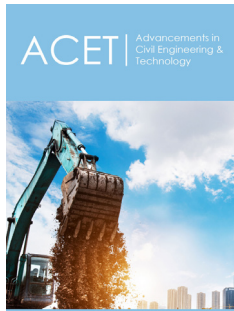


Enhancing Facility Management through Performance Contracts: A Case Study of King Khalid International Airport

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Abstract

Facility management is crucial for ensuring efficient and effective operation of airports. Performance contracting is one approach that has been used to improve facility management in various industries. This study aims to explore the effectiveness of performance contracting in enhancing facility management at King Khalid International Airport (KKIA) in Saudi Arabia. The investigation was carried out by conducting a case study at the airport, collecting data from various stakeholders and analyzing the findings. The study found that performance contracting had a positive impact on various aspects of facility management at KKIA, including maintenance, energy efficiency and cost savings. The results suggest that performance contracting can be an effective tool for improving facility management at airports.

Keywords: Facility management; Total facility management; Airports; King Khalid international airport; Performance contracts; KPIs; Key performance indicators

Introduction


With the growing urbanization (with an elevated demand for transportation services) and technological advancements in building components and equipment, airports are facing increasing pressure to provide wider and diverse transportation services to a growing number of passengers [1]. The deterioration rate of airport facilities is typically higher than other buildings, compounded by the fact that these facilities provide essential services and are occupied and in use 24 ha day, all year round [2]. Over the years, there has been a growing focus on improving maintenance management practices in airports, mainly through establishing maintenance strategies, conducting performance measurements, and employing information technology (IT), to address maintenance cost, schedules and performance targets of airports [3].

To address these challenges, improving maintenance management practices in airports is essential [4,5]. This article presents a case study of King Khalid International Airport's (KKIA) Total Facility Management (TFM) service, which covers property, financial, human resources, health, safety, security, environmental, risk and change management across the supply chain [1].

The KKIA's TFM approach aims to drive value through improved service, reduced costs and well-managed risks. It seeks to attain international standards in safety, quality, environment, energy, facility and asset management, provide clear accountability and a single point of contact for TFM, reduce work duplication and service interruptions, enhance resilience and business continuity and provide clear Service Level Agreements (SLAs) and enhanced performance using Key Performance Indicators (KPIs) [2,6,7]. The performance specification of the facility management system seeks to clearly define the scope of services and establish

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a framework to achieve a fully integrated TFM solution across the airport site [7,8]. On another hand Facility management is a critical aspect of airport operations, as it plays a significant role in ensuring the efficient and effective functioning of various airport facilities. In recent years, there has been a growing interest in using performance contracting as a tool to enhance facility management [8-10]. Performance contracting involves the use of contractual agreements between facility managers and contractors to ensure that specific performance targets are met [7,11].

KKIA in Saudi Arabia is a large and busy airport that serves as a major hub for air traffic in the region. Given its importance, KKIA has invested heavily in facility management over the years. However, there is still room for improvement, and performance contracting has been proposed as a potential solution. This study aims to investigate the effectiveness of performance contracting in enhancing facility management at KKIA.

Methodology of Investigation

This study is a case study of King Khalid International Airport's (KKIA) Total Facility Management (TFM) service. The study analyzed the KKIA's TFM approach, which aims to drive value through improved service, reduced costs, and well-managed risks. The study examined the KKIA's performance specification of the Facility Management System, which seeks to clearly define the scope of services and establish a framework to achieve a fully integrated TFM solution across the airport site. Data was collected through various methods, including interviews with airport management, contractors, and other stakeholders, as well as a review of relevant documents and records. The data collected was analyzed using qualitative methods to identify themes and patterns related to the effectiveness of performance contracting at KKIA.

