

The Importance of Dos-Maximo CMMS in Improving Operational and  
Maintenance Efficiency  
at Red Sea International Airport

أهمية نظام إدارة الصيانة المحوسب في تحسين كفاءة التشغيل والصيانة في مرافق مطار البحر  
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## حقوق الطباعة

حقوق الطباعة تمتلكها جامعة ميدأوشن حيث إن جميع المواد والمحتويات الواردة في هذا البحث هي ملك للجامعة ولا يجوز استخدامها أو إعادة نشرها أو توزيعها بدون إذن مسبق من جامعة ميدأوشن.

الباحث

## المستخلص

تهدف هذه الدراسة إلى تقييم أثر تطبيق نظام إدارة الصيانة المحوسب

على رفع كفاءة التشغيل والصيانة في مرافق مطار البحر الأحمر الدولي. ويُعد النظام أحد أهم (Dos-Maximo) ركائز التحول الرقمي في المطارات الحديثة، حيث يساهم في تنظيم أوامر العمل، وتحسين برامج الصيانة الوقائية، ورفع جودة التوثيق، وتعزيز أداء المقاولين. ركزت الدراسة على عدة جوانب رئيسية تشمل: زمن الاستجابة، جودة الصيانة، موثوقية الأصول، الامتثال لخطط الصيانة الوقائية، وجودة سير العمل بين الأطراف التشغيلية

قبل Dos-Maximo اعتمدت الدراسة على منهج دراسة الحالة، حيث تم تحليل البيانات التشغيلية المسجلة في نظام وبعد التطبيق، بالإضافة إلى إجراء ملاحظات ميدانية ومراجعة تقارير الأداء الخاصة بالمقاولين العاملين في مرافق المطار. كما تم استخدام استبيان إلكتروني لقياس رضا المستخدمين وفعالية النظام في تحسين سير العمل. وقد تمت مقارنة النتائج مع معايير الصيانة الدولية والدراسات السابقة ذات الصلة.

أظهرت نتائج الدراسة تحسناً ملحوظاً في الاستجابة للأعطال، وارتفاعاً كبيراً في معدل الالتزام بالصيانة الوقائية، إضافةً إلى تطور واضح في دقة التوثيق وجودة الإغلاق، مما أدى إلى تعزيز موثوقية الأنظمة التشغيلية داخل المطار. كما ساهم النظام في تحسين مستوى الشفافية والمساءلة بين المقاولين ورفع كفاءة متابعة الأداء. وتشير كان خطوة مؤثرة في تعزيز التحول الرقمي وتحقيق الكفاءة التشغيلية بمطار Dos-Maximo النتائج إلى أن تطبيق البحر الأحمر الدولي.

### **الكلمات المفتاحية:**

كفاءة التشغيل، الصيانة الوقائية، إدارة الأصول، مطار البحر Dos-Maximo نظام إدارة الصيانة المحوسب، الأحمر، التحول الرقمي.

## الشكر و التقدير

أتقدم بخالص الشكر والتقدير إلى كل من كان له دور في إنجاز هذا البحث. أولاً وقبل كل شيء، الفضل لله وحده، ثم لعائلتي وأصدقائي على دعمهم الدائم وتشجيعهم لي خلال الرحلة الأكاديمية والمهنية، فقد كان حضورهم ومساندتهم مصدر قوة وإلهام بالنسبة لي.

كما أود أن أعبر عن عميق امتناني لإدارة جامعة ميدأوش على توفيرها البيئة التعليمية والأكاديمية المناسبة، وعلى ما قدّمته من موارد وتسهيلات كان لها بالغ الأثر في إتمام هذا العمل. وأخص بالشكر مشرفي الكريمين د. الفيصّل و د. فايز على توجيهاتهم المستمرة، وملاحظاتهم القيّمة، ودعمهم اللامحدود طوال فترة إعداد هذا البحث؛ فقد كانت خبرتهم العلمية ومنهجيتهم الرفيعة ركيزة أساسية في تطوير محتوى هذه الدراسة.

