

National Manual of Assets and Facilities Management

Volume 15, Chapter 2

Key Performance Indicators

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Key Performance Indicators

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Key Performance Indicators

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Key Performance Indicators

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1.0 PURPOSE

This document lays out the standards by which the Key Performance Indicators (KPIs) shall be set. The procedure incorporates International Best Practice throughout.

The aim of this procedure is to encourage Entities to follow the best practice guidelines during their KPIs development process to ensure that the Entities create effective and efficient KPIs that lead to success and continuous improvement.

Therefore, this document provides guidelines to the Entities concerning the concept, significance, framework, and process around KPI. This document can also be utilized by Entities in order to help them to be able to measure and control their performance, which leads them to improve the overall outcome based on their objectives.

2.0 SCOPE

This document is written specifically for O&M departments (A&FM) domain) within government Entities as a guideline which describes fundamental aspects of O&M performance monitoring procedure. Although references are made to commonly used O&M KPI, each Entity shall produce its specific KPI according to relevant parameters such as asset management strategy, asset manuals, end-user requirements, operational levels, and contractual obligations.

This document is written to demonstrate the key aspects of the KPI development including their concept, value to the Entity, types, framework, development process, and reporting techniques based on the best standards/practices. The KPI creation phases within the Entities should be fulfilled as per the EXPRO Standards and guidelines.

2.1 Defining KPI

Definition by the International Facility Management Association (IFMA) says, "KPI are quantifiable measurements, agreed by the stakeholders, which reflect the critical success factors of the assets or the operations or the services to be delivered."

Taking that into account, high level KPI may focus on the overall performance of the business, while low level KPI concern about the lower management levels such as departments and sections.

Performance Indicators (PIs) are quantifiable measurements that help organizations to measure their achievement, and to tell them what needs to be improved. However, there is a difference between a Performance Indicator (PI) and a KPI, which lies in its significance, value, and relationship with the Entity/organization's objectives and their predefined Critical Success Factors (CSFs).

2.1.1 Why Do We Need KPI?

KPI enable the Entities to measure their own ability to achieve their goals and objectives, also to help them spot O&M gaps, issues, and the opportunities for improvement, which lead to the best outcome.

Therefore, KPI are becoming more important at the present time to the Entities' leaders, senior executives, and managers as they help them to be able to make better-informed decisions and to improve their organization's performance.

The following sub-sections will explain in brief relationships between KPI and other components at high level abstraction, and then describe three different terms that are related to KPI development.

2.1.2 KPI Context within O&M Concept

KPI development is a critical aspect that leads an organization or the 'Entity' to success and continuous improvement. Extracting O&M requirements from the organization's objectives is an important step towards realization of the performance requirements, which should lead to a proper process for KPI creation that will satisfy the overall goal.



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A high-level abstraction relationships diagram between the KPI and the main components within an organization has been illustrated in Figure 1, in order to visualize the concept of KPI dependency within O&M context.

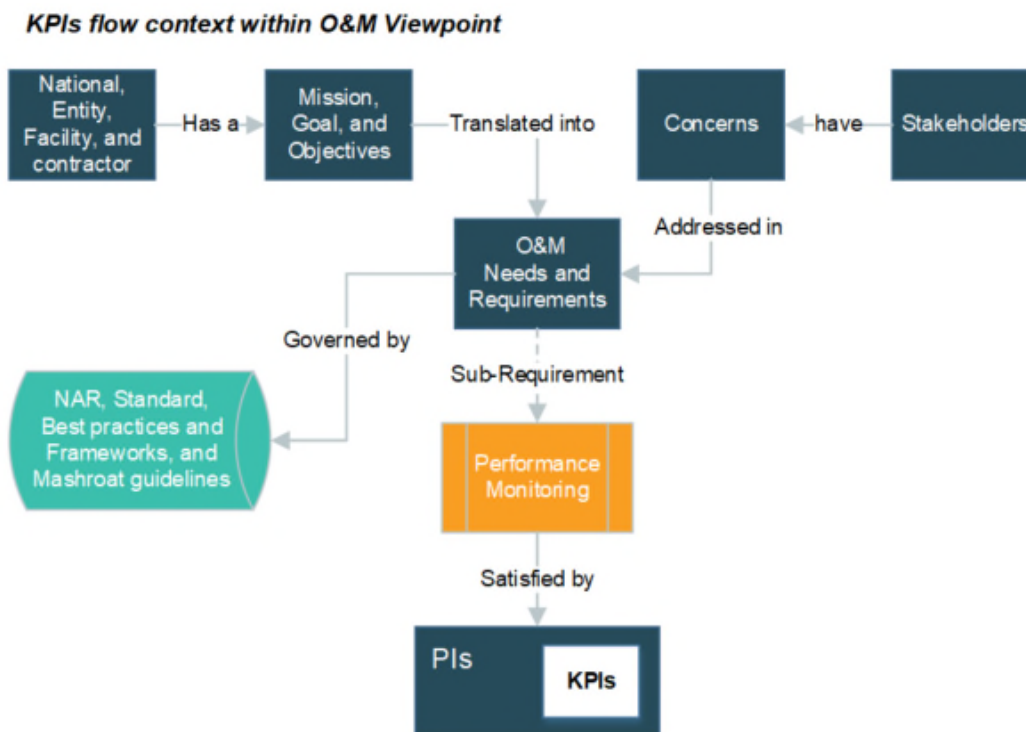


Figure 1: Relationship between KPI and Other Components – O&M Context

2.1.3 Smart and Smarter KPI

Two terms have been introduced to the industry during the last two decades, which are “SMART and SMARTER” KPI. Both concepts propose attributes/ingredients that need to be included during the process of defining KPI. Whereas SMART means “Specific, Measurable, Attainable, Relevant, and Time-Bound,” SMARTER adds “Explainable” and “Relative.” However, a proper definition for ‘SMART’ is, “Specific, Measurable, Achievable, Realistic, and Time-limited,” a criterion to guide in the setting of objectives concerning KPI which are typically used in project management and employee performance management.