Outcomes of Investigation

The Contracting Authority, King Khalid International Airport, sought to provide a Total Facility Management Service that can deliver high-quality services that meet international standards. The Service Provider must manage complex facilities sustainably across their entire lifecycle, creating an exceptional airport experience for airlines, passengers, operations and business partners. To achieve their goals, the Contracting Authority is transitioning from its current operating model of delivering facilities management services to a consolidated model that delivers Total Facility Management TFM across four location packages. A Facilities Management Managing Agent (FMMA) is being sourced to support the Contracting Authority in delivering its Facility Management FM transformation and strategic goals.

The KKIA's TFM approach seeks to attain international standards in safety, quality, environment, energy, facility and asset management. The approach provides clear accountability and a single point of contact for TFM, reduces work duplication and service interruptions, enhances resilience and business continuity and provides clear SLAs and enhanced performance using KPIs. The performance specification of the Facility Management System seeks to clearly define the scope of services and establish a framework

to achieve a fully integrated TFM, to ensure that the performance monitoring system is effective, the Contracting Authority should also establish a governance structure that will oversee the TFM provider's performance.

The governance structure should include a contract management team that will manage the SLAs, KPIs and performance monitoring system. The team should also be responsible for reviewing and approving the TFM provider's performance reports, identifying areas for improvement, and developing action plans to address any deficiencies.

In conclusion, the increasing complexity of airports facilities requires a comprehensive approach to facility management that ensures the efficient and sustainable operation of airport facilities. Performance contracts have been shown to be an effective tool for enhancing facility management practices in airports, enabling the establishment of maintenance strategies, conducting performance measurements and employing information technology. The case study of King Khalid International Airport illustrates how Total Facility Management Services can be used to provide high-quality services that meet international standards, covering property, financial, human resources, health, safety, security, environmental, risk and change management across the supply chain. The Performance Management System overview and key objectives, as well as the Performance Monitoring System, provide a framework for ensuring that TFM providers deliver world-class services and continuously improve their performance.

The use of performance contracts in facility management has been shown to have various benefits, including increased efficiency, improved service quality, reduced costs and enhanced risk management. This article presents a case study of the King Khalid International Airport in Saudi Arabia, which is seeking to enhance its facility management through performance contracts. The airport is seeking to provide total facility management services that can deliver high-quality services that meet international standards. The service provider is responsible for considering all elements of the total facilities management requirements and using its best judgment to determine the necessary resources and approach to meet the required standard of services.

To achieve its goals, the contracting authority is transitioning from its current operating model of delivering facility management services to a consolidated model that delivers total facility management across four location packages. A facilities management managing agent is being sourced to support the contracting authority in delivering its facility management transformation and strategic goals. The new approach aims to drive value through improved service, reduced costs and well-managed risks. It seeks to attain international standards in safety, quality, environment, energy, facility and asset management, provide clear accountability and a single point of contact for total facility management, reduce work duplication and service interruptions, enhance resilience and business continuity and provide clear SLAs and enhanced performance using KPIs.

The performance management system used by the contracting authority involves an incentivized performance mechanism for operational service costs. This mechanism involves a fixed percentage figure of the operational costs as the contractor’s fee, which the service provider is required to place within the performance mechanism against performance risk. The performance mechanism includes KPIs and SLAs that are intended to be pragmatic and flexible, allowing the service provider to operate while ensuring that performance in certain operational facilities is sufficiently important to warrant fees being withheld if obligations are not met.

The service delivery plan is the tool used to measure performance and ensure that the key objectives of the total facility management service provider are being achieved. The SLAs are the fundamental requirements that the provider must deliver to demonstrate efficient execution of the contract and the manner in which services are delivered. These requirements are grouped into three main sections, namely mandatory compliance, standards and contract performance. The KPIs, on the other hand, are the outputs of the service provider’s endeavors and generally reflect asset

performance, availability, workflow management, presentation of the facility, cleanliness, hygiene and waste management.

