents partial results of this wider research, answering to the objectives set of the current paper. Thus, our findings show that students, although they consider useful an implementation of various Smart solutions for the sustainable development of their university, they also consider that these are not more important than "traditional" ones, such as selective recycling or studying more relevant subjects for sustainability. Starting from the findings of this research, recommendations for possible future development of Smart sustainable solutions are made.

Keywords

Sustainable university, smart university, smart campus, student's behavior.

JEL Classification

I23, I29, Q56

Introduction

Our information society is becoming every day "smarter", in terms of technology, transforming little by little into a Smart society. According to Morze et al. (2017), smartness "is the ability to interact with the environment and adapt to it" and communities - such as cities, companies, universities may become Smart, as the continuous development of ICT provides complex adaptive solutions for their needs. Thus, a Smart university focuses on developing its technological infrastructure with the purpose of improving the quality of the education provided, but in the same time, the integration of Smart ICT solutions will help all

academic, administrative and social processes (Morze et al., 2017). In general, smartness is differently perceived by researchers, businesses, authorities and other stakeholders (Al-Nasrawi et al, 2017). Nevertheless, there is a common point for scholars, when defining what is Smart: namely, the presence of ICT devices, sensors and software, working together to ensure improved experiences to both individual users and to community. Thus, in describing a smart campus, many researchers emphasize the various smart technological constructs, without offering a holistic vision about how these are connected to the "wider objectives of the academic institution". (Vasileva et al, 2018). However, in what concerns urban communities – cities, more and more studies tend to associate the concept of smartness with sustainable development, as sustainability should be our society's primary goal (United Nations, 2015). Thus, smart cities are aiming to become smart sustainable cities and, consequently, universities should try to become not just smart universities, but smart sustainable universities.

In the first part of this article, the concepts of smart campus and sustainable university are discussed, through a review of the scientific literature. Following these, in the second part of the article, the objectives and the corresponding results of a quantitative research are presented. The general aim is to identify if focusing on building various smart solutions for sustainable actions within university is perceived more useful than acting for sustainability in a traditional manner.

Review of the scientific literature
Universities have a fundamental role in shaping the minds and skills of future generations, in orienting them towards sustainability, as campuses provide an "unique socio-cultural setting to promote sustainable development in practice." (Colding and Barthel, 2017)

The implementation of all three sustainability pillars (economy, society and environment) in university campuses is difficult to be performed in an integrated manner, because there are no standard guidelines about how to understand sustainability here, nor there is a standard set of indicators to be looked at and measured.

Of course, there are efforts on behalf of most prestigious universities to act sustainably and, for this purpose, they use either their own sustainability framework or one of the proposed models, such as in UI Green Metric World University Ranking (UI Green Metric, 2020) or Green Office Model (Green Office Movement, 2020). In general, after a thorough reading of scientific literature, we can say that the sustainability within university refers to:

- Educating students and community through the proposed curricula about sustainable development
- Research, as means of answering important social questions and solving social, economical and environmental problems
- Operations: minimizing the environmental effects and even achieving zero footprint for campus operations
- Community: students, professors and administrative staff are encouraged and empowered to act sustainably within university in particular, and for the welfare and ethics within society, in general
- Governance: the way management makes sustainability a priority for the whole univerity campus.
- Collaboration with businesses, authorities and NGO's for community sustainable projects.

Most often, the first measures universities take towards sustainability are oriented towards the environmental component (Sonetti et al., 2016). Because a smart campus can manage data more efficiently than traditional campus platforms (Yang et al., 2018), the result is delivering higher quality services, the protection of the environment and a reduction of the cost

(Alghamdi and Shetty, 2016). Thus, many universities have implemented Smart solutions for tracking, analyzing and adapting the consumption of energy and water to the real needs of the campus (Gomes R. et al., 2017; Stavropoulos et al, 2016)

However, smart systems can be used not only, for reducing energy and resources consumption or for monitoring environmental parameters like temperature, humidity, light, noise or the level of air pollution in campus spaces. There are also other areas of use, such as knowing the traffic of people within university and controlling the academic flow of professors and students in classrooms, library and between various buildings of the campus (i.e. analysis of movement patterns, places with higher people traffic, stay time in various places etc.). The smart use of ITC for monitoring such processes helps the campus management and leads to better adapted conditions and services (Alvarez-Campana et al, 2017). Nevertheless, transforming into a smart university needs the involvement, commitment and feedback of all stakeholders: students, professors and university administrative staff, parents, management team etc. (Dong et al., 2020).

