

# A Conceptual Framework for Facility Management in Higher Education Institutions in Saudi Arabia

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**Abstract** – A utilization of facility management (FM) practices may greatly simplify the process of managing and operating the facilities of higher education institutions. Thus, this paper presents a conceptual framework for effective and efficient operation and management of facilities of these institutions in the Kingdom of Saudi Arabia (KSA). This field of research is significant given that the top management at the Ministry of Education level in the KSA is concerned about the high cost of operational expenditures and cleaning contracts of universities. As a result, 8% percent of the financial support has been reduced in last two years. Yet, more reduction in the support is expected in the coming years, which necessitates a reconsideration of practices and restructuring of responsible departments. The ministry's set of actions in this context is justified by the stringent goals mandated by the Saudi 2030 Vision and the National Transformation Program (NTP) to rationalize the expenditures of all government sectors. Therefore, this paper summarizes the current practices of FM in universities and identifies the opportunities and challenges they typically face. Given the common structure and regulations of the public universities in Saudi Arabia, this study takes Shaqra University (SU) as a sample study. Therefore, SU's facilities were assessed through data collection and analysis.

Additionally, interviews were conducted with the property and maintenance departments' teams to understand the current management and operations practices being implemented at the university. The results show that SU professionals do not comply with the correct practices of FM. Practical implications of this work include setting up good practices for managing and operating higher education facilities, where the adaptation of the correct FM rules will improve the liability of the educational infrastructure.

**Keywords** – FM, facility management, higher education facilities, higher education operation and management.

## 1. Introduction

Facility Management (FM) plays a prominent role in an organization's performance, productivity, and livability of the organization's facilities. Failing to recognize the previous fact creates a gap in the organization strategy plan's elements. For example, the interest rate associated with leasing versus construct of a facility has a significant impact on the strategic plan of an organization [1]. On the other hand, FM has a high impact on people's productive, business model, and workplace environment. FM parameters such as power consumption and maintenance practice may affect the planning and the management. In an economic language, the success of managing and operating a facility depends on the ability to maximize its return per money invested.

Public higher education organizations and institutions are a type of public sector organizations since they are funded by a government [1]. Consequently, managing and operating the facilities differ from private sectors. For instance, the reviews and approvals of actions must go through layers of management. Also, maintenance contractors are rewarded with the lowest bid by delivering low-quality services. On the other hand, organization structure, IT, aging buildings, insufficient financial resources, lousy maintenance practices, and planning are increasing the challenges in managing and operating the higher education facilities. However, at

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the government level, some initiatives have been responded to identify innovative solutions to these challenges. For example, Saudi Vision 2030 and Fiscal Balance Program call for raising the efficiency of operational spending through adopting best practice methodologies since the annual funding of Saudi's universities have reached high number [2], [3]. Specifically, the initiatives are searching out ways to improve the operations efficiencies and optimizing consumption of utilities. At the ministry of education level, it was clear that the budget operational expenditure and cleaning contracts have been reduced for the last two years.

A closer look at some educational institutes systems in Saudi Arabia revealed that the formal FM practices do not exist and are not practiced at the minimum requirements. Currently, the property manager is responsible for administrating the utilities while the practice of property management is different from the FM. Also, contracting out or outsourcing some of the universities' activities/functions without retaining the control over all functions lead to quality deficiencies in the services provided by the contractors and sub-contractors. In the current economic status, there is considerable pressure on every organization to deliver 'more for less' resulting in a reduction of operation costs. Considering the Life Cycle Cost (LCC) and Total Cost of Ownership (TCO), an organization can get a much broader picture of the benefits of sustainable practices. Measures such as a reduction in energy consumption, productivity increases, waste reduction, and other beneficial effects of sustainability can be quantified to enhance sustainable practices and comprehend their positive effects [1].

In the short run, setting up good practices for managing and operating higher education facilities could result in the minimization of maintenance cost, improvement of people, workflow and conservation of energy. In the long run, higher education institutes are funded by the same source. They have the same procedures and same organization structure, which makes managing and operating of the educational facilities even more effective. Also, the adaptation of the FM could improve the livability of the educational infrastructural, which eventually helps to achieve the goals set by a government and institutions.