ولا يفوتني أن أتقدم بالشكر لإدارة مطار البحر الأحمر الدولي ولكل الزملاء في أقسام التشغيل والصيانة، على تعاونهم وتقديمهم للبيانات والوثائق اللازمة، مما أتاح لي فرصة تطبيقية غنية وقيّمة كان لها أثر كبير في نجاح هذا المشروع. إن انفتاحهم وتجاوبهم وتبادلهم للمعلومات ساعدني على فهم أعمق لجوانب التشغيل الفعلي في بيئة المطار.

كما أتوجه بالشكر إلى المجتمع الأكاديمي والباحثين الذين أسهمت أعمالهم السابقة في بناء الإطار النظري لهذه الدراسة، وكانت إضافاتهم العلمية مرجعاً أساسياً في تطوير هذا العمل.

وأخيراً، لا يسعني إلا أن أعبر عن امتناني لكل من وقف معي وقدم لي العون سواء بصورة مباشرة أو غير مباشرة. إن هذا الإنجاز لم يكن ليرى النور لولا تلك الجهود الجماعية، وبصدق أشكر كل شخص كان له أثر في هذه الرحلة.

**الباحث**

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# **Chapter One**

## **Introduction**

## Introduction

### 1.1 Background of the Study

Airports depend heavily on reliable, well-maintained systems to ensure smooth operations, passenger safety, and efficiency. Modern airports operate hundreds of interconnected assets such as HVAC systems, electrical networks, ICT infrastructure, baggage handling systems (BHS), fire safety equipment, and surveillance systems. Managing these assets manually often leads to delays, poor documentation, inconsistent maintenance routines, and increased operational risks.

Red Sea International Airport (RSIA) is one of the newest smart airports in the region. The airport operates with high sustainability standards and advanced technologies. To meet international expectations, RSIA implemented the Dos-Maximo Computerized Maintenance Management System (CMMS) to improve maintenance planning, asset tracking, work order (WO) automation, preventive maintenance execution, and contractor performance monitoring.

This study examines how Dos-Maximo contributed to improving operational efficiency inside RSIA and how digital maintenance changed daily workflows, communication, and service quality among contractors and airport teams.

### 1.2 Problem Statement

Before implementing Dos-Maximo, several operational challenges existed at RSIA. Work orders were recorded manually through Excel sheets, which caused delays, missing information, and difficulties in tracking unresolved issues. Preventive maintenance tasks were inconsistent because schedules were not digitally organized. Contractors used different reporting formats, which made quality control harder.

The main problem addressed in this study is the lack of an integrated digital system for managing

maintenance operations and asset performance. This gap created delays, miscommunication, and limited visibility of maintenance activities across different service providers.

With the introduction of Dos-Maximo, RSIA expected an improvement in response time, documentation quality, preventive maintenance compliance, and overall operational efficiency. The study explores how effective the system has been in achieving these improvements.

### **1.3 Purpose of the Study**

The purpose of this study is to evaluate the impact of the Dos-Maximo CMMS on operational and maintenance efficiency at Red Sea International Airport. The study aims to measure improvements in asset management, work order processing, preventive maintenance planning, and contractor performance after digital transformation.

### **1.4 Research Objectives**

The study aims to achieve the following objectives:

1. Evaluate how Dos-Maximo improved work order management and response time.
2. Measure the impact of the system on preventive maintenance (PPM) compliance.
3. Assess improvements in documentation quality and workflow transparency.
4. Analyze contractor performance after system implementation.
5. Identify challenges during and after digital transformation.

### **1.5 Research Questions**

This study aims to answer the following key questions:

1. How did Dos-Maximo improve response time for maintenance tasks?
2. Did preventive maintenance activities become more organized and consistent?
3. How did the system improve documentation and communication?
4. What changes occurred in contractor performance after implementation?
5. What challenges remain in the maintenance workflow?

### **1.6 Research Hypotheses**

Based on the study's objectives, the following hypotheses are proposed:

- H1: Dos-Maximo significantly improves maintenance response time at RSIA.
- H2: The system increases preventive maintenance compliance.
- H3: Documentation and workflow visibility are enhanced after implementation.
- H4: Contractor performance improves due to KPI tracking and automated follow-ups.