The performance monitoring system is designed to ensure that all elements of the service delivery plan are fully met and that daily, weekly, monthly, quarterly and annual deliverables making up the plan are measured on a monthly basis. The TFM provider will self-report their performance, which will then be checked for adherence to the service delivery plan by airport management or its nominated agent. Both assessments will take into account non-conformance reports that exist and remain ‘live’ during the assessment period, with discounts given to NCR.

Tables 1-3 in appendix A show samples for Key Performance Indicators (KPI’s), Service Level Agreements (SLAs) and penalty points system. The investigation found that performance contracting had a positive impact on various aspects of facility management at KKIA. Specifically, performance contracting was found to be effective in improving maintenance operations, reducing energy consumption and generating cost savings. The following are the key outcomes of the investigation:

Table 1: Key Performance Indicators (KPI’s) – Soft FM Services (Applicable to all TFM Work Packages - Aerodrome, Terminals, Landside and Royal Terminal).

Ref. No	SFM 1	SFM 2	SFM 3	SFM 4
KRA	General Cleaning Standards	Front of House (FOH) Cleaning	Non-public / Back of House (BOH) Cleaning	Pest Control & Fumigation
KPI Description	Objective: The Service Provider will work to and maintain BICSc, or the Contracting Authority approved equivalent accreditation throughout the contract term. Service Provider operative staff will have received BICSc or equivalent training ensuring the delivery of competent cleaning skills. Training records will be retained by the Service Provider for the Contracting Authority review and approval if required. ¹ NCR per area not cleaned in accordance with the Standards.	Objective: The Service Provider shall ensure that all areas Front-of-House (FOH) are presented and maintained in a clean condition and in line with all of the standards and specifications outlined in the Soft FM Services document whilst ensuring to maintain the aesthetics of the facility. Any deviations from the required standards and specifications must be reported to the Contracting Authority. The Cleaning Services includes all planned (Preventative) and all unplanned (Reactive) events.	Objective: The Service Provider shall ensure that all areas Back-of-House (BOH) are presented and maintained in a clean condition and in line with all of the standards and specifications outlined in the Soft FM Services document whilst ensuring to maintain the aesthetics of the facility. Any deviations from the required standards and specifications must be reported to the Contracting Authority. The Cleaning Services includes all planned (Preventative) and all unplanned (Reactive) events.	Objective: Ensure that no infestation outbreaks occur. ¹ NCR to be issued for each occurrence.
Measure	Cleanliness and hygiene in accordance with the color-coded chart as presented in the soft FM services document.	The Service Provider must ensure that the cleaning requirements for General, Entrances, Exits, Corridors, Elevators, Escalators, Stairwells, Travellators, Moving Walkways, Check-in Desks, Common Areas, Toilets, Ablution Areas and Outdoor Areas as described in the Soft Services scope are upheld.	The Service Provider must ensure that the cleaning requirements for BOH Entrances, Exits, Corridors, Elevators, Escalators, Stairwells, Offices, Meeting Rooms, Break Rooms, Locker rooms, Prayer Rooms, Kitchens, Toilets & Ablution Areas as described in the Soft Services scope are upheld.	No infestation outbreaks (where pests are under control) No infestation outbreaks as a result of failure to carry out planned preventative services ^{100%} planned services completed in compliance with the program
Indicator	Cleaning in line with the British Institute of Cleaning Standards General KPIs including Compliance, Performance and Service Delivery Plan as detailed Reactive Callout KPIs as defined in the Soft Services Section	No deviations from the criteria	No deviations from the criteria	0 outbreaks per year ⁰ outbreaks as a result of failure to carry out services ^{0%} planned services missed

Points per event per review	2 per NCR	2 per NCR	1 per NCR	2 per NCR
Input sources	Cleaning schedules, registers and photographs Monthly reports	Cleaning schedules, registers and photographs Monthly reports	Cleaning schedules, registers and photographs Monthly reports	Monthly reports, customer complaints register.

Table 2: Service Level Agreement (SLA) – Standards.