This paper presents a conceptual framework for effective and efficient operation and management of public higher education facilities in Saudi Arabia, where current practices are presented facilities, opportunities and challenges of higher education management are identified. The study takes Shaqra University (SU) as a sample case. Nevertheless, the paper is organized as follows. While Section II

presents a brief overview about the study motivations and background, Section III provides the conceptual methodology. The work is concluded in Section IV, and future glimpse is given.

## 2. Study Motivations and Background

### A. *FM Best Practices*

FM is defined as “a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process, and technology” [4]. International Facility Management Associate (IFMA) is the earliest recognized professional association that had been established to guide and develop the FM profession. The organization was founded in October 1980, and it is considered the World's most significant and most widely recognized international association for FM professionals [4]. FM's lifecycle begins at the planning, acquisition, operation and maintenance, and deposition phase [1]. Typically, the operation and maintenance stage is the most extended phase in the FM's lifecycle where facility managers must be alerted to all aspect of this phase. This highlights the importance of FM as a merged profession of maintenance and property management [5].

The best practices presented in the section are the ones relevant and applicable to the study. The authors in [6], for example, stated that the lifecycle costing analysis, integration of services, design for operations, maintenance and sustainability, cost-effectiveness, and quality of life are significant themes of FM. The IFMA claims that the 11 core competencies for FM professionals and knowledge base are communications, quality, technology, operations and maintenance, human factors, finance and business, emergency planning, business continuity, leadership and strategy, real estate, property management, project management, environmental stewardship and sustainability [7]. By recognizing the factors mentioned above will most likely assist in designing methodology for management and operation of higher education facilities.

### B. *Saudi Arabia Government's Initiatives and Programs*

The government of the KSA has launched a strategic vision in April 2016 called "Saudi Vision 2030" to reduce the dependency on oil and improve the performance and spending efficiency of public sectors such as education, health, and tourism. Further the Vision aims to optimize the use of current resources, facilities and limit the waste. Following the Vision's announcement, many programs have been launched to execute and achieve its objectives. In this section, some of these programs and

initiatives will be highlighted to motivate the establishment of the study [2].

1). *Fiscal Balance Program 2020*: It is a program that was launched to reform the government spendings and support the implementation of best practices for public sector facilities. It was stated that the most spending elements of the Ministry of Education (MOE) are contracting, procurement, facility operations and consumption of utilities [2].

2). *Privatization Program*: The objective of the program is to increase the level of the private sector's involvement and partnership in the education sector. The involvement includes constructing buildings and operating schools under the name of "independent school." Also, the program supports plans and initiatives that are related to finding other fund sources such as paid programs [2].

3). *Quality of Life Program 2020*: The program's objectives are to measure the citizen satisfaction. For instance, education is one of the other indices that are often utilized to measure the citizen satisfaction. In term of education, the quality of life is measured by a reliable infrastructure and facilities and quality educational systems. Besides, improving the total number of universities that are ranked globally is a critical dimension that affects the objectives of the Quality of Life program. To be globally recognized and ranked, universities should make certain their facilities are upgraded and are safe to conduct the businesses. In fact, facilities play a substantial role in the accreditation process as they are listed as number 7 criterion among the Accreditation Board for Engineering and Technology (ABET). For instance, universities should define the maintenance policy and procedure [2].

### C. Current State of FM at SU

SU is a newly established university that was founded in 2009, where the main campus is located in Shaqra city of the KSA. In fact, it covers a large geographical area, where it has around 23 colleges distributed among 9 different campuses. As the university is relatively young and most of its permanent buildings are under construction, most of its facilities are rented. In this study, the focus of the study is on the main campus that is located in Shaqra. The purpose of this section is to briefly summarize the current state of the FM practice at SU [8].

1). *Power Consumption*: The power consumption poses a unique challenge to facility managers and decision makers at universities. The significant growth of electricity demand and consumption in recent years call for urgent actions for an efficient usage of power. In the education facilities, space and water heating, lighting, cooling, and ventilation consume a large amount of electricity as shown in Fig. 1. [9].