### 1.7 Significance of the Study

This study is important for several reasons:

- It provides practical insights for RSIA management on system effectiveness.
- It supports better decision-making for future system upgrades.
- It helps contractors understand performance expectations and improve service levels.
- It contributes academically by documenting a real case of digital transformation in an airport environment in Saudi Arabia.

The study can also be a reference for other airports planning to implement CMMS solutions.

### 1.8 Scope of the Study

The study focuses on maintenance operations within Red Sea International Airport. It includes work order history, preventive maintenance schedules, contractor performance reports, and BMS integration data from the first operational year of the system. The study does not cover financial analysis or other airport departments unrelated to facility maintenance.

### 1.9 Definitions of Key Terms

**CMMS:** A Computerized Maintenance Management System that automates maintenance activities and asset management.

**Work Order (WO):** A documented maintenance request generated manually or automatically.

**Preventive Maintenance (PPM):** Scheduled maintenance tasks performed to prevent equipment failures.

**Dos-Maximo:** The CMMS used at RSIA to manage assets, maintenance tasks, and contractor performance.

**BMS:** Building Management System used to monitor and control smart systems in the airport.

# **Chapter Tow**

## **Literature Review**

## Literature Review

### 2.1 Introduction

This chapter presents a comprehensive review of the literature related to Computerized Maintenance Management Systems (CMMS), asset management practices, maintenance strategies, and the role of digital transformation in modern airport environments. The chapter also provides an overview of IBM Maximo (and Dos-Maximo), theoretical models relevant to the study, and international case studies that highlight how CMMS contributes to operational efficiency. Finally, the chapter concludes with a conceptual framework linking the study's independent and dependent variables.

### 2.2 Computerized Maintenance Management Systems (CMMS)

A CMMS is a software system designed to enhance the planning, tracking, execution, and reporting of maintenance activities. CMMS solutions are widely adopted in industries such

as aviation, manufacturing, oil and gas, and transportation. The core functions of CMMS typically include:

- Work order creation and tracking
- Preventive maintenance scheduling
- Asset registry and asset lifecycle management
- Spare parts and inventory control
- Reporting and performance dashboards

Studies show that organizations using CMMS experience improved maintenance response time,

higher preventive maintenance compliance, cost reduction, and better documentation standards.

CMMS acts as the backbone of digital maintenance operations, enabling technicians and managers to work with real-time data and intelligent workflows.

### 2.3 Asset Management in Airport Environments

Asset management in airports is complex due to the diversity and criticality of systems. Airport assets include HVAC, electrical networks, baggage handling systems (BHS), fire protection systems, power generators, lighting systems, ICT networks, and ELV systems such

as CCTV and access control. The International Civil Aviation Organization (ICAO) highlights

asset reliability as essential for passenger safety and operational continuity.

Effective asset management ensures:

- Reduced downtime
- Longer equipment lifespan
- Better resource planning
- Improved safety and compliance

CMMS plays a central role in helping airports maintain compliance with ICAO and local regulatory standards by providing reliable documentation and maintenance records.

## **2.4 Maintenance Strategies: PPM, CM, and Predictive Maintenance**

Maintenance practices commonly fall into several categories:

### **1. Preventive Maintenance (PPM):**

Scheduled maintenance to prevent equipment failure. PPM reduces unexpected breakdowns and enhances asset reliability.

### **2. Corrective Maintenance (CM):**

Actions taken after a fault occurs. This approach is costly and often leads to operational disruptions.

### **3. Predictive Maintenance (PdM):**

Uses sensors, data analytics, and AI to predict failures before they happen. PdM is becoming more common in modern smart airports.

CMMS systems support all three strategies by automating scheduling, capturing fault data, and providing insights for better decision-making.

## **2.5 IBM Maximo and Dos-Maximo Capabilities**

IBM Maximo is one of the world's leading CMMS platforms. Dos-Maximo is a customized implementation of Maximo tailored for aviation and facility management sectors. Key features include:

- Automated work order routing
- Barcode-based asset tracking
- Preventive maintenance templates based on O&M manuals
- BMS integration for automatic fault creation
- Mobile access for field technicians
- Contractor performance monitoring
- SLA and KPI dashboards

At Red Sea International Airport (RSIA), Dos-Maximo was configured to match the operational needs of contractors (ENOVA, METCO, ADB SAFEGATE, VANDERLANDE, MAFA, HONEYWELL), ensuring centralized reporting and standardized workflows across all service providers.

