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STRATEGIC PLANNING FOR THE TRANSFORMATION OF A UNIVERSITY CAMPUS TOWARDS SMART, ECO AND GREEN SUSTAINABLE BUILT ENVIRONMENT: A CASE STUDY FROM PALESTINE

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Abstract

An-Najah National University in Palestine had decided to include the transformation towards Smart, Eco and Green University as one of the major themes in its strategic plan for 2016-2020. The paper considers the new university campus as the model for planning towards a smart and sustainable built environment. The paper considers the systems thinking approach, taking into account the connections among the various relevant components, to achieve a sustainable built environment on the scale of a university campus. The interaction among the infrastructure components, the built and natural environment, along with the socio-economic and regulatory domains, was considered. The paper presents the strategic planning framework, highlighting the strategic analysis in the fields relevant to the Smart, Eco and Green University theme, conducted through a participatory approach engaging the university professors and administrators, as well as the students. This had assisted to identify the major issues to be considered in the formulation of the university's strategic plan related to the theme, identifying the points of strength and weakness within the internal environment, as well as the opportunities and threats within the external environment. With the most important thematic major issues identified through participatory approaches, and considering the university's vision and mission, the relevant interventions were identified. The paper highlights the key aspects in devising the resulting strategic plan, including the action plan, and summarizes the lessons learned.

Keywords:

Sustainable Built Environment; Strategic Planning; Smart University

1 INTRODUCTION

The goal of this paper is to present the strategic planning efforts that had been made over more than a year towards transforming the university science and technology campus of An-Najah National University in Palestine into a smart, eco and green built environment. These were part of the efforts made to prepare the third strategic plan for the university for 2016-2020.

An-Najah National University, the largest public university in Palestine, has decided to lead in providing a prototype model of a small smart and sustainable city in the region, through adopting the smart city concept for achieving a sustainable built environment. Such a transformation is envisaged to result in better asset maintenance and management, a reduction in the operational expenses and the consumption of resources (such as those related to energy, water, and heating/air conditioning), protection of the environment, and improving the quality of the living environment, through the use and adaption of advanced technology.

2 SMART AND SUSTAINABLE BUILT ENVIRONMENT

2.1 Smart city concept

The 21st century is being recognized as the city century [1]. Statistics show that today more

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people live in urban areas than in rural environments, while in 2050, urban population will reach 70% [2]. In Palestine, recent statistics indicate that urban population reached 74% [3]. The socio-economic, environmental, and engineering challenges posed by this transformation will shape the societies of the 21st century. Therefore, there is a need for efficient urban management and sustainable development, mainly envisaged to be achieved utilizing “smart” technologies and technological innovations.

Smart city is a recently developed concept to highlight the growing importance of information and communication technologies (ICT) in profiling the competitiveness of cities [4]. Major technological, economic and environmental changes have generated an interest in smart cities. Sectors that have been developing smart city technology include transport and traffic management, energy, water and environmental utilities, as well as the building sector.

The aim is to establish new cities and develop existing ones on the bases of sustainability. Therefore, developing a smart city concept can support an efficient urban management and a sustainable development, by the use of “smart” technologies, which can improve the efficiency and effectiveness of urban systems.

2.2 Smart university concept

Research in the field has focused on components of urban services or on enhancing the learning environment [5] [6]. Less has been done on the systems thinking approach across the city by integrating various urban system services (transportation, electricity, street and public lighting, water supply, sanitation, etc.) and interactions with stakeholders, mainly the users [7].

In this paper, the approach followed to consider systems thinking in demonstrating the attempt of the university to experiment on the scale of a small town (a large university) by treating the technical components of the city (infrastructure networks, built environment, and natural environment). This is a unique experiment in the region, as it deals with the systems at large, and considers, the socio-economic and regulatory aspects, during the course of preparing the university's five-year strategic plan.

3 STRATEGIC PLANNING AS A TOOL TO DEVELOP SMART BUILT ENVIRONMENT

To achieve a sustainable development, strategic planning has been conducted. Strategic planning helps to see the larger picture of the situation and assists in achieving the desired objectives.

Through strategic planning, community change can be planned in an effective way for stimulating, developing and managing goals determined by the community itself. Strategic planning is a demonstration of how the community can identify its mission and vision and change the environment to achieve its objectives.

Therefore, strategic planning provides a framework to achieve the smart built environment concept. The followed strategic planning approach assists in the systematic decision-making, focusing attention on important issues and how to resolve them. Therefore, the process provides a general methodological framework to determine priorities, make wise choices, and allocate scarce resources (mainly money and time) to achieve agreed upon objectives.