Key Areas of Energy Consumption in Educational Facilities

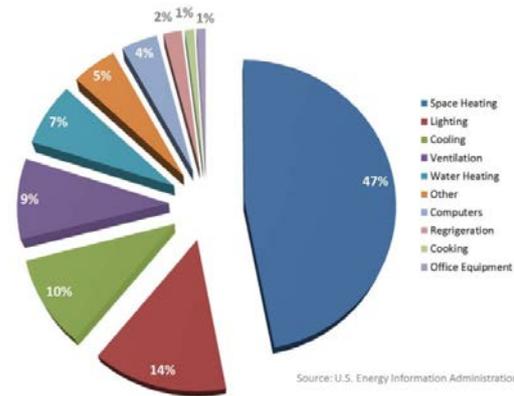


Figure 1. Energy consumption areas in educational campus

The current practice at SU regarding power consumption is not sufficient. For example, Fig. 2. shows the estimated power consumption for the winter session. Also, smart systems for energy usage efficiency such as thermal and light sensor system are not utilized in the university campuses, and people often rely on the cleaning team to turn off the lights, AC, PCs. Therefore, decision makers should start to think about purchasing and installing energy efficient equipment to increase consumption efficiency.

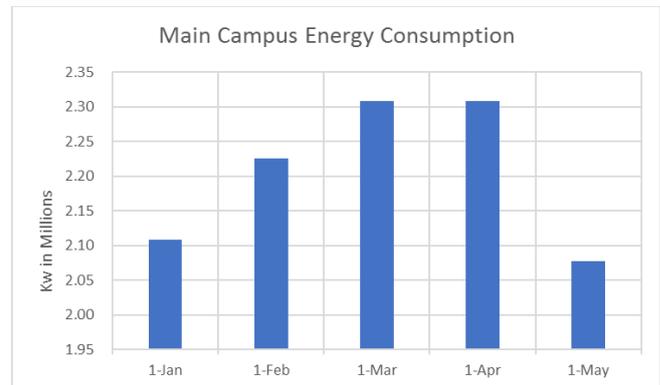


Figure 2. Estimated power consumption for Winter 2018

2). *Water Consumption*: The demand for the water in Saudi Arabia is growing whereas water is considered a scarce resource due to the arid climate of the country. Based on the raw data received from the maintenance department, it shows that the main campus has its own water station, which is running at 80% of its capacity. More investigation is needed to understand the use of the water in different campuses. It is also among the FM's various roles to improve the water-use efficiency and to have a better way of managing its use. In fact, some of the devices could be implemented in the washrooms to conserve the water use and awareness programs should be supported to reduce the water use.

3). *Workplace Allocation*: Departments' and offices' assignments are not well organized. Also, the authorities to distributing and management of offices and facilities are not defined. Often, it takes a long

process to assign the office to an instructor. It appears that the problem is due to different colleges sharing same buildings. One case that was noticed is a department chair's office being located five minutes driving distance from their students and department's staff. It was also reported that some instructors are sharing a single office whereas others have more than two offices. In fact, the role of FM to solve such issue is vital, and FM model can help to assign space based on rank or function.

4). *Work Flow Process*: The flow of information or work process may require frequent changes in spaces. Thus, FM should work with front line to identify the flow of information to be able to anticipate the spaces. In the case of this study, some departments are not allocated in the same building, which often causes delays in some requests. As a partial mitigation to such issue, a new management system, called "Muraslat," has been recently launched. It is also the role of FM to build a dependency matrix to capture the interactions between different parties. The benefit of this action is to increase the productivity among departments.

5). *Information Technology (IT)*: The utilization of IT is an essential element in today's educational environment. IT generally includes the voice, data, and electronic information. Also, it supports the facility managers' activities and executes their plan. Further, it helps to automate the process of FM. From a different perspective, facility users need to have a robust IT infrastructure to execute their research and conduct their work. Nowadays, the concept of the smart classroom is getting more attention in the educational sector. Conversely, the technology brings a question of who should be responsible for operating and running the equipment. For instance, a maintenance issue with the smart board brought a question to who should the instructor report the problem, whether they should belong to the deanship of IT or the maintenance department.

6). *Maintenance Practice*: Maintenance deals with ensuring a facility operate efficiently. A site visit to one building revealed that the current maintenance practice is weak and the facility is not well maintained. It seems there is no preventive maintenance or maintenance schedules. Images of defects are shown in the following figure.



Figure 3. Maintenance issues

#### D. Need of the Study

Most of the educational institutions in the KSA lack some of formal FM practices. Thus, this work investigates the factors that could have the most significant impact on the higher education facilities management and operation. Then, the proposed framework provides recommendations for adoption of the FM profession, which in long-term will improve organization's performance and user's satisfaction.