Research objectives and methodology
From our literature review research, we could see that, although there are sustainable universities and universities that are using smart technologies for various areas linked to sustainability, Smart is not a mandatory component in building sustainability within university. Also, as we agree with the fact that students are very important stakeholders of the university. As such, our set objectives connected to the subject of this paper, that we aimed to reach through our quantitative research were:

O1 – to assess students' perception about the usefulness of potential Smart elements as compared to the traditional elements in building the sustainable university;

O2 – to analyze students behavior in what concerns their tendency using smart mobile phones or computers for communicating or getting informed in various situations;

Through our first objective we seek to obtain useful information about the opportunity of reaching sustainability within the studied university by focusing on Smart technologies, while our second objective provides information for the design of future smart systems and apps to be used by students.

Thus, for meeting these objectives, during October – November 2019, we distributed online a survey - questionnaire based, to students belonging to Business and Tourism Faculty of Bucharest University of Economic Studies. We considered that the most relevant answers in terms of our set research objectives, could be obtained from students currently enrolled in the 2nd and the 3rd year of Bachelor program and from those attending a Master program, because they already have the experience of at least one academic year to familiarize themselves with the subjects studied or to be studied, with campus life and with the notion of sustainability. The method used for sampling was simple random sampling, as we randomly selected 360 students from various study groups within Business and Tourism Faculty, who were solicited to answer to the questionnaire posted on Google Forms. We had 292 valid responses, the associated margin of error for this sample being +/- 5.73%, using a 95% confidence level. All respondents have ages between 19-25 years.

The results discussed in the next part are partial findings of a more extensive analysis of the research and they address the issues discussed in this article, answering to our set research objectives, as mentioned. Data were exported from Google Forms and processed in Microsoft Excel, then statistically analyzed with Minitab software.

Discussion of the results
Referring to our 1st objective, we investigated the way students evaluate the usefulness of various potential solutions for improving university sustainability, among which Smart ones were suggested. The answers, on a scale from 1 to 5, where 1 is very little usefulness and 5 is

very much usefulness, are shown in figure no.1. As it can be noticed, for each item to be evaluated, most of the respondents gave either a positive or a negative opinion. There are very few answers with moderate opinion about the usefulness (evaluation with 3). The distribution of answers for each of the potential solutions indicates a majority of positive opinions (evaluations with 4 and 5). As a matter of fact, by analyzing the median of evaluations for each of these potential solutions for improving university sustainability, we found these situated at 4, on a scale from 1-5.
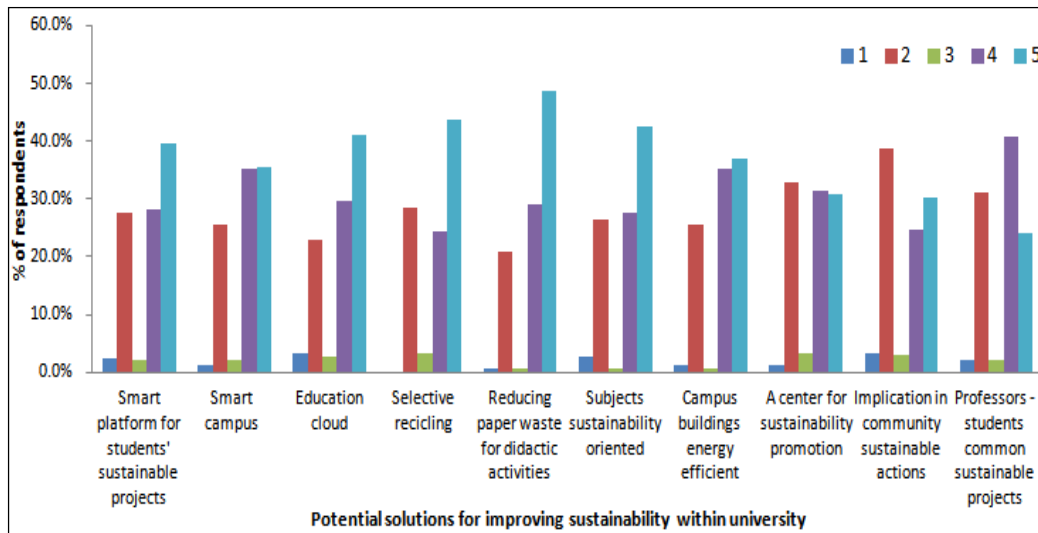

Fig. no. 1 Students' evaluation of the usefulness (1 – very little usefulness, 5 – very much usefulness) of various potential solutions for improving university sustainability

We also wanted to see whether there are differences between these answers and as such we tested the median against higher than 4 and lower than 4 value.

The results of sign test for median = 4.000 versus median > 4.000 are presented in table no.1 below, for each individual item.