A participatory strategic planning approach is followed, which can be described as a holistic process that directly and meaningfully engages the university body, including the university academic and administrative community, as well as the student community, to identify and choose interventions to achieve the university vision, and ensure that these are well selected and reflect the best use of resources.

Urban strategic planning has been seen as a means to control, regulate and determine the directions of the development of a city or urban area, in the context of its current profile and future opportunities and challenges. The systematic assessment of Strengths, Weaknesses, Opportunities, and Threats, or SWOT Analysis, is one of the most widely used strategic assessment approaches. Strategic assessment is followed by a process of identifying the highest priority issues, formulating the vision and mission, and defining goals and objectives. Consequently, the interventions, or strategies, are devised to define what needs to be done, when, and how to achieve the stated goals and objectives.

4 THE CASE STUDY SETTINGS

4.1 Overview

The An-Najah National University new campus is constructed on 126 thousand square meters of land in the western part of Nablus City, located in the heart of the northern region of the West Bank of the occupied Palestinian territories.

The university enrolment is currently about 25 thousand students, distributed over four campuses. The new campus hosts about half this number. The new campus was planned to be a base for science and technology in Palestine, as it houses the faculties of sciences, medicine and health sciences, and engineering and information technology. In addition, it hosts the faculties of graduate studies, law and fine arts. It also accommodates a theatre, a mosque, a centre of IT excellence, the scientific centre's complex, a

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library and media centre, as well as sports and student activities complexes.

Although construction works started 15 years ago in building the new campus, efforts continue to satisfy the developmental needs. Currently, the total built up area has reached a total of about 70 thousand square meters, while the total lengths of urban infrastructure systems has reached about 20 thousand meters. Figure 1 shows the Master Plan of the university's new campus.

4.2 University strategic planning

The university had prepared its first strategic plan in 2005 to cover the five year period from 2006 to 2010. The university formed a Steering Committee in the fall of 2014 to oversee the preparation of its third strategic plan for the period from 2016 to 2020.

The administration of the university has decided to start transforming it towards being a smart and sustainable campus as a demonstrator for a Smart and Sustainable City, with a vision to provide a secure, environmentally safe, green, and efficient urban centre of the future.

The Steering Committee was designated to plan and oversee the activities related to the formulation of the strategic plan. The Steering Committee defined 10 themes that have been integrated under four major areas: the academic area, the scientific research area, the community service area, and the institutional support area.

Under the institutional support area, the new theme of the Smart, Eco and Green University was set. The Steering Committee formed a specialized sub-committee to diagnose the current situation related to the theme topics. The sub-committee included professors in planning, transportation, energy, water and environment, building engineering, information technology, socio-economic sciences, as well as the university's new campus senior engineer in charge of operations and maintenance.

5 STRATEGIC PLANNING FOR A SMART, ECO AND GREEN UNIVERSITY

5.1 Diagnostic study

Strategic assessment was done first in the fields relevant to the Smart, Eco and Green University theme, which include the infrastructure, the built environment, and the natural environment. Moreover, an inter-disciplinary area was considered, which is related to the economic, social/behavioural, and regulatory aspects [8].

The infrastructure field included the transportation, wet utilities and environmental systems (water, wastewater, storm water, irrigation, and solid waste), electricity and energy, and data and telecommunication systems.

The built environment field considers all the campus buildings, with concentration on the buildings' systems, with emphasis on water and environmental utilities, heating/air conditioning, data systems, electricity and energy.