### 3. Conceptual Methodology

The conceptual methodology focuses on the concept or theory that explains or describes the facility through an in-depth analysis and evaluation. The measures adopted for the analysis and evaluation procedure vary according to the facility under consideration. These ways must be chosen to ensure that all significant factors that impact the present or future state of the facility are thoroughly evaluated. This will most likely benefit the future course of maintenance and development planning of the available facilities.

In this study, the conceptual methodology for FM comprises facility assessment and qualitative and quantitative analysis. Altogether these criteria evaluate the present state of the facility and help in planning and implementation of future maintenance and development procedures.

#### A. Facility Assessment

Universities are sophisticated systems comprising varying stakeholder groups, ranging from undergraduate students to post-doctoral research scientists. FM functions need to plan and develop processes that take into account and respond efficiently to the various needs and expectations of each group. In designing an effective FM function, the context is everything. The first step towards developing an efficient and effective facilities management plan requires an in-depth analysis of the facility. A proficient FM team should possess data-capture capabilities and relationship-management skills to study and understand the present needs and plan accordingly to future developments [10]. Facility Assessment is a procedure that analyzes the existing and projected future scenario of facilities and assets within those facilities. The process assesses the physical condition of facilities, analyzes opportunities for enhancement, and starts processes to improve the present state [11]. Firstly, the FM team needs to plan and set up the assessment procedure. Then, they should carry out the planned assessment steps as shown in Fig. 4. With the analysis of findings obtained after the assessment, the team typically begins addressing the opportunities for improvement. The assessment procedure enables organizations to

analyze the funding along with operational requirements [12].

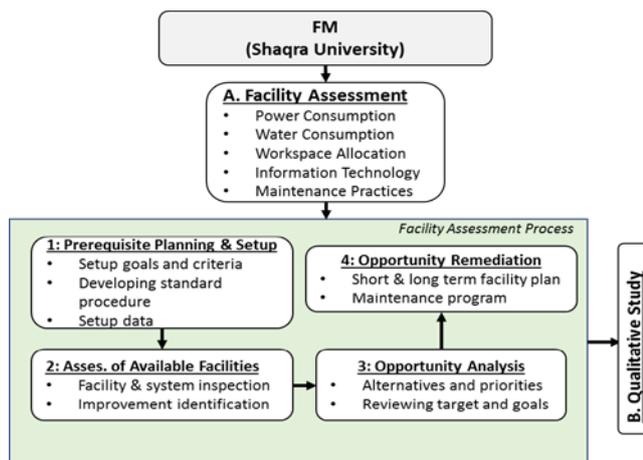


Figure 4. Facility assessment model in SU

As a matter of the fact, the process may be summed up in four major steps:

1) *Prerequisite planning & setup*: Before beginning to assess the condition of facilities, the FM team needs to define the assessment and analysis program goals and criteria. Then, they should accordingly develop the standards and procedures and setup data that is required to achieve those goals.

2) *Assessment of Available Facilities*: This is achieved by carrying out the facility and system inspections to identify the physical and functional condition of the facility and its component systems. The inspection will help identify opportunities for the improvement and estimate costs that are associated with addressing the opportunities.

3) *Opportunity Analysis*: With the findings of facility analysis, the FM team can determine funding requirements and review against targets and goals that are established during the planning phase.

4) *Opportunity Remediation*: Taking into consideration the present scenario and opportunities, short and long-term facilities plans can be developed and accordingly launched to improve the functioning of facilities. The opportunity remediation can be easily integrated with ongoing maintenance programs.

Facility Assessment procedure results in the identification of drawbacks or performance bottlenecks that can restrict the smooth functioning of an organization. By highlighting these loopholes and recommending a course of action, taking into consideration the present and future scenario of the organization, assessments catalyze improved facilities. There are some core elements such as a facility's energy consumption, building's power infrastructure, facility's non-structural properties and floor plan, and sustainability evaluation that are often prioritized in most facility assessments. Assessments typically feature the analysis of a facility's overall

physical state and functionality. FM in a university's context significantly impacts an organization's goals by influencing both revenue and cost, henceforth, adding more value to the university's development plan. In this study, the following parameters are undertaken for assessment:

1) *Work space allocation*: It starts with assessment of the facility's floor plan, which comprises physical space that aids diverse teaching and learning programmes, constituting technologies that facilitate optimum performance and operation of a facility. This, in turn, is tuned with the environment, thereby, encouraging active social participation and keeping under consideration healthy, comfortable, safe, and secure space for its occupants. With the increasing cost per square foot, it is vital to maximizing the workspace investment. A thorough evaluation of the facility's floor plan will result in a better understanding of how we use our facilities, make workspaces more functional and manage costs.