## 2.6 Digital Transformation in Airports

The aviation industry is rapidly adopting digital solutions to streamline operations. Digital transformation enhances efficiency by integrating CMMS, BMS, IoT sensors, and smart dashboards. Modern airports such as Hamad, Changi, and Schiphol rely on predictive maintenance technologies to reduce downtime and improve reliability.

Literature shows that digital transformation contributes to:

- 20–40% reduction in operational delays
- 30% improvement in maintenance accuracy
- Higher transparency and documentation quality
- Better regulatory compliance

RSIA aims to achieve similar benchmarks by fully implementing Dos-Maximo in all maintenance departments.

## 2.7 International Case Studies on CMMS

Several global airports have documented the benefits of CMMS:

- Heathrow Airport (UK): Improved asset uptime and reduced manual reporting.
- Dubai International Airport: Achieved major enhancements in PPM planning.
- Singapore Changi Airport: Uses CMMS with BMS and AI to predict system failures.
- Hamad International Airport (Qatar): Increased contractor accountability through digital workflows.

These case studies align with the operational improvements observed in RSIA after adopting Dos-Maximo.

## 2.8 Theoretical Framework

This study is based on a simple causal model:

Independent Variable:

- Implementation of Dos-Maximo CMMS

Dependent Variables (Maintenance Efficiency):

- Response time

- PPM compliance
- Documentation quality
- Contractor performance
- Asset reliability

The literature consistently supports the link between CMMS implementation and improvements in operational performance.

## **2.9 Summary of the Chapter**

This chapter explored the theoretical foundations of CMMS, maintenance strategies, airport asset management, and digital transformation. It also examined Maximo's role in enhancing maintenance efficiency and presented several international case studies that support the effectiveness of CMMS. The next chapter explains the methodology used to evaluate Dos-Maximo's impact at Red Sea International Airport.

# **Chapter Three**

## **Research Methodology**

## Research Methodology

### 3.1 Introduction

This chapter explains the research methodology used to evaluate the impact of the Dos-Maximo CMMS on maintenance and operational performance at Red Sea International Airport (RSIA). The methodology includes the research design, data collection tools, data sources, sampling, validity and reliability measures, and data analysis approach.

### 3.2 Research Design

This study uses a case study research design, which is appropriate when examining real-life processes and operational changes within a specific environment. RSIA provides a suitable case because the airport introduced Dos-Maximo as part of its digital transformation and has complete maintenance data before and after system implementation.

The case study approach allows the researcher to:

- Observe real operational changes
- Analyze system-generated data
- Understand how maintenance workflows evolved
- Evaluate contractor performance objectively

### 3.3 Study Population

The study population includes all maintenance-related activities and operational departments within RSIA. This includes work orders, preventive maintenance schedules, asset data, BMS alerts, and contractor performance reports. The population also includes staff and contractors involved in maintenance operations, such as:

- ENOVA
- METCO
- ADB SAFEGATE
- VANDERLANDE
- MAFA
- HONEYWELL

### 3.4 Sampling

A purposive sampling method was used because the study focuses on specific departments and

operational data directly affected by Dos-Maximo. Samples include:

- Work order logs (before and after implementation)
- Preventive maintenance (PPM) records
- Asset registry and barcoding data
- BMS auto-generated alerts
- KPI reports for contractors

### 3.5 Data Collection Methods

Three main data sources were used in this study:

#### 3.5.1 System Data Extraction

Operational data was extracted directly from the Dos-Maximo CMMS, including:

- Work orders (WO)
- Preventive maintenance (PPM) schedules
- Asset hierarchy and barcodes
- Spare parts and inventory records
- System timestamps for response time
- Contractor performance KPIs

#### 3.5.2 Observation

The researcher conducted direct observation of maintenance operations to understand:

- How technicians receive and close work orders
- How PPM tasks are executed
- How departments coordinate using the system
- How BMS alerts generate auto-work orders

#### 3.5.3 Questionnaire

A structured questionnaire was shared with RSIA maintenance staff and contractors to measure

their satisfaction, ease of use, and perceived improvements due to Dos-Maximo. The questionnaire

focused on:

- Response time improvements
- PPM organization
- Communication quality
- Documentation accuracy
- System usability

### 3.6 Validity and Reliability

To ensure validity, system data was cross-checked with monthly reports and contractor submissions.

