



Practical Implementation of Campus Facility Management Performance Measurement in Qatar

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Abstract

Effective facility management is crucial to overall firm performance and is becoming a core competency for organizations seeking to gain a competitive advantage and attain their goals. Recent research on facility management indicates that ineffective management is a leading cause of budget overruns, maintenance delays, reworks, variations, non-compliance events, unnecessary risk, and dissatisfied customers. In Qatar, there is an expansion of educational facilities to achieve the 2030 Qatar National Vision of having an educated population through a well-developed, accountable, and accessible educational system. This expansion is causing a growing demand for effective campus facility management (CFM) in order to effectively manage and accurately monitor the performance of campus facilities. Through a comprehensive literature review, expert interviews, and online questionnaire responses, this paper aims to develop a Campus Facility Management Performance Framework (CFMPF) that consists of tactical and strategic critical campus facility management success factors categorized into process groups. The proposed framework provides an operational foundation for benchmarking the CMF performance to support the identification of underperforming areas. The CFMPF has been used in real-world facility management firms to benchmark their performance and determine which areas of management need to be improved.

Keywords: Facility management; Operation and maintenance; Campus facility management framework; Performance measurement framework

1 Introduction

As reflected in Qatar's National Vision 2030, education is seen as a crucial pillar for the State of Qatar. Qatar, as represented by the Ministry of Education and Higher Education (MOEHE), is committed to collaborating with numerous academic institutions to offer the best educational opportunities both locally and internationally. This is done in an effort to foster a distinctive academic setting that encourages students to develop their imagination and enhance their skills in order to succeed and stand out in various facets of undergraduate and student life. As shown in Table 1, the Ministry of Higher Education has identified 31 universities in Qatar that provide exploration and knowledge generation as well as teaching and research activities in various fields of study (Hukoomi, 2021). These facilities require effective management in order to accomplish their main objectives at the lowest possible cost. According to Matse et al. (2022), poor facility management lowers the value

of existing buildings, raises the cost of unrepaired maintenance issues, raises the price of emergency repairs, and lowers the quality of public services. Additionally, Yasin et al. (2022) highlights facility management of higher education buildings as a crucial element to guarantee the building's sustained peak performance throughout its design life to a workable degree. Therefore, proper facility management is needed for university buildings in order to provide a valuable environment that supports and stimulates teaching, learning, innovation, research, and other diverse academic purposes that all support the government's overall vision for the country. Otherwise, it will hinder the productivity and comfort level in universities, which will ultimately lead to a decline in the quality of its outputs. This paper's goal is to conduct research and make recommendations for a campus facility management framework that can be used in Qatar's higher education facilities.

Table 1: Universities in Qatar as of 2022

University	Sector	University	Sector
Stenden Qatar University of Applied Sciences.	Private	Police College	Public
Doha Institute for Graduate Studies	Private	University of Calgary in Qatar	Public
AFG College with the University of Aberdeen	Private	College of the North Atlantic-Qatar	Public
University Foundation College	Private	Qatar Finance and Business Academy with Northumbria University	Public
City University College	Private	Rule of Law and Anti-Corruption Centre (ROLACC) with University of Sussex	Public
Oryx Universal College with Liverpool John Moores University	Private	Qatar Leadership Center	Public
Lusail University	Private	Ras Laffan College for Emergency and Safety with University of Central Lancashire	Public
Indian State University Savitribai Phule Pune	Private	Georgetown University in Qatar	A
Qatar University	Public	Northwestern University in Qatar	A
Hamad bin Khalifa University	Public	Virginia Commonwealth University School of the Arts in Qatar	A
Community College of Qatar	Public	Texas A&M University in Qatar	A
Qatar Aeronautical Academy	Public	Carnegie Mellon University Qatar	A
Ahmed Bin Mohamad Military College	Public	HEC Paris in Qatar	A
Al Zaeem Mohammed Bin Abdullah Al Attiya Air Academy	Public	Weill Cornell Medicine-Qatar	A
Joaan bin Jassim Joint Command and Staff College	Public	University College London in Qatar	A

A: Higher Educational Institutions affiliated with Qatar Foundation for Education, Science and Community Development