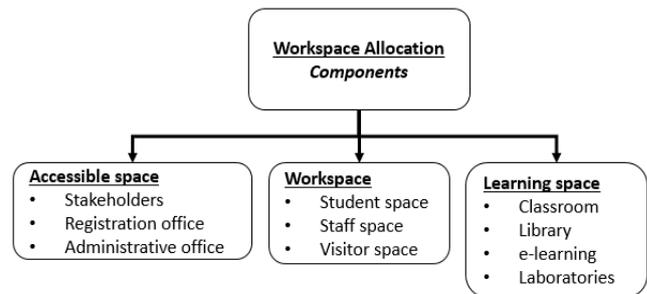


Figure 5. Components of work space allocation

The following requirements under space allocation are taken into consideration in this study as shown in Fig. 5.

- *Accessible space*: The space should be a suitable fit for all stakeholders (i.e., students, staffs, visitors) by keeping in mind their requirements.
- *Work space*. There should be enough spaces in which all stakeholders can interact with each other. For example, students' space should be enough to support the current and estimated student enrollment.
- *Learning Space*: Learning spaces accommodate a vast range of educational programs and its pedagogies. It should be of sufficient space, multi-purpose and fulfills the primary seat of learning.

2) *Power Consumption*: Power consumption comprises one of the most substantial costs of a facility's operations. The priority is to find energy efficient and sustainable cooling solutions that address rising energy costs. According to the Department of Energy, facility energy consumption can be reduced by 20 to 40% by applying some best

practice energy efficiency measures and strategies. [13]

Studying the patterns of energy usage helps identify waste and find opportunities for change. Further, it helps in setting targets for improvement. Constant monitoring and targeting is most likely to help improving the energy efficiency, reduce carbon emissions, and increase the facility's profitability.

3) *Water Consumption:* The next vital facility is water supply. The assessment will result in a detailed analysis of water consumption in the university. Moreover, efficient measures can be adopted to minimize the consumption.

Multiple reasons can be listed to manage water consumption in a facility. Along with saving money and energy, it offers a broader picture of total usage and therefore helps in minimizing the facility's impact on the environment. [14]. In this study, water consumption is a priority issue by taking into account the geographical location of the facility. Adoption of a few necessary water conservation measures will help a great deal in making the facility efficient and environmentally responsible by reducing water consumption to a great extent.

4) *IT:* Maximizing the use of technology and making it easily accessible is the most critical issue for catering to the fast-paced development of IT. In fact, IT in facilities management must be part and parcel of the organizational culture to make a positive impact on the organization's evolution.

Incorporating a new and more efficient IT services may support the FM organization to maintain the facilities. For instance, the online registration services enhance the functioning of registrar office as well as the facility. It enabled students to drop or add any course without making a regular visit to the registrar office and the work process.

5) *Maintenance Practice:* Maintenance management is a crucial part of FM given that it ensures that critical components of a facility do not fail unexpectedly by individualizing various assets within the facility and planning their improvement and risk management for the long run. Maintenance does not only mean to run things smoothly and efficiently, but it also means keep plans in all aspects ensuring a longer lifecycle, hence, maximizing the revenue and cutting cost.

A facility's assets run longer and more efficiently when they are maintained regularly in a planned manner resulting in overall increased productivity, which results in generating a higher return on investment. Evidently, planned facility maintenance helps an organization to focus more on strategic

business decisions, thus helping evolution with the ongoing scenario. Facility maintenance brings overall efficiency and transparency into business processes, saves time, reduces costs and adds more value through proper usage and maintenance of equipment and investment. Increasing productivity and efficiency is essential for the growth of an organization. This study gives a consideration to the geographical location of the campus climatic conditions, which plays a vital role in the functioning of the university.