SR. No	SLA Topic	Service Level Agreement (SLA)	Measure	Points Per Event Per Review	Input sources
STD 1	Safety Management Systems (ISO 45001)1	Objective: Ensure the Service Provider complies and is certified to international standards ² of Safety Management Systems. Ensure that the Contracting Authority is certified (where possible) to each of the standards the Service Provider is certified to. Ensure the Service Providers' Safety Management Systems are site-specific to KKIA and its needs.	<ul style="list-style-type: none"> Develop a comprehensive 'Health & Safety Plan' capturing a complete overview of the Service Providers initiatives and procedures to ensure the Health and Safety of all staff and airport stakeholders. Develop a Health & Safety Management system in accordance with the recognised international standards for health and safety ISO 45001:2018. Other relevant measures as identified in the reference sections and subsections 	10 (site-specific Health & Safety plan or Health & Safety Management System not available, incomplete or not approved)5 (failure to adhere to the Health & Safety Management System)10 (lapsed certification)	Health & Safety policies and procedures Health & Safety management system Health & Safety Plan Evidence of Audits (internal quarterly & external annually) Standards, procedures, schedules and records Evidence of supporting Contracting Authority to meet health and safety policy requirements
STD 2	Quality Management Systems (ISO 9001) 1	Objective: Ensure the Contracting Authority, and the Service Provider comply with international standards ² of Quality. Develop a robust, customer-centric Quality management System (TFMQMS) that complies with ISO 9001 and relevant elements within ISO 14001.	<ul style="list-style-type: none"> Evidence of the Service Provider's ability to consistently provide services that meet all relevant quality requirements Enhanced customer satisfaction Achieving effective process performance 	10 (site-specific Quality Management System not available, incomplete or not approved)5 (failure to adhere to the Quality management System)10 (lapsed certification)	Quality Management System Quality Management Documentation Quality Control Program Quality Assurance System Evidence of Audits (internal quarterly & external annually) Policies and Procedures
STD 3	Environmental management Systems (ISO 14001)1	Objective: Ensure the Contracting Authority, and the Service Provider comply with international standards ² of Environmental Management. Ensure compliance of SP's and any subcontractors' environmental management systems with the Contracting Authority's requirements and applicable national regulations including the SAEHSMS RF and any other relevant standards or policies. Ensure that waste is measured and disposed of in a responsible manner compliant with all regulations and directives Ensure responsible use of materials	<ul style="list-style-type: none"> Evidence of reduction in tax, energy & insurance bills as well as lower operating costs Evidence of efforts of the Spin following best practices and mitigation of risk related to negative Public Relations (PR) and reputational damage 	10 (site-specific Environmental Management System not available, incomplete or not approved)5 (failure to adhere to the Environmental Management System)10 (lapsed certification)	Environmental Management Plan Compliance Obligations Documents Environmental Impact Assessment Environmental Policy Risk and Opportunities Documents Emergency Preparedness and Response Evidence of Audits (internal quarterly & external annually)
STD 4	Energy Management (ISO 50001)	Objective: Ensure energy management at the KKIA campus aligns with global standards. To this end, the Service Provider shall develop an Energy Management System (EMS) generally in accordance with the recognised international standard, ISO 50001. The energy management system shall support and enable the following additional objectives: <ul style="list-style-type: none"> Improve energy performance from an initial baseline Minimize energy costs/waste without affecting operations and performance, and Minimize environmental effects. 	<p>Within the first 12 months:</p> <ul style="list-style-type: none"> A policy for more efficient use of energy Fix targets and objectives to meet the policy Energy reductions on a like for like basis Use of data to better understand and make decisions about energy use Maturity assessment & gap analysis complete Demonstrable evidence of progression towards gap closure 	5 (site-specific Energy Management System or Policy not available, incomplete or not approved)5 (failure to adhere to the Energy Management System)	Evidence of Maturity Assessment Audits (internal quarterly)