Table no. 1 Sign test for median = 4.000 versus median> 4.000 of respondents evaluations for usefulness of potential solutions to sustainability

Potential solutions for sustainability	N	Below	Equal	Above	P	Median
A smart platform for students sustainable projects	292	94	82	116	0.0736	4.0
Smart campus	292	85	103	104	0.0952	4.0
Education cloud	292	85	87	120	0.0088	4.0
Selective recycling inside university	292	93	71	128	0.0111	4.0
Reducing paper waste for didactic activities	292	65	85	142	0.0000	4.0
Subjects sustainability oriented	292	87	81	124	0.0066	4.0
Campus buildings energy efficient	292	81	103	108	0.0293	4.0
Professors-students common sustainable projects	292	103	119	70	0.9951	4.0
A centre for sustainability promotion	292	110	92	90	0.9312	4.0
University implication in community sustainable actions	292	132	72	88	0.9988	4.0

As it can be noticed (table no.1), the p-value < 0.05 is for campus buildings energy efficient, subjects sustainability oriented, education cloud, selective recycling and reducing paper waste. When we tested the median= 4 versus median< 4, we obtained a p-value of 0.0075 < 0.05 for Professors-students common sustainable projects, all others being above the 0.05 cut off. We can say that Smart solutions are not necessarily better appreciated by students as useful for sustainability. Education cloud involves a decrease of the amount of paper used for study materials, projects and homework; hence its general slightly better perception corresponds to the reduction of paper waste for didactic activities. As a matter of fact, these two items directly correlate, the calculated Spearman coefficient being of 0.585.

We also wanted to see if there is a correlation between students' evaluations for Smart potential solutions usefulness and their evaluation about the quality of education in using ITC they receive in University. The evaluation of education is a little right skewed, the median being situated at 3, on a scale from 1-5 (1 –very poor education and 5 –very good education). The p-values for all Spearman coefficients between evaluations of ITC education and the evaluations for Smart solutions usefulness were >0.05, indicating no correlation. There were found no associations between gender or year of study and the usefulness evaluations through Chi Square Test, p-value being in all cases >0.05.

In what concerns student's behavior when learning, communicating or getting informed in various situations, their tendency to use the smart mobile phone or the laptop/computer is shown below, in figure no. 2.
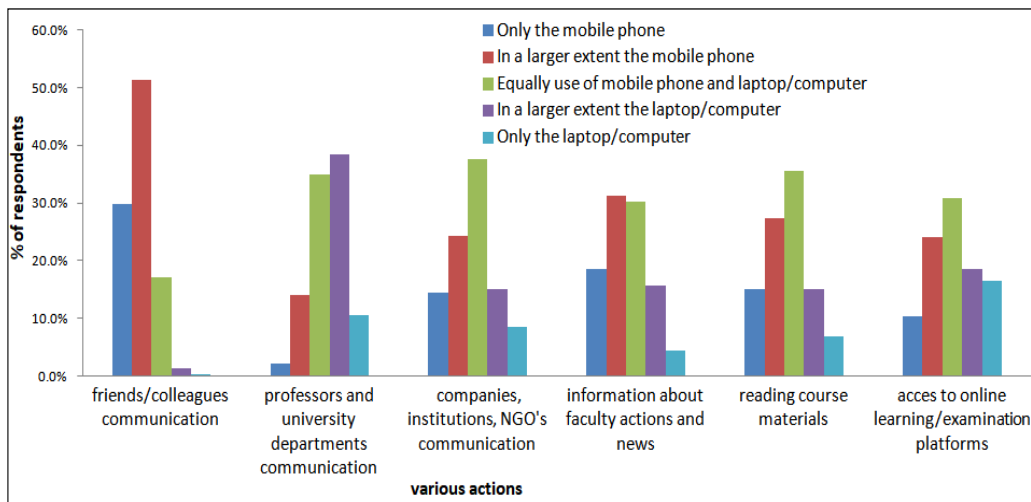

Fig. no. 2. Students behavior about using mobile phone and laptop for various actions

While it can be noticed that mobile phone is rather used for communicating with colleagues, for getting informed about faculty actions, for reading course materials and even for communicating with companies and other institutions, it is surprising that the communication with professors and university departments is rather made through laptop. There were found no associations between students' behavior in using mobile phones/laptop and gender when using Pearson Chi Square test for association.

Conclusions

It is still difficult to assess the degree of sustainability of universities, since there is no standard framework to define and to measure it in an integrated manner. There are various models suggesting criteria and indicators for university sustainability, but none of these include the use of ITC technologies. There are universities that use smart technologies in some of their

processes that help indeed improving the campus sustainability, especially in the environmental area, but not only. Our research aimed to identify whether students – important stakeholders in building the sustainable university, perceive potential smart solutions as more useful than traditional activities linked to sustainability. The results show that, though assessed as useful, they are not seen as more useful. Of course, research results are specific to the particularities of the sample, hence they should be regarded through this limitation. A future development of smart solutions within university aiming to improve some areas of sustainability should take into consideration students' behavior of using ITC. Our research shows that students change their behavior when reading and communicating electronically in various situations, in what concerns the devices they use. Of course, Smart solutions will not bring themselves sustainability, but they will greatly help to improving it..

Acknowledgement

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