### B. Qualitative Analysis

The qualitative approach (i.e., Questionnaire/Survey based) is to be used to collect a large number of responses from stakeholders of educational pedagogies (i.e., student, staff, and visitor). The main aim is to obtain a detailed assessment of stakeholder's experience and understanding of FM practices and apply any remediation needs. The following are the primary objectives to be fulfilled by the survey:

- 1) Evaluate the FM practices in educational institutions (SU in study case).
- 2) Identify knowledge and understanding of FM Competencies elements in universities.
- 3) Quantify and assess the effectiveness of available facilities through stakeholder's survey.
- 4) Identify gaps (if any) and explore future remediation programs.

Appropriate working business models shall be developed in conjunction with other relevant departments under lead of this research team so that the proposed research is practice-oriented.

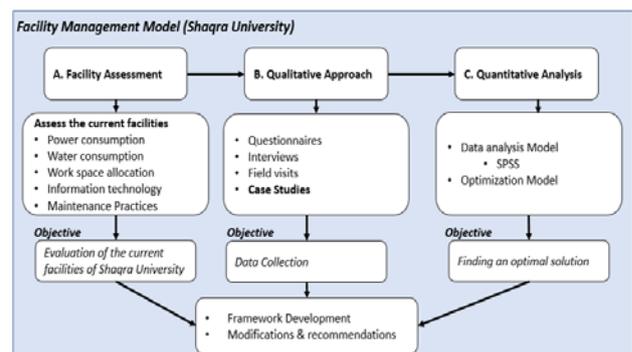


Figure 6. Conceptual methodology of FM at SU

A questionnaire was developed to evaluate the importance and effectiveness of identified facilities. The questionnaire survey mainly deals with various aspects of services being provided by the university. Each factor was weighted according to their significance, as being marked by respondents.

Table 1. Facilities Performance Weightage

Response	Weightage
Strongly agree	5
Moderately agree	4
Agree	3
Disagree	2
Moderately disagree	1
Strongly Disagree	0

The questionnaire comprises two sections (i.e. A and B). Section A consists of items related to individual demographics (i.e., details related with users). Section B contains elements of FM competencies associated with services, further subcategorized mainly into six subsections.

- **“Quality of Institutional Facilities”**: main attributes considered are level of satisfaction with provided services, nature of functionalities of institutional facilities including ergonomics and room temperature, comfort zone including impact on user life quality, aesthetics of facilities including colors, and indoor quality (e.g., air quality).
- **“Workspace Allocation”**: main attributes considered are level of satisfaction with provided spaces (e.g., size, facilities, and maintenance) and interspace connectivity (e.g., space between classroom, lab, staff room, and visitors’ rooms) within the workspace.
- **“Power Distribution”**: main attributes considered are level of satisfaction with provided electricity (nature and frequency of supply and requirements), nature of lighting facilities (e.g., labs, classroom, hallways, offices, etc.), HVAC aspect (i.e., heat, ventilation, and air conditioning emergency supplies) [15].
- **“Water Supply”**: main attributes considered are level of satisfaction with provided water supply (i.e., nature and frequency of supply, requirements, and excessive), quality of potable water (e.g., processed and unprocessed), and emergency supply in case of fire.
- **“IT”**: main attributes considered are level of satisfaction with provided IT facilities (e.g., online university portal, e-learning, registration services, and quality of Wi-Fi).

- **“Maintenance Practices”**: main attributes considered are level of satisfaction with maintenance facilities (i.e., nature and frequency of maintenance), building repairs services, and quality of space concerning the construction.

### C. Quantitative Analysis

The survey data is mainly used to develop a conceptual framework for measuring and evaluating the performance of FM elements in Saudi universities. The collected survey data is designed to investigate the above parameters and analyze them using the SPSS package. Therefore, the attributes under each parameter are ranked accordingly using questionnaire responses. The higher the weight, the more is the ranking index, which directly reflects upon "Performance Indicator." The effectiveness of the designed framework is further validated by conducting semi-structured interviews with specific FM professionals.

## 4. Conclusions and Future Research

Lacking FM practice in higher education institutions in Saudi Arabia creates a need to study the implementation and the value added of adopting the FM practice. The conceptual methodology begins with facility assessment, moves to data collections, and ends with data analysis. The application of the framework is applied in SU's campuses. The study focuses on specific parameters and settings: power consumption, water consumption, space allocation, work process flow, IT, and maintenance practice. The methodology introduced in this paper is just a beginning of an ongoing effort to operate and manage a higher education facility. In addition, this work is part of a larger project that aims to increase quality of education and facilities at Shaqra University. Previously published work include [16], [17], [18], and [19].

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