2 Qatar Expansion

Qatar National Vision 2030 was unveiled as a strategy for the country's development. Its goal is to advance Qatar by coordinating the country's human and natural assets in a way that fosters economic growth. To ensure that the next few decades of development in Qatar are inclusive and beneficial for all citizens and residents of the country, this vision will serve as a guide for the country's economic, social, human, and environmental development. Qatar's economy is expanding, and the quarterly GDP at current prices for the third quarter of 2021 is QR 176,225 billion (Authority, 2021). This represents an increase of 40.6% compared to the estimate of QR 125,336 billion for the third quarter of 2020. The construction industry is the second source of growth in non-hydrocarbon activities, with a quarterly GDP at Q3 2021 prices of \$22,923 billion, representing a 31.5% increase over 2020. As

a component of human development, Qatar aims to attain a world-class educational system that equips citizens to realize their aspirations and meet the needs of Qatar’s society. According to Qatar’s Planning and Statistics Authority (2020), out of 222,701 buildings in Qatar, 745 are educational buildings. Campus facility management must be equipped with the most current research and practical experience in order to accommodate the growth of the Qatari construction industry.

3 Campus Facility Management Performance Model

Using a three-step research design, a framework with specific measures is created, investigated, and tested. An extensive literature review and five field expert interviews were used to identify 45 factors classified into seven process groups. In the second step, an online questionnaire was distributed to approximately 1,400 FM experts to rank the CFM key success factors and factor groups; 402 responses were obtained and analyzed. The model has been validated through real-world case studies, and the findings show that the proposed framework can be applied to quantify the performance of a wide variety of campuses.

The proposed framework was built on a 1) extensive review for the relevant literature on effective and successful campus facility management, 2) critical success factors for campus facility management, and 3) strategies to prevent poor campus facility management. As shown in Appendix I, the proposed framework included seven CFM process groups and forty-five key factors affecting the performance of campus facility management. The Group Performance Index and CFMPI were computed using the standard factor loading as weighted scores, similar to the procedure used by Gunduz et al. (2016), and the within-group measure weights are presented in Appendix I. The CFMPI index is computed using Equation 1, where X_j is the within-group weight and P_j is the sum of performance measures in each process group:

$$CFMPI_j = \sum X_j P_j \quad (1)$$

4 Research Methodology

A “case studies” research methodology was used in the study. Six campuses are chosen at random from among Qatar’s 31 campuses based on their sector type. Facility management specialists from each of the selected campuses completed performance evaluation forms, which were then input into the CFMPF model to quantify CFM performance. The findings are then discussed, and a conclusion is reached.

5 Framework Implementation

5.1 Selected Campuses

The CFMPF was used to evaluate CFM performance across six campuses in Qatar. CFM experts (minimum of 10 years of facility management experience) completed the assessment forms on a scale of 0 to 100, with a blank assessment for any inapplicable factors. The sizes of the campuses vary, which affects their level of manageability; however, the specific campuses names will not be revealed in order to maintain confidentiality.

5.2 Results

Table 2 demonstrates the results of the campus facility management performance index (CFMPI) for the six campuses and the Group Performance Index (GPI) for the seven process groups. The calculated CFMPI for Campus 1 is 88.42%. Quantifying the levels of performance reveals that PG4 - Organizational Management has the highest performance (GPI = 93%) for campus 1. There are no discernible differences between the different GPIs. CFMPI is calculated to be 81.11% for campus number two. PG1-Workforce

Management and PG2-Assets Management have the highest performance with GPIs of 90%, while PG5-Financial Management has the lowest performance (GPI = 67%). For campus number three, the CFMPI is calculated to be 81.57 percent, and the highest GPIs are for Sustainability and Environmental Management (90 percent). In contrast, PG2-Communications Management and PG3-Systems Management have GPIs of 75% and 76%, respectively, making them the least effective process groups. Only minor significant differences exist between groups. CFMPI is calculated to be 88.49% for campus 4. The process groups with the highest performance are PG5-Financial Management and PG6-Sustainability and Environmental Management. The group with the poorest performance is PG5-Organizational Management (79% GPI). For campus #5, the CFMPI is 86.86, and the top performing process groups are PG6-Sustainability and Environmental Management and PG5-Financial Management, with a GPI of 76% for both PG3-Systems Management and PG4-Organizational Management. The CFMPI for campus number 6 is 88.30%. PG7-Assets Management, PG3-Systems Management, and PG5-Financial Management are the process groups with the highest performance.