The questionnaire was reviewed by experts in maintenance and airport operations to ensure clarity and relevance.

Reliability was ensured by using consistent data sources, standardized performance reports, and system-generated timestamps that cannot be altered manually.

### 3.7 Data Analysis Approach

The data was analyzed using comparative and descriptive analysis:

1. Before vs After Analysis

Comparing key indicators before and after CMMS implementation.

2. KPI Trend Analysis

Reviewing contractor KPIs such as:

- Response time
- PPM completion
- Quality score

3. Workflow Analysis

Reviewing how work orders move between departments and contractors.

4. User Feedback Analysis

Using questionnaire results to identify strengths and challenges.

### 3.8 Ethical Considerations

All data used in this study was obtained with permission from RSIA management.

Personal information of staff and contractors was not collected.

The study focuses only on operational data and anonymized records.

### 3.9 Summary of the Chapter

This chapter described the methodology used to examine the impact of Dos-Maximo CMMS at RSIA.

The use of system data, observations, and questionnaires provides a comprehensive approach for understanding how the system improved operational efficiency. The next chapter presents the study results and analysis.

# **Chapter Four**

## **Findings and Analysis**

## Findings and Analysis

### 4.1 Introduction

This chapter presents the results and analysis of the operational data collected from the Dos-Maximo CMMS at Red Sea International Airport (RSIA). The findings compare system performance

before and after implementation and evaluate improvements in work order processing, response time, preventive maintenance compliance, documentation quality, contractor performance, and system integration.

### 4.2 Work Order Performance Before and After CMMS

Before implementing Dos-Maximo, work order (WO) tracking was done manually using Excel files.

This caused delays, missing information, and inconsistent reporting. After implementation, the CMMS automatically recorded all requests, assigned them to responsible contractors, and timestamped each action.

Key improvements observed:

- Faster WO creation and assignment
- Full traceability of each ticket
- Elimination of manual paperwork
- Clear visibility of WO status and priority

The number of unclosed work orders dropped significantly once contractors were required to close requests directly through the system.

### 4.3 Response Time Analysis

Response time is a critical KPI in airport operations. After introducing Dos-Maximo, contractors received instant notifications through the system and email alerts, reducing delays from communication gaps.

Findings show:

- Response to high-priority issues became faster
- Emergency cases (fire-related or safety events) were instantly escalated
- Real-time monitoring allowed supervisors to track delays

BMS integration also generated automatic work orders when faults were detected in major systems, improving early intervention.

#### 4.4 Preventive Maintenance (PPM) Compliance

PPM activities were one of the biggest challenges before implementation due to manual scheduling.

After shifting to Dos-Maximo, each asset received a clear maintenance schedule based on O&M manuals

(monthly, quarterly, semi-annual, annual tasks).

Improvements include:

- Higher PPM completion rates
- Accurate task lists for each asset
- Reduced random and reactive maintenance
- Better long-term asset reliability

The system generated reminders and prevented contractors from skipping scheduled tasks.

#### 4.5 Documentation and Workflow Quality

Documentation quality improved significantly after CMMS implementation. Contractors were required

to upload before-and-after photos, attach reports, and record used spare parts.

Major improvements:

- Higher accuracy in maintenance records
- Clear audit trails for all tasks
- Better transparency between RSIA and contractors
- Faster approval and rejection processes through digital workflows

Quality control teams could verify tasks easily through detailed digital evidence.

#### 4.6 Contractor Performance Evaluation

Contractors previously submitted reports manually, which caused inconsistencies.