SMART and SMARTER attributes are illustrated in Figure 2 in brief with their meanings.



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Figure 2: SMART & SMARTER Concepts' Attributes

2.1.4 Critical Success Factors (CSF)

In general, success is measured by achieving the goal and objectives. Yet, there is no exact definition of success, because success differs from one viewpoint to another. In order to achieve success, any organization needs to know the factors that could lead to such accomplishment. The CSFs concept was introduced by people from both the sectors - academia and industry.

According to Rokart,¹ CSFs are “the limited number of areas in which results, if they are satisfactory, will ensure the successful competitive performance for the organization.”

On the other hand, Parmenter defined CSFs as the “issues or aspects of organizational performance that determine ongoing health, vitality, and well-being,” sometimes called the Key Success Factors (KSF) or Key Result Areas (KRA) (usually between 3 and 8 characteristics).

“Success Factors (SF) are approximately 30 issues or aspects of organizational performance that are important in order to perform well in any given sector/industry, while the CSFs are the significant ones among them.”

There are many terminologies and definitions concerning some aspects of performance monitoring such as CSFs, KSF, KRA, and Success Criteria. All of these terminologies could add confusion with regard to their usability. However, Figure 3 summarizes the concept of each term mentioned above. While Figure 4 illustrate an example of common CSF within A&FM domain. However, these CSFs could be changed and/or amended from one Entity to another, based on their mission, vision, goals, objectives, requirements, and nature of an assets.



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There are different categorizations for CSFs based on organization objectives, type of business, and viewpoints. However, broad categorization can be summarized into four dimensions as follows:

- Process dimensions
- Technological dimensions
- Environmental dimensions
- Organizational dimensions

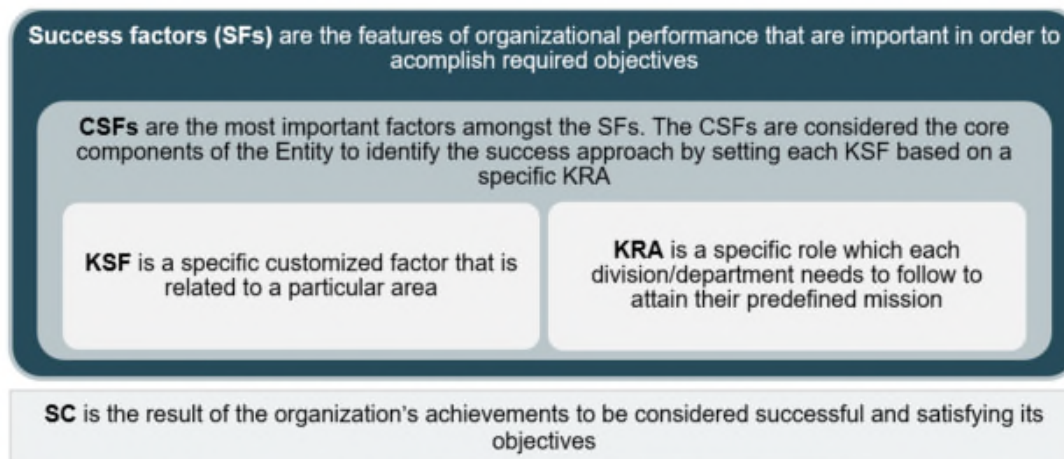


Figure 3: Concepts of “SFs, CSFs, KSF, KRA, and SC”

 Increase Asset Utility (within Entity)	1.1. Maximize asset utilization	 Enhance peak capacity and effective throughput	Apply demand management	Optimize availability/reduce downtime
	1.2. Enhance quality for users	 Adopt a customer-centric operating model	Enhance the end-to-end user experience	Use smart technologies to refine user performance
 Decrease A&FM total cost	1.3. Reduce A&FM costs	 Implement lean and automated processes	Optimize procurement costs and outsourcing	Rightsize management and support functions
	1.4. Mitigate externalities	 Arrange comprehensive sustainability/HSE plans	Embed sustainability/HSE into routine operations	Cooperate with relevant stakeholders
 Increase Asset lifetime value	1.5. Extend asset life	 Invest in preventive and predictive maintenance	Control excessive asset consumption and stress	Enhance disaster resilience
	1.6. Reinvest with a lifecycle view	 Prioritize project options with whole lifecycle CBA	Select contracting mode for best value for money	Prepare for efficient project delivery
 Enable A&FM best practice	2.1. Ensure funding	 Dedicate user taxes via maintenance funds	Apply inclusive user charges	Capture ancillary business opportunities
	2.2. Build capabilities	 Introduce asset management planning	Apply data, benchmarks, and tools	Conduct training and develop talent
	2.3. Reform governance	 Corporate and professionalize public agencies	Foster cooperation between agencies	Consider private-sector participation and competition

Key: HSE = Health Safety Environment; CBA = Cost-Benefit Analysis

Figure 4: Common SCFs within A&FM Domain

2.1.5 Balanced Scorecard (BSC)

Balanced Scorecard (BSC) is a measure or technique (tool) that was introduced in the nineties by Kaplan and Norton and can be used to fulfill the requirement of ‘ISO 9001 - the quality management standard.’



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Also, BSC is a method used for tracking and managing an organization's strategy, which supports continuous improvement of its performance.