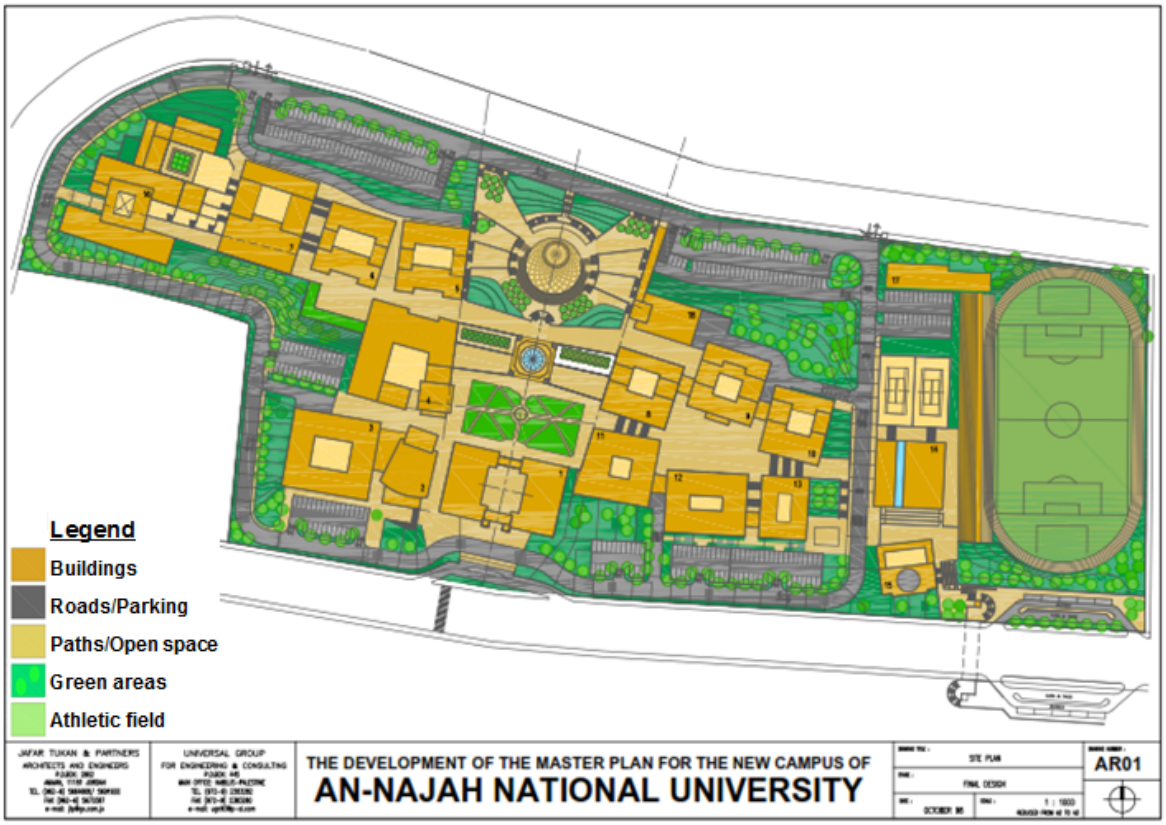

Fig. 1: University new campus Master Plan.

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The natural environment field considers all the outdoor facilities, with emphasis on the open spaces and green areas.

The SWOT analysis was conducted in order to identify the points of strengths and weaknesses, as related to the internal environment, and the opportunities and threats, as related to the external environment.

Based on the outcome of the strategic assessment stage, a diagnostic report that presents the results of the diagnosis was prepared by the Steering Committee. Each sub-committee, using both historical and current data as well as the situation assessment, had identified the potential key issues to be considered in the strategic plan.

5.2 Identifying major issues

To prioritize the key issues in each theme, the Steering Committee held a participatory workshop to present the report, and discuss with the participants the important issues across the fields to derive the most important issues to be considered in the strategic plan. The participants included the university administration, the deans of faculties, and the heads of academic departments, administrative units, and research and community service centres.

In the workshop, and after presenting the diagnostic report, the attendants were divided into groups, and each ranked all the issues according to priority. Based on that, the ranked priorities of the key issues across all the sectors were identified.

The issues that were selected to be those of high priority and to be considered in the preparation of the strategic plan interventions included, under the theme of Smart, Eco and Green University, the following, which were selected from the defined ten thematic relevant issues:

- Lack of a proper infrastructure and building management systems, especially for the wet and environmental utilities
- Traffic congestion at the vicinity of the campus and the inappropriate public transportation and parking facilities
- Insufficient use of potential renewable energy to satisfy the increasing demand

In addition, the sub-committee that was later formed for the ICT has identified ten other issues, where the high priority issue chosen in the workshop was the lack of a well-developed ICT infrastructure system, including the wireless communications.

5.3 Defining goals and objectives

In order to address the identified top priority issues in the Smart, Eco and Green University theme, as well as the theme of ICT, the related sub-committees had further analysed the issues and conducted a root-cause analysis to trace the issues/problems to their origin, and to facilitate arriving at the strategic goals and objectives that would address the identified issues. The defined strategic goals and objectives were specified for each of the identified issues of top priority.

5.4 Specifying interventions

Once strategic goals and objectives were defined, the interventions (programs, projects, and activities), were then specified. Alternate interventions were proposed and assessed, and the most appropriate and efficient interventions were selected.

After the most appropriate interventions (or strategic alternatives) had been agreed upon and formulated, these were then operationalized and included in the grand five-year action plan. It was necessary to meet with the university administration and get endorsement of the Board of Trustees on the strategic interventions, in order to maintain the commitment and secure necessary resources.