Table 2: CFMPI and GPI for Campuses 1 to 6

Process Group	Factor Loading	Relative Weight	GPI of Each Campus						Average GPI
			Campus 1	Campus 2	Campus 3	Campus 4	Campus 5	Campus 6	
PG 1	0.840	0.143	87	90	85	90	86	82	86.8
PG 2	0.840	0.143	85	85	75	91	90	84	85.1
PG 3	0.826	0.141	91	79	76	80	76	98	83.2
PG 4	0.820	0.140	93	69	81	79	76	80	79.5
PG 5	0.870	0.148	91	67	79	95	93	91	86.0
PG 6	0.841	0.143	85	88	90	94	100	90	91.2
PG 7	0.834	0.142	87	90	85	90	87	93	88.7
Sum	5.871	1.00	CFMPI						
			88.42	81.11	81.57	88.49	86.86	88.30	85.8

5.3 Discussion of Results

The CFMPI benchmarking value for the six campuses is 85.8%, as depicted in Figure 2. The result indicates that campus #1 has the highest determined CFMPI, at 88.42%, while campus #2 has the lowest, at 81.11 %. The CFMPI values for campuses 1, 4, 5, and 6 are higher than the benchmark value. The CFMPI of campuses 2 and 3 deviates from the benchmark value; consequently, the managements of the last-mentioned campuses are advised to focus on enhancing the weak performing process groups in order to boost the firm’s performance. In addition, the significant differences between campuses necessitate the identification of the campus team’s performance across the various groups. The model has demonstrated that it can be utilized in practice to evaluate the performance of campus facility management in order to identify pitfalls and strengthen weaknesses.

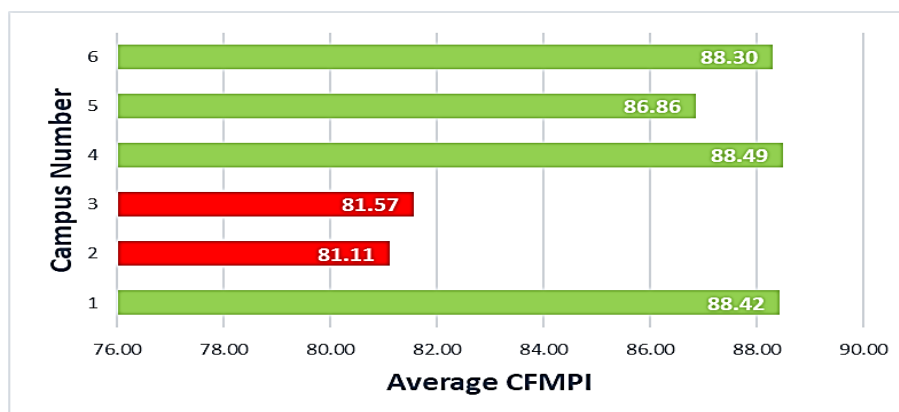


Fig. 1: Calculated CFMPI for campuses # 1 to 6

With respect to the process groups' levels depicted in Figure 3, it is important to note that all process groups, with the exception of PG4, exhibit a higher than average GPI, with PG6 – Sustainability and environmental management being the highest performing group (GPI=91.2%) and PG7–Assets Management being the second highest performing group (GPI=90.9%). This describes Qatar's significant shift toward environmentally friendly and sustainable building facilities. PG3–Organizational management, on the other hand, is slightly below the benchmark but within a 6% range. Therefore, it could be argued that the top management should examine the organizational management factors proposed by the present framework more closely in order to improve the management of campus facilities. According to the performance rating scale, it is possible to conclude that group performance indicators on the studied campuses are in good standing.