The main objective of this tool is to align measurements to strategic objectives, and to include strategic non-financial performance measures to classical financial metrics, to give the top-level management a more 'balanced' view regarding the organization's performance. This method is scoped into four perspectives as follows:

- Financial: tracking the financial performance
- Customer: tracking performance from customer's viewpoint - "how do we appear to our customer?"
- Business Process: evaluating the key processes used to meet the organization's goals and objectives and to satisfy shareholders and customers
- Learning and growth: the vision on how to be sustainable and to be able to change and improve

So, the point of this section is to highlight the BSC concept and to utilize it through strategic business management to track KPI. Figure 5 shows a sample of the BSC matrix.

		Dimensions			
		Objectives	Measures	Targets	Initiatives
BSC perspectives	Financial				
	Business Process				
	Customer				
	Learning and Growth				
Priorities					

Priority ratings		
	High	+9
	Medium	+5
	Low	+1

Figure 5: BSC Matrix Table (Example)

3.0 DEFINITIONS

Term	Definition
Asset	An item, thing, or system that has potential, or actual value to an organization. The value will vary between different organizations and their stakeholders, and can be tangible or intangible, financial or non-financial.
Asset Lifecycle	The cycle of activities that an asset (or facility) goes through while it retains its identity as a particular asset i.e., from planning and design to decommissioning or disposal
Asset Management	Asset management is the coordinated activity of an organization to realize value from assets
Asset Register	An asset register is a list of the assets owned by an Entity. It contains relevant details about each asset. The register can identify the location, description, value, and age of the asset
Balanced Scorecard (BSC)	BSC is a strategic planning and management model utilized by organizations to measure and monitor their performance toward strategic targets



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Benchmarking	An evaluation that identifies quantified performance levels from precedents and appropriate levels of performance with specific, quantitative insight and best practices for a project, a product, and/or service.
BIFM	British Institute of Facilities Management
Critical Success Factors (CSF)	CSF is "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization", after 'Rokart from Harvard Business Review'
Dashboard	A data visualization tool to monitor and evaluate performance
ECMS	Enterprise Content Management System
Entity	Any Government representative (i.e., ministry), or any other agency authorized by the Government Ministry to work on its behalf
Facility	An environment built, installed, or established to serve an organization in the delivery of its operational objective. This is also a generic term to describe a specific building, a group of buildings on the same site, and/or a site itself, which is used to provide an overall function, for example, a school, a research establishment, a hospital complex, a training complex, a university campus
Facilities Management	Organizational function which integrates people, place, and process within the built environment with the purpose of improving the quality of life of the people and the productivity of the core business
Joint Coordinating Board (JCB)	JCB is a formed/assigned working group, that is responsible for developing the organization's KPI according to the current best practices
KPI	"KPI are quantifiable measurements, agreed by stakeholders, which reflect the CSFs of Assets or the operations or the services to be delivered" (IFMA definition)
O&M	Operations and Maintenance (O&M) of facility and Assets. All activities that are related to operate or maintain an asset and/or facility.
Performance Evaluation	The internal form used to evaluate and record a 2nd Party's performance and suitability for the future work for an Entity
SMART & SMARTER	Specific, Measurable, Achievable, Realistic, Time-limited, Explainable, and Relative - a criterion to guide in the setting of KPI, typically used in project management, employee performance management, and personal development
Success Criteria	SC is the result of the organization's achievements to be considered successful and satisfying its objectives
Acronyms	
A&FM	Asset and Facility Management
CAFM	Computer Aided Facilities Management
CMMS	Computerized Maintenance Management System
FM	Facilities Management
HSSE	Health, Security, Safety and Environment
IAM	Institute of Asset Management
IFMA	International Facility Management Association
ISO	The International Organization for Standardization
ISMS	Information Security Management System
IWFM	The Institute of Workplace and Facilities Management
KPI	Key Performance Indicator
KRA	Key Result Area
KSF	Key Success Factor
EXPRO	Government Expenditure & Projects Efficiency Authority
Acronyms	
MTTF	Mean Time to Failure
NAR	National Asset Register
NCLOM	The National Committee for Legislation and Standardization of Operation and Maintenance



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NMA&FM	National Manual for Assets & Facilities Management
OPM	Operational Performance Management
PI	Performance Indicator

Table: 1 Definition

4.0 REFERENCES

- Project of Survey and Study of the current Operation and Maintenance work statues at government Facilities – UNCLOM Executive Report (31st Jan 2016)
- British Institute of Facilities Management (BIFM) – Sourcing strategies
- National Manual of Assets & Facilities Management, Volume 14
- NPM-IT0-PL-00000X Mashroat O&M Dashboard Development Scope
- EXP-ZA0-RP-000024 Modular Maturity Assessment
- EOM-ZF0-PR-000001 Volume 15 - Chapter 3 Key Performance Indicators
- EOM-ZF0-PR-000001 National Asset Register (NAR) Process & Integration Guidelines
- EOM-ZA0-PR-000005 Asset Management Software Procedure
- ISO 55000 family - 2017
- ISO 22400 under the general title 'Automation systems and integration — Key performance indicators (KPI) for manufacturing operations management'
- ISO/IEC 27001:2005, which is a specification for an Information Security Management System (ISMS)
- ISO 9000 family that addresses various aspects of quality management including performance indicators. ISO 9001 addresses Evaluation of Performance
- ISO/IEC 19770-1:2012, Information technology — IT asset management — Part 1: IT asset management systems — Requirements

5.0 RESPONSIBILITIES

5.1 Roles Description Table

Role	Description
The Government Entity	The Entity sets the mission, goals, objectives, and requirements concerning their O&M aspects. Also, the Entity should form the Joint Coordinating Board (JCB) to develop the Entity-specific KPI based on predefined objectives, in order to meet their ultimate business goal successfully. Any Entity should develop and report their performance based on EXPRO guidelines
KPI Joint Coordinating Board (JCB)	The JCB shall follow the guidelines of the latest standards and best practices methodologies, concerning "O&M KPI" development. Such standards could be, NAR, EXPRO guidelines, and ISO 55000 family standards. Also, the JCB should engage any necessary stakeholders in the KPI development process, consequently, reporting the required outcome to related parties. This board is responsible for reviewing and improving their KPI as required according to any changes within the Entity objectives. All affected stakeholders need to be involved in any KPI changes

Table 2 Responsibilities

6.0 PROCESS

The process of creating a proper KPI suite for an organization starts from the organization's objectives and business requirements as described in Section 2.1.2. However, the framework of KPI should utilize the latest standards, best practices, and guidelines where applicable. The following section will explain the KPI framework that is based on the current standards, studies, and research within academia and industry domains.