Each of the interventions was briefly defined, providing a summary description of the intervention, its linkage with the university strategic plan goals, intervention's activities and/or components, cost per activity/component, time frame for implementation, and responsibility for implementation and follow up.

5.5 Devising the action plan

Based on the identification of the strategic interventions, the action plan was prepared. This plan establishes what must be done, the date by which it will be done, and who will be responsible for the implementation. The action plan needs to be implementable within the existing or foreseen limitations of budgets, time, and institutional capacity. The Steering Committee prepared the estimated cost of the strategic plan interventions. Such cost was set considering potential allocations, taking into account the past five year developmental expenditures. A summary of the costs of the implementation of the interventions specified under the themes of the smart, eco, and green university, as well as the ICT, are presented in Table 1.

The overall costs are estimated at 6.991 million USD, including 5.791 million USD under the theme of the smart, eco, and green university, and 1.2 million USD under the ICT theme.

The major cost items concentrated on transforming the infrastructure to be capable of serving the continuous data collection on the operation and performance of the transportation, wet utilities, energy, and lighting systems, and to implement relevant smart, eco, and green projects. These included equipping the infrastructures with sensors and communication networks, implementing a major solar energy harvesting project, and implementing a major

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public transportation and parking improvement program using smart technologies.

Moreover, the overall costs included the implementation of the first phase to transform the internal systems, including water, energy, and lighting systems, in two buildings towards sustainable and smart buildings. The costs included also implementing a program for the development of green areas and open spaces. Finally, the costs included awareness programs to engage the students and faculty in the wise use of resources aim, in order to complement the physical related interventions.

In addition to the above indicated interventions, the action plan included the allocation of 2 million USD for the development of the ICT infrastructure in the university. It is estimated that 60% of this cost will be allocated to the new campus. Therefore, it is estimated that 6.991 million USD will be spent to transform the new campus to be smart, eco and green.

5.6 Strategic plan approval

The Board of Trustees has studies the strategic plan and adopted it with its components and budget. The smart, eco and green university theme, along with the ICT infrastructure theme, formed about 33.9% of the whole cost of the strategic plan cost of 22.965 Million USD, extending over the strategic plan's five-years.

No.	Field/ sector	Sub-sector	Cost (1000* USD)
1.	Infra-structure	- Water and Environment - Energy - Transportation	1,303 500 3,503
2.	Built Environ-ment	- Pilot Smart Energy and Utilities in Buildings	160
3.	Natural Environ-ment	- Green Areas and Open Spaces	265
4.	Social/ Behavior/ Economic	- Awareness Programs	60
5.	ICT	- Development of the ICT infrastructure	1,200
	Total		6,991

Table 1: A summary of the interventions under the smart and sustainable university relevant themes for the new campus.

The Board of Trustees requested that the university administration should consider a close follow up of the implementation of the approved interventions. The Steering Committee was therefore delegated the authority to follow up the implementation of the strategic plan, through the already prepared monitoring and evaluation framework. This framework had included well-identified key performance indicators, which were specified for each of the interventions over the five years of the plan, to facilitate monitoring and the evaluation of the progress towards achieving the objectives.

It has to be stated that by the start of the year 2016, executive sub-committees were formed to implement the interventions, including three sub-committees for the Smart, Eco and Green, as well as the ICT themes.

6 CONCLUSIONS

This paper presents the planning efforts conducted towards the preparation of the strategic plan for An-Najah National University in Palestine, which included the intention to transform the new science and technology campus towards Smart, Eco and Green built environment. The adopted related interventions were meant to demonstrate how a "small city" can be transformed to be smart and sustainable. The experiment once judged to be successfully implemented, is envisaged to be benefited from and repeated in other cities in the country and in the region.

By the end of the plan's five years in 2020, all the infrastructure systems would have been converted to be "smart". Eco and green university natural environment objective should have been realised. It is hoped that the pilot smart energy and utilities in buildings sub-sector included in the plan would be successful, encouraging to move ahead towards implementation to other buildings as appropriate, transforming the built environment to be smart and sustainable.

Despite the seemingly high investment by a university in an emerging country in the theme, it is envisaged that such high cost would pay back. Tangible benefits are foreseen on fronts related to the proper asset and maintenance management, reduction of operational expenses and resource consumption, protection of the environment and improving the quality of the living environment.

The university administration and Board of Trustees commitment to transform the new campus towards a Smart, Eco and Green Sustainable Built Environment was essential. Without such commitment and provision of the necessary resources, the efforts towards the realization of such an aim would not have started.

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