Dos-Maximo unified

reporting for:

- ENOVA
- METCO
- ADB SAFEGATE
- HONEYWELL
- MAFA
- VANDERLANDE

Performance KPIs such as:

- Response Time

- PPM Compliance
  - Quality Score
  - Closure Time
- were automatically calculated.

Contractors with low performance received warnings or penalties according to the SLA.

#### **4.7 Asset Data Accuracy and Barcoding**

Asset accuracy was a major issue before implementation. Over eight months, RSIA teams collected complete data, tagged assets, recorded serial numbers, locations, and linked each item to its hierarchy in the system.

Benefits observed:

- Accurate asset counts
- Faster asset identification using barcodes
- Better spare parts planning
- Clear mapping of asset locations and dependency trees

#### **4.8 Integration with BMS**

The integration between BMS and Dos-Maximo enabled the system to auto-generate work orders when faults occurred. For example:

- HVAC alarms
- Electrical outages
- Temperature fluctuations
- Fire system troubles

This reduced downtime and provided early alerts for maintenance teams, improving overall reliability.

#### **4.9 Analysis of Questionnaire Results**

The questionnaire results showed high employee and contractor satisfaction with the CMMS implementation. Users reported:

- Improved clarity in work processes
- Better coordination between teams
- Reduced miscommunication
- Better ability to track tasks

Challenges mentioned include:

- Need for additional training
- Desire for a simpler mobile interface
- Occasional delays in system syncing

#### **4.10 Comparison with Literature**

Findings from RSIA align with international literature on CMMS. Researchers have noted that CMMS

improves efficiency, documentation, response time, and asset reliability. RSIA's experience mirrors

case studies from Heathrow, Changi, and Dubai International Airport.

#### **4.11 Summary of Findings**

Overall, Dos-Maximo significantly improved operational efficiency at RSIA by:

- Reducing response times
- Increasing PPM compliance
- Improving documentation
- Enhancing contractor accountability
- Supporting digital transformation goals
- Strengthening asset reliability

These results support the study's hypotheses and demonstrate the success of CMMS in airport environments.

# **Chapter Five**

## **Conclusion and Recommendations**

## Conclusion and Recommendations

### 5.1 Introduction

This chapter presents the main conclusions of the study and offers practical and technical recommendations for improving operational performance at Red Sea International Airport (RSIA).

The chapter also provides suggestions for future research and includes the study's references and appendices.

### 5.2 Summary of Key Findings

The study aimed to evaluate how the Dos-Maximo CMMS improved maintenance and operational efficiency at RSIA. Based on system data, observation, and questionnaire responses, the key findings include:

- **Improved Work Order Management:** Faster creation, assignment, and closure of work orders.
- **Enhanced Response Time:** Real-time notifications and automated routing reduced delays.
- **Higher PPM Compliance:** Scheduled tasks became organized, consistent, and easier to track.
- **Better Documentation:** Photos, reports, timestamps, and digital signatures improved quality.
- **Improved Contractor Performance:** KPIs became measurable, transparent, and enforceable.
- **Accurate Asset Data:** Barcode tagging and asset hierarchy improved asset visibility.
- **BMS Integration:** Automatic work order generation minimized downtime and enhanced reliability.

Overall, the system successfully improved operational efficiency and supported RSIA's digital transformation goals.

### 5.3 Practical Recommendations

Based on the findings, the following practical recommendations are suggested:

1. **Increase User Training:**  
Continuous training will improve user confidence and reduce errors.
2. **Enhance Collaboration with Contractors:**  
Conduct monthly performance meetings focusing on KPIs and operational challenges.

3. Strengthen Preventive Maintenance Programs:  
Expand PPM templates using historical data and OEM recommendations.
4. Improve Internal Communication:  
Use automated escalation workflows to reduce approval delays.
5. Monitor High-risk Systems Daily:  
Such as HVAC, electrical, BHS, and fire systems, to maintain reliability.

#### **5.4 Technical Recommendations**

1. Advance BMS–CMMS Integration:  
Enhance two-way communication for real-time fault resolution.
2. Mobile Application Optimization:  
Improve usability for technicians in the field.
3. Develop Predictive Maintenance Tools:  
Use IoT sensors and machine learning to predict failures.
4. Create Smart Dashboards:  
Provide managers with real-time analytics and performance indicators.
5. Enhance Spare Part Tracking:  
Use QR codes for faster inventory updates and automated stock alerts.