6.1 KPI Framework

Before proceeding in explaining the KPIs framework, briefly illustrating the KPIs components within the PM overall approach within the Entity, identifying main activities for the KPIs team, and the important aspects that needs to be considered during the KPIs development. Thus, the KPIs is one main the main components within the overall PM activities, which includes KPIs specific framework that should satisfy PM requirements and the Entity strategic performance objectives as illustrated in Figure 6.

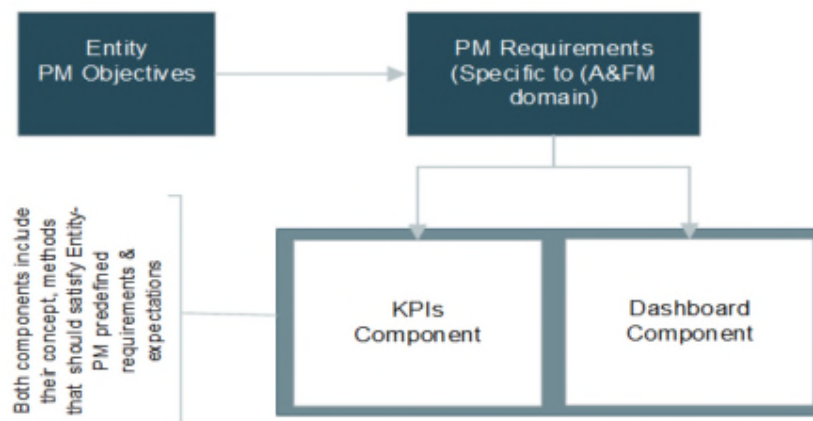


Figure 6: KPIs and Dashboards within PM overall concept

6.2 JCB Main Role and Activities

The KPI Working group or 'KPI Joint Coordinating Board (JCB)' is a team formed/assigned (gathered) based on their experience and the organization's needs. Their main objective is to define, develop, analyze, report, review, and improve the organization's KPI portfolio as illustrated in Figure 7.

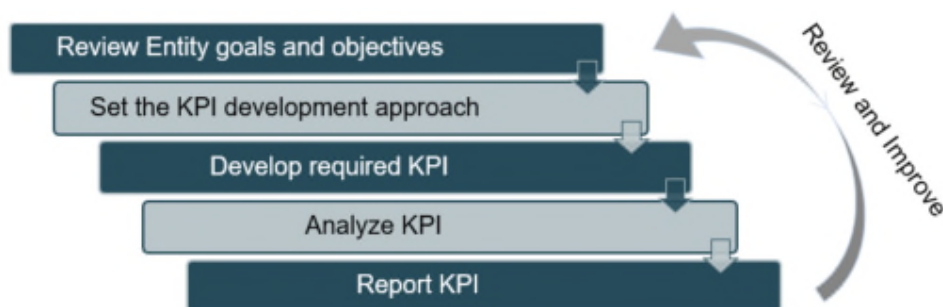


Figure 7: JCB Main Activities

There are some aspects required to be considered by the JCB during the Entity performance evaluation planning and development process, which are demonstrated in Figure 8. 'Maintenance view' is neglected by most current organization models. Due to its importance to this manual, context that concern is about 'O&M', this view is added as a separate point that needs to be taken into consideration during KPI development.



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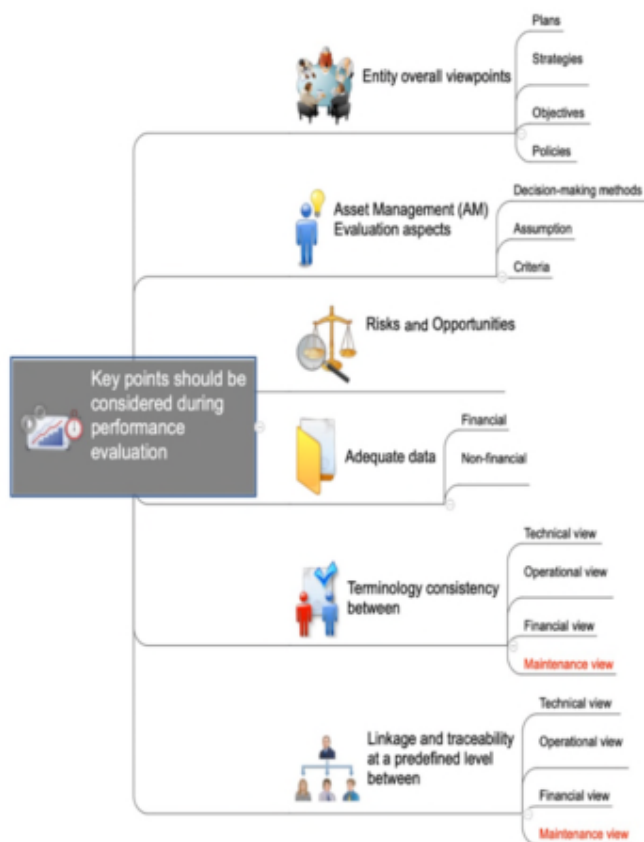


Figure 8: Important Aspects Concerning Performance Evaluation

6.3 Important Viewpoints to be Considered by JCB During Performance Evaluation

So, a framework is a conceptual structure created to guide users to build something beneficial. However, this KPI fundamental framework (Figure 9) has been developed to guide government 'Entities' throughout the KPI development process in order to assure the consistency among Entities countrywide, to utilize the best existing performance monitoring approaches, and to simplify its process in a scientific manner without neglecting any important pillar.