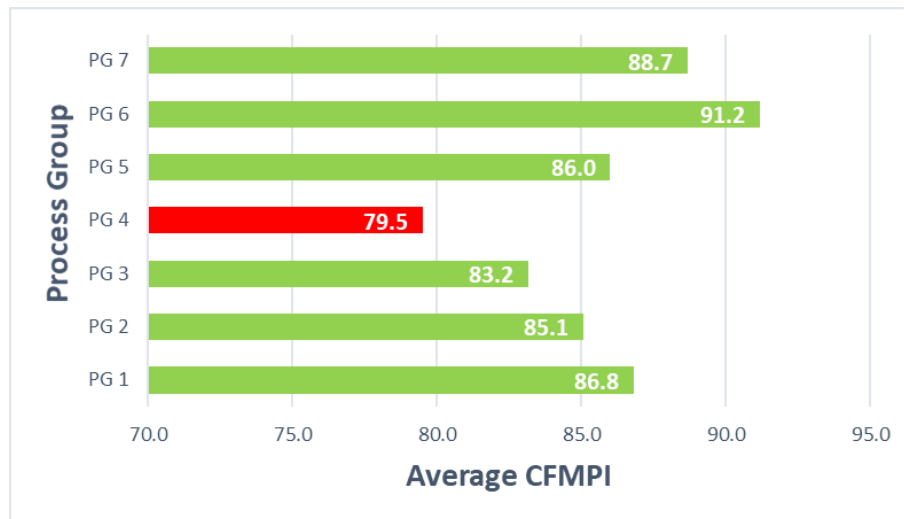


Fig. 2: Performance index for process groups

6 Conclusion

This research shows how the CFMPM can be used by industry experts to determine the overall CFM Performance Index (CFMPI) for campuses of all sizes and sectors. Using data from six campuses in Qatar, the practical application of CFMPM is illustrated. The case study's findings showed how the CFMPM implementation can be used to gauge the actual performance levels of different process groups and how they deviate from the facility management's projected performance. The benchmarking value for the CFMPII (85.8%) indicates that the average CFM performance across the six campuses is satisfactory. Additionally, the performance of CFM process groups is satisfactory with the exception of a few areas that require improvement. The proposed framework of the study can be used by universities of varying sizes by just adjusting the weighting of the factors according to the priorities of different administrations.

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Appendix I: Campus Facility Management Framework