#### **5.5 Limitations of the Study**

The study is limited to RSIA’s maintenance operations and does not include financial analysis, passenger services, or airport-wide digital systems. Additionally, the research relied on operational data for one year only, and longer-term analysis may provide deeper insights.

#### **5.6 Recommendations for Future Research**

The following topics are suggested for future research:

- Long-term analysis of CMMS performance over 3–5 years
- Comparative studies between RSIA and other airports
- Cost-benefit analysis (ROI) of CMMS implementation
- The role of AI in predictive maintenance and smart airports
- The impact of fully autonomous systems on maintenance efficiency

## 5.7 Conclusion

The implementation of the Dos-Maximo CMMS significantly improved maintenance operations at Red Sea

International Airport. The system enhanced work order processing, improved PPM compliance, increased documentation quality, strengthened contractor accountability, and supported digital transformation.

The findings confirm that CMMS systems like Dos-Maximo are essential for modern airports seeking operational excellence and reliability.

# References

## References

- Al-Turki, U. (2011). CMMS effectiveness in industrial facilities.
- Galar, D. & Kumar, U. (2013). Maintenance Performance Measurement.
- ICAO. (2020). Airport Maintenance Management Manual.
- Smith, A. (2018). Preventive Maintenance Best Practices.
- RSIA Internal Maintenance Reports (2024).
- IBM Maximo Documentation (2023).

# **Appendices**

#### Appendix A: Digital Survey Link

<https://docs.google.com/forms/d/e/1FAIpQLSdm0-cOONZPVSTRfEYIOZRJ-IZINmj1osMca3bWOV186S1VNA/viewform>

QR Code for quick access:



الدكتور / ..... المحترم،

السلام عليكم ورحمة الله وبركاته،

أتمنى أن تكونوا بخير وبأفضل حال.

أود إفادتكم بأنني طالب في جامعة ميدأوشن - كلية الإدارة، تخصص ماجستير إدارة الأعمال، وأعمل حاليًا على بحث بعنوان:

في تحسين كفاءة التشغيل والصيانة في مرافق مطار (Dos-Maximo) أهمية نظام إدارة الصيانة المحسوب البحر الأحمر الدولي.

أتوجه إليكم بهذا الطلب للاستفادة من خبراتكم القيمة في تحكيم الاستبيان الخاص ببحثي

أرفق لكم نسخة من الاستبيان، وأرجو منكم التكرم بمراجعته وإبداء ملاحظاتكم حول مدى دقة وملاءمة العبارات المطروحة لقياس الأهداف المرجوة من الدراسة. كما أرجو منكم تزويدي بأي اقتراحات أو تعديلات ترونها مناسبة، سواء بإعادة صياغة العبارات، أو حذفها، أو إضافة عبارات جديدة

أشكركم جزيل الشكر على وقتكم وجهودكم، وأتطلع إلى تلقي ملاحظاتكم القيمة

مع خالص التقدير والاحترام،

مهند سعيد مقبول

طالب ماجستير إدارة الأعمال

كلية إدارة الأعمال جامعة ميدأوشن

Mohanad\_maqbool@hotmail.com

Dear Dr. ....,

I hope this message finds you well.

I am writing to inform you that I am a student at Midocean University – College of Management, pursuing a Master’s degree in Business Administration. I am currently conducting a research study titled:

**“The Importance of Dos-Maximo CMMS in Improving Operational and Maintenance Efficiency at Red Sea International Airport.”**

I kindly request your expertise in reviewing and validating the research questionnaire designed for this study. Attached is a copy of the survey, and I would greatly appreciate your insights and suggestions regarding the accuracy and appropriateness of the statements used to measure the study’s objectives. Any recommendations for modifications—whether rephrasing, adding, or removing statements would be highly valuable.

Thank you very much for your time and support. I look forward to receiving your constructive feedback.

Sincerely,

**Mohanad Saeed Maqbool**

MBA Candidate

Mohanad\_maqbool@hotmail.com