6.3.1 Framework Overall Description

KPI framework is comprised of three main components, one external input, one external output, and two constraints components as follows:

- Main components are:
 - o Development
 - o Analysis
 - o Report
- External input is the Performance monitoring requirement
- External output is the Results that feed into the action plan
- Constraint's components are:
 - o Mission, goal, and objectives
 - o NAR data structure/format, standards, best practices and frameworks, and EXPRO guidelines



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The main components illustrate three main phases of the KPI life cycle. Each phase contains some components that should be fed into the KPI component within that phase before moving to the second stage.

On the other hand, the external input is the sub-requirements (data) that are evolved from O&M requirements as illustrated in Figure 1 (section 2.1.2), which should be developed based on organizations' objectives.

In addition, the external output is the final outcome of the last phase of the framework, which should feed into the action plan for continuous improvement.

The last constraints components are the steering wheels for the entire framework stages that need to be followed.

The KPI working group/JCB should review and improve their KPI based on the organization strategic changes as well as KPI results.

6.3.2 KPI Development Phase (Phase One) Description

This is the first phase of the framework, which contains four components that need to be clearly defined in order to develop the KPI before moving to the analysis phase. The following sections explain these components.

6.3.2.1 Stakeholders Input

In order to develop KPI, the JCB needs to be selected and formed. Their responsibilities need to be clearly defined and assigned by top management. The JCB activities have been explained in section 5.2. One of the main tasks of the JCB is to make sure that the relevant stakeholders are involved in the KPI process where applicable. This involvement of the stakeholders differs based on different factors such as prospective, level of KPI, and professionalism. The JCB will then decide who the 'stakeholder' will be, and when they will be involved during the KPI development process. Stakeholders could be individuals, divisions, departments, sections, and external resources.



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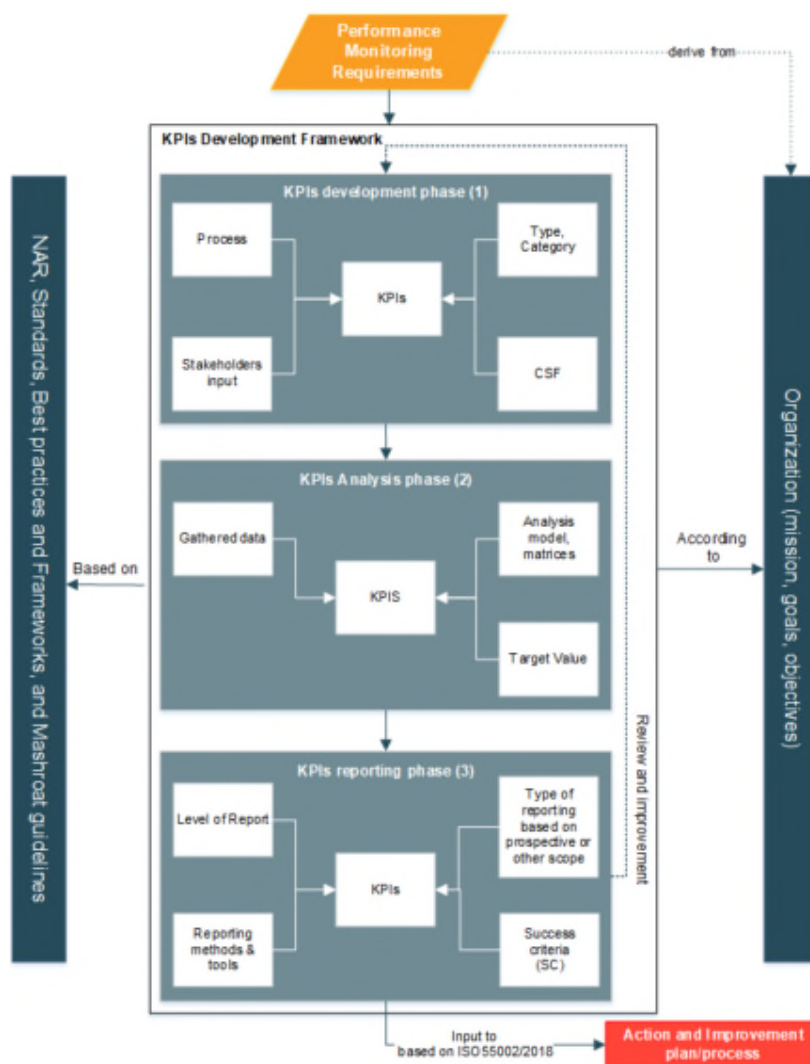


Figure 9: KPI Development Framework



6.3.2.2 KPI Process

A general and common process used by industry is as illustrated in Figure 9. However, the KPI process could be extended to more processes or divided into segments to be easily manageable. Also, one process from Figure 10 could have an internal lifecycle process, which would depend on the JCB's approach and the size of the work.