STD 5	Facilities Management Systems (ISO 41001)	Objective: Manage and maintain the Facility in a manner that supports effective Procurement, Operations, Maintenance, Catering, Technology and Energy management. To achieve these objectives, the Service Provider is expected to develop the TFM Policy, Strategy, Service Delivery Plan (TFMS-DP) and a clear set of TFM Objectives.	Within the mobilization period: • Evidence of benefits to the Contracting Authority • Timely delivery of TFM documents, policies and procedures • Maturity assessment & gap analysis complete • Demonstrable evidence of progression towards gap closure	5 (site-specific Facilities Management System not available, incomplete or not approved) 5 (failure to adhere to the Facilities Management System)	Strategy, Policy, Objectives and TFMSDP documents Evidence of Maturity Assessment Audits (internal quarterly)
STD 6	Asset Management (ISO 55001)	Objective: enable the organization to maximize value from its assets and deliver its strategic objectives by managing the facilities assets over their whole life cycle. The Service Provider must develop an Asset Management System (AMS) in accordance with ISO 55001 within the first 12 months of the Contract	• AMS developed in accordance with the Contract • AMS implemented, resulting in: Optimized return on investment to Demonstrable legal & statutory compliance Improved health, safety and environmental performance across the asset portfolio	5 (site-specific Asset Management System or Policy not available, incomplete or not approved) 5 (failure to adhere to the Asset Management System)	AMS documents including: • Strategic Asset Management Plan • Asset Management Policy • Asset Management Maturity Assessment (gap analysis to achieve ISO 55001 certification) • Asset Life Cycle Delivery Plan (including acquire, operate, maintain and asset disposal) • Asset Information Management System Evidence of Maturity Assessment Audits (internal quarterly)

Table 3: Weighted penalty points system.

Points	Penalties per point (SAR)	Minimum (SAR)	Maximum (SAR)
1-10	0	-	-
11-20	1,000	1,000	10,000
21-30	2,000	12,000	32,000
31-40	3,000	35,000	65,000
41-50	4,000	69,000	109,000
51 and over	5,000	114,000	10% of Contract value

A. Maintenance operations: Performance contracting helped to improve maintenance operations at KKIA by setting clear performance targets for contractors and ensuring that they were met. This led to a reduction in maintenance costs and improved reliability of airport facilities.

B. Energy efficiency: Performance contracting also helped to reduce energy consumption at KKIA by encouraging contractors to adopt energy-efficient practices. This led to a significant reduction in energy costs and a more sustainable operation.

C. Cost savings: Finally, performance contracting was found to generate cost savings at KKIA. This was achieved by setting performance targets that incentivized contractors to reduce costs and improve efficiency.

Conclusion

The investigation revealed that performance contracting is an effective means of improving facility management at airports. Through the case study conducted at King Khalid International Airport, it was evident that performance contracting led to enhancements in maintenance operations, cost savings and

reduction in energy consumption. The findings indicate that airports can benefit from adopting performance contracting as a strategy for enhancing facility management. By doing so, airports can deliver high-quality services that meet global standards, while also reducing costs and improving risk management. It is important to establish clear SLAs and KPIs to ensure efficient execution of the contract and the delivery of high-quality services. The case study of KKIA in Saudi Arabia highlights the advantages of this approach.

Author Contributions

A.E.M: The main idea of the paper. A.E.M. and M.E.M: Writing preparation part and interpretation of its data analysis. A.E.M. and M.E.M: Interpretation of application, paper writing and paper revision. A.E.M. and M.E.M: Review and editing. "Conceptualization, A.E.M: Methodology, A.E.M: Software, A.E.M and M.E.M: Validation, A.E.M. and M.E.M: Formal analysis, A.E.M. and M.E.M: Investigation, A.E.M. and M.E.M: Resources, A.E.M. and M.E.M: Data curation, A.E.M. and M.E.M: Writing-original draft preparation, A.E.M. and M.E.M: writing-review and editing, A.E.M. and M.E.M: Visualization, A.E.M. and M.E.M: Supervision. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors state that they do not have any conflicts.

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