Campus Facility Management Framework	
<p>PG1 - Campus Facility Work Force Management (0.1431)</p> <p>PG01.01 - A collaborative and integrated team of professionals on the campus facility (0.1216) (0.1216) PG01.02 - Recruiting a team of exceptional individuals with extensive qualifications and expertise (0.1119) PG01.03 - Development and implementation of ongoing training initiatives (0.1126) PG01.04 - Regular team performance monitoring and assessment (0.1108) PG01.05 - Allocating appropriate personnel to oversee and maintain campus facilities (0.1101) PG01.06 - Utilizing the transformational leadership approach to effectively managing the teams (0.1114) PG01.07 - Timely communication of updates regarding job roles and responsibilities (0.1054) PG01.08 - Implementing incentive programs to enhance motivation among the campus facility team (0.1096) PG01.09 - Developing a flexible attendance system for the campus facility team (0.1066)</p>	<p>PG4 - Campus Facility Organizational Management (0.1397)</p> <p>PG04.01 - Synchronization of facility management objectives and plans with the overall organizational strategy (0.1276) PG04.02 - Conducting regular external and internal audits to assess the efficiency of campus facility management operational processes (0.1266) PG04.03 - Possessing an agile management framework capable of seamlessly adjusting to evolving external conditions (0.125) PG04.04 - Engaging the stakeholders (the faculty, staff, students, visitors, etc.) in decision making process (0.1217) PG04.05 - Choosing capable facility management contractors for subcontracting purposes (0.1247) PG04.06 - Analyzing the cost-effectiveness of purchasing or leasing necessary assets (0.1249) PG04.07 - Implementing protocols to ensure that all stakeholders, including faculty, staff, students, and contractors, are fully dedicated to the sustainable management of the facilities (0.1243) PG04.08 - Implementing a system for process improvement through the utilization of lessons learned registers (0.1251)</p>
<p>PG2 - Campus Facility Communication Management (0.1431)</p> <p>PG02.01 - Formulating an effective communication management strategy inclusive of evaluating communication requirements, selecting appropriate technology, and determining suitable methods and tools. (0.1703) PG02.02 - Continuous engagement of senior management personnel is essential for effective facility management (0.1541) PG02.03 - Timely and effective handling of communications from various stakeholders including faculty, staff, students, contractors, and others (0.1731) PG02.04 - Engaging in scheduled stakeholder meetings to effectively address concerns (0.1671) PG02.05 - Up to date registers/logs including stakeholders register (the faculty, staff, students, contractors, etc.) , issues log, inventory list, etc. (0.1670) PG02.06 - Utilizing appropriate software for effective communication management (0.1684)</p>	<p>PG5 - Campus Facility Financial Management (0.1482)</p> <p>PG05.01 - Implementing the value engineering framework as part of service delivery (0.3307) PG05.02 - Implementing lifecycle cost analysis (LCCA) as a pre-requisite for asset procurement (0.3237) PG05.03 - Establishing effective financial management system (0.3457)</p>
<p>PG3 - Campus Facility Systems Management (0.1407)</p> <p>PG03.01 - Establishing an independent quality control and quality assurance system (0.1104) PG03.02 - Establishing an effective health, safety and security management system (0.1185) PG03.03 - implementation of an efficient workflow system for campus facility services, aiming to enhance operational effectiveness (0.1093) PG03.04 - Establishing effective procurement management system (0.1075) PG03.05 - Implementing decision making techniques for campus facility management (0.1070) PG03.06 - Executing efficient strategies for operational risk management (0.1151) PG03.07 - Implementing a proactive maintenance initiative (0.1128) PG03.08 - Establishing a digital document tracking system (0.1076) PG03.09 - Formulating and implementing contingency strategies and financial plans to address unexpected events (0.1117)</p>	<p>PG6 - Campus Sustainability & Environment Management (0.1432)</p> <p>PG06.01 - Implementing sustainable development concepts and principles in establishing the strategic direction, purpose, targets, and aims of the facilities (0.1641) PG06.02 - Implementation of a waste management strategy integrating sustainable waste collection methods, efficient transportation practices, and the promotion of reuse and recycling initiatives (0.1678) PG06.03 - Using water saving technologies in serving the campus facilities (0.1705) PG06.04 - Using noise reduction/control methods during maintenance works (0.171) PG06.05 - Implementing sustainable energy practices to power the campus facilities, such as utilizing photovoltaic systems and ground source heat pumps. (0.1625) PG06.06 - Establishing environmental impact management system (0.164)</p>
	<p>PG7 - Assets Management (0.142)</p> <p>PG07.01 - Ensuring the acquisition of materials of superior quality and long-lasting durability (0.2605) PG07.02 - Utilizing contemporary technologies such as Building Information Modeling (BIM), Computer-Aided Facility Management (CAFM), Computerized Maintenance Management Systems (CMMS) in order to effectively manage the facilities (0.251) PG07.03 - Implementing a reliability-centered maintenance (RCM) approach to optimize equipment maintenance efficiency (0.2415) PG07.04 - Establishing a resource management system (0.247)</p>

Appendix II: Survey Sample

Subject: Invitation to Participate in a Research Validation Process - Campus Facility Management.

Dear Madam/Sir,

It is our pleasure to invite you to take part in the validation process of a newly developed Campus Facility Management model as part of a conference paper titled: "**Practical Implementation of Campus Facility Management Performance Model in Qatari Campuses.**" Your responses and information gathered for this study will be kept strictly confidential and used for academic research purposes only.

As a practitioner with extensive experience in the facility management industry, you are the ideal expert to offer us your insightful ratings and assessments for what you think it is the actual performance of your campus facility management firm. Please rate your firm's degree of compliance with each of the below 45 factors and 7 process groups based on your own opinion using the scale provided.

Please scroll down and insert your ratings for the degree of compliance as per the following scale:

1 = Totally noncompliant
4 = Very complied

2 = Slightly complied
5 = 100% complied

3 = Moderately complied

Group 1: Campus Facility Workforce Management

SN	Factor	Degree of Compliance	Comments/Feedback
PG1-01	Building of a multidisciplinary and cohesive campus facility team		
PG1-02	Hiring highly qualified and experienced campus facility team		
PG1-03	Establishing continuous training program with the most updated campus FM practices		
PG1-04	Regular campus facility team performance monitoring and assessment		
PG1-05	Assigning reasonable numbers of workforce to operate and manage campus facilities		
PG1-06	Employing the transformational (open to reform and adapting policies) leadership style for managing the campus facility teams		
PG1-07	Regular update of roles and responsibilities		

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