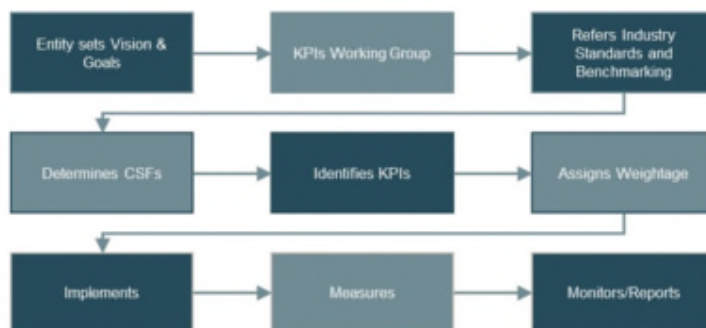


Figure 10: KPI Development Process Flow

6.3.2.3 KPI Types

The types of KPI could be categorized based on different aspects such as timeframe, domain, and management level. Figure 10 demonstrates the different KPI classifications. As an example, one type of KPI that are based on timeframe is defined as:

Leading KPI are indicators of performance that are used to predict future success or trends ('forward-looking,' i.e., employee engagement rate). On the other hand, **Lagging KPI** are indicators of performance after the business or process ('backward-looking,' i.e., customer satisfaction).

Both domains industry and academia listed many classifications and matrices that cover performance monitoring domain. Entity classifications depend on their business model and objectives. JCB is responsible to set off proper categories for its organization.

Regarding, Critical Success Factors (CSF), the main benefit of CSF is that they provide goals and benchmarks, and links operational activities to the organization's strategies. The concept of CSF has been explained in section 2.1.4.

KPI and CSFs concepts are strongly connected and used interchangeably. However, we should not be confused between the two terms. The main difference between a KPI and a CSF is that the former reflects the level of success, while the latter points out to the reason of success.

For example, let's assume that an organization objective is to increase profit by 2% within 12 months. In this case, the KPI to monitor could be "percent of net profit in one year," while the CSF to consider may be "to gain (sign) at least 2 more new project contracts within 6 months." An objective can have more than one KPI and CSF.

6.3.3 KPI Analysis Phase (Phase Two) Description

Analysis phase is the process of considering KPI carefully and using statistical methods in order to understand the organization performance or explain it. The following sections will describe the three main components that are involved in this phase.

6.3.3.1 Gathered Data



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In order to build the right KPI, appropriate data needs to be gathered and organized. Information required for the KPI development needs to be defined by the JCB. The KPI O&M context diagram summarizes the data flow required in Figure 1, which shows that any organization has predefined vision, goal, and objectives that form the organization general requirements. Also, every organization has stakeholders, and each of them has a concern. Both 'general requirements and stakeholders' concerns' should be translated into the specific requirements concerning O&M domain. Consequently, further process will extract O&M requirements into the specific performance monitoring requirements. Also, organization asset register, old mentoring reports, resources, and the other required information are examples of beneficial information during KPI requirements elicitation and analysis. Checklists, surveys, interviews, questionnaires, field studies, and legacy data could be some of the methods of gathering information process.

6.3.3.2 Analysis Model

An analysis model could utilize many current methods and approaches, such as metrics, algorithms, equations, and modeling languages. Also, the types of the KPI outcome should be defined in this step, which could be qualitative, quantitative, or hybrid (both quantitative and qualitative). In order to illustrate the analysis concept, Figure 11 shows an example of an objective that translated into two KPI (qualitative and quantitative) scheme, along with baselines and targeted values. Engineering modeling approaches and tools could be advantageous if utilized in this step, such as requirement, sequence, case-study, and parametric diagrams.



Figure 9: Types of KPI Classifications Scheme

6.3.3.3 Target Value

Target Value is the desired level of performance based on organization's strategic plans and objectives.

Boundaries or exact target values should be defined by the top management, and then delivered to the JCB, in order to design the required KPI according to them. The Target values should be specific and could be absolute or proportional. Figure 12 illustrates an example of the target values.

There are some attributes that target values should have, such as,

- Targets should be defined relative to the internal or external benchmarks, or the global best practices



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- Target value should be defined with a clear time frame

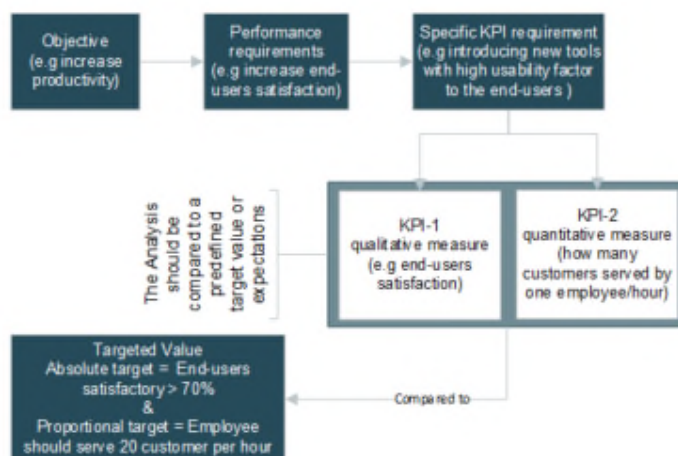


Figure 12: How to drive target KPI value from general objective (Productivity Example)

6.3.4 KPI Reporting Phase (Phase Three) Description

Reporting mechanism is an important phase of the KPI framework. Reporting KPI analysis results could be tricky in regard to the information selection (what we need to show?), presentation method (how we represent the results?), and the report audience (to whom the report will be represented?).

A KPI report is a type of representation that targets a specific audience in order to facilitate the analysis results to them, which shows the organization's performance that concerns to most important business objectives over a specific time frame.

The following sections will explain the main components involved in KPI reporting phase:

6.3.4.1 Type of Reporting Based on Prospective or Other Scope

There are many categorizations of KPI report. Types of KPI report could be constrained by different factors such as:

- Domain (i.e., financial, operational)
- Data type (i.e., numerical, categorical)

Taking into the account that, one report could be hybrid, which combines different types into one report, based on the organization's needs.

6.3.4.2 Level of Report

To ensure sustainable performance, each entity should assign Performance Management Team (EPMT) which has appropriate authority from the highest management to perform as expected. EPMT main responsibilities are:

- Develop Entity Performance Management System (starting from objectives to reporting lines, types of reports, escalation criteria)
- Ensure alignment with different entities, sub-entities, EXPRO
- Report to EXPRO through frequent reports, dashboard data, EXPRO O&M Portal

It is important to know your audience (i.e., ministers, executives, managers) prior to KPI report development in order to select the correct analysis results that need to be included in the report. Also, the scoping of KPI report to a specific audience is a critical task, because some information could be sensitive and confidential to a certain level of management. Exposing such confidential information to an undesired level of management could have negative effects within the organization. It is the JCB's job to define, design, and categorize KPI reports according to the organization's objectives and needs. Coordination with the top management level and other related parties during KPI reports production is necessary.



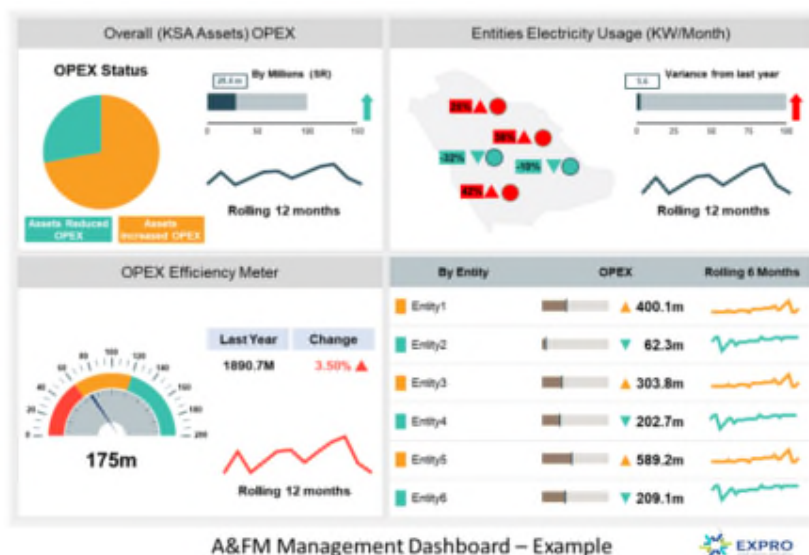
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6.3.4.3 Reporting Methods and Tools

The reporting method is a defined approach to represent and share the organization's KPI results. Reporting tool is the medium used to produce the report, which includes paper-based or a software. Reporting methods and tools selection for KPI report should be defined based on:

- Best practices
- Organization's objectives
- Affordability

There are many methods that could be utilized to represent KPI analysis results such as matrices, comparisons, benchmarking tables, and dashboards. Reporting tools include different types of software such as excel, word, data pine, and Scorio. Figure 13 show an example of dashboards.



A&FM Management Dashboard – Example



Figure 13 (A): Dashboard Examples

6.3.4.4 Success Criteria

Success Criteria (SC) has been defined in Figure 3 (section 2.1.5), should answer the question - How do we realize success?

Organization needs SC to ensuring that the defined KPI are correct and support The SC should be linked to objectives, targets, and metrics. An example of SC i on time?"



Measurement metrics are important, but SC and KPI should not neglect **intangible** aspects that are critical to the organization's performance such as:

- Behavior and attitude of individuals and managers, and teams' satisfaction
- Work quality
- Positive communication among team members

SC is what defines success, and it should be:

- Defined at the early stage, with the strategic plan.
- Work as an input to the KPI framework (reporting phase) to check the performance indicators against them
- Changed at any stage via the change control process when required
- Documented for further analysis or future improvements.

6.4 Standardizing the KPI



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It is important to utilize the current standards, guidelines, and best practices during the development of KPI across the Entity, which includes, but is not limited to, terminologies, process, and measurement units.

A standardized process helps in assuring consistency through the KPI development process that helps the Entities to express their performance indicators based on well-defined ground, which remains practical for a long time, regardless of the individuals or departments who are responsible to create them.

Thus, the Table 3 shows a list of the mandatory KPI's that all entities shall monitor and report regularly as part of the performance monitoring.

Key performance Indicator	Unit	Description	Formula	Frequency
Cost per m2 of building area	SR/m2	The indicator provides an indication of the cost per size of the asset maintained which could be referenced and benchmarked between different sites and facilities	Total cost of the maintenance activities/area m2	Monthly
Labor comparator	Hour/m2	The indicator provides an indication of the utilization of the labor in the operation and maintenance activities in a facility	Total working hours of all labor/area m2	Monthly
% of work orders on planned maintenance.	Percentage	These indicators provide overview of the percentage of the planned versus unplanned maintenance activities which help to reach to the optimum percentage of planned maintenance	Number of work orders in planned maintenance/ total work orders of all maintenance activities	Monthly
% of work orders on unplanned maintenance.	Percentage		Number of work orders in unplanned maintenance/total work orders of all maintenance activities	Monthly
% of maintenance working hours on planned maintenance	Percentage		Number of working hours consumed in planned maintenance/total number of working hours consumed in all maintenance activities	Monthly
% of maintenance working hours on unplanned maintenance	Percentage		Number of working hours consumed in unplanned maintenance/total number of working hours consumed in all maintenance activities	Monthly
Customer Satisfaction %	Percentage	This indicator provides a proportionate measure of satisfied customers	Number of satisfied customers/total number of customers	Monthly
Power Consumed per m2	KWh/m2	This indicator provides the power consumed in the facility per building area	Total power consumption of the facility /area (m2)	Monthly
Water Consumed per m2	M3/m2	This indicator provides the water consumed in the facility per building area	Total water consumption of the facility /area (m2)	Monthly



Key Performance Indicators

Key performance Indicator	Unit	Description	Formula	Frequency
Budget Compliance	Percentage	This indicator expresses the difference between budgeted and actual figures for a specific accounting category.	$\frac{\text{Actual budget (per contract or per service)} - \text{Planned budget}}{\text{Planned budget}}$	Monthly, quarterly or every fiscal year
Performance based contracts	Percentage	This indicator reports the average turnaround time and completion of a service	$\frac{\text{Actual time spent}}{\text{Allocated time}}$	Monthly
EXPRO National A&FM Manual Compliance	Percentage	This indicator identifies the adaption and implementation progress of A&FM Manual	$\frac{\text{Business processes developed in accordance with A\&FM Manual}}{\text{Total A\&FM Manual Process requirements}}$	Monthly
Safety procedures Compliance	Percentage	This indicator provides proportionate measure of safety compliance	$\frac{\text{Number of safety processes developed, and deployed}}{\text{Number of safety processes required to meet full compliance to governance standard}}$	Monthly
Accident rate	Percentage	This indicator provides measure of Reported Accidents & Incidents	$\frac{\text{Number of reported Accidents \& Incidents}}{\text{Time duration of service or contract}}$	Monthly
Worker-Supervisor ratio	Percentage	This indicator provides supervisory indication	$\frac{\text{Number of workers per service or contract}}{\text{number of supervisors}}$	Monthly
Annual Training Hours per Employee	Number	This indicator provides overview of training progress	$\frac{\text{Number of training \& certifications per employee}}{\text{planned training \& certifications per employee to meet position requirements}}$	Monthly
Job Positions with a Documented Skills Profile	Percentage	This indicator provides overview of employee's skillset compliance to positions	$\frac{\text{Number of employees with required documented qualification in appropriate position}}{\text{total position}}$	Monthly

Table 3: Entities Compulsory KPIs

Also, based on project of survey and study of the current operation and maintenance work statues for governmental facilities, NCLOM suggested a list of 52 KPI within 12 arenas that may help in evaluating government Entities against them, which promotes the standardization concept and helps the high-level management to compare Entities' performances. Figure 14 demonstrates the 52 common KPIs that are linked to their domains.



Key Performance Indicators



Figure 14: NCOLM 52 Common KPI

6.5 KPI Examples

Current literature within industry, government, and academic sectors illustrates hundreds of KPI examples, which are categorized into different domains. The most common KPI are:

- Time
- Cost
- Productivity, measurement of the efficiency of the operation (i.e., the availability of time)
- Quality, measurement of the process effectiveness (i.e., the number of satisfied customers)

Table 4 briefly demonstrates the examples of KPI from different viewpoints. These scoped KPI are valuable to measure, but they are typically just a portion of a broader KPI.

The broader KPI might include:

- Minimizing incident rate within the Entity facilities by X percent



Key Performance Indicators

Business KPI's	Service KPI's	Health and Safety KPI	Systems KPI's	Operational KPI's	Maintenance KPI's
Increase revenue by 5% within a year Decrease operational and maintenance cost by 2% within 6 months	Number of customer complaints/ per 100 customers served	Frequency of unsafe behavior reported onsite/month Average overtime hours per person	Manage resources by introducing concurrency Control resource demand by limiting event response	Operational cost per (unit)/year Decrease absenteeism rate by 20% within three months	Maintenance cost per (unit)/year The average lifespan of non-repairable asset could be measured by Mean time to failure (MTTF) metric

Table 4: KPI Examples from Different Perspectives

- Improving space utilization by X percent
- Minimizing energy consumption by X percent
- Reducing assets' maintenance cost by X percent and operational cost by X percent

7.0 ATTACHMENTS

1. Examples of KPI Procedure
2. Concrete Example of KPI Development Table after "KPI.org" Research, with Modifications
3. Example of maintenance productivities and effectiveness hierarchy components
4. Samples of common A&FM KPIs within current industry

Attachment 1 - Example of KPI Procedure – EXPRO Projects White Book

Number	KPI	Measurement	Frequency
1	Delivery of Leading Change and Technical Training Courses	Total number of courses delivered/14 total courses (%)	Monthly
2	PMC Award	Number of Entities awarding PMC/Total planned Entities (%)	Monthly
3	Enterprise Content Management System (ECMS)	Number of Entities awarding ECMS/Total planned Entities (%)	Monthly
4	Initial Planning - Scorecard	Topic score/Total maximum topic score (%)	Quarterly

Table 5: KPI EXPRO Projects White Book's Examples



Key Performance Indicators

Attachment 2 - Concrete Example of KPI Development Table, after “KPI.org research”, with Modifications

Table 6 illustrates the characteristics that need to be addressed during the development of any KPI.

Activity	Description
Objective (strategic level)	One of the fundamental building blocks of the strategic plan that support the overall mission
Objective owner	Who develops the objective
Required Result	Desired outcome from the objective ‘Target Value’
Measurement	Brief textual description of specific measurement that should be clear to the users
Measurement Description	The intent of measurement: what is it about? why does it matter? What is included and excluded? When and where should be applied?
Measurement Input, Output, and Type	Explains the measurement input, process, and output
Formula	Mathematical equation or modeling methods that are used to calculate the measurement, such as percentages, fraction of totals, and rate of errors
Measurement Unit	What’s being counted? Such as seconds, degrees, and dollars
Measurement Location	Where measurement happened and where data will be saved?
Measure owner	Who develops the measured and all associated data, applies it, reports its result
Collected information source	What is the proper method to collect the correct information for the intended measure? Is it by questionnaire, field study, checklist, one-to-one interview, or old legacy system information? Where the input data comes from?
Reporting Methods and Tools	Selecting the type of representing the data analysis, dashboard, and excel sheets
Frequency of Data Collection and Reporting	How often the data will be collected and analyzed? Monthly or yearly
Validation	is knowing and confirming that the measure is realistic, related to the objective, and accurate. This role should be done by different person than who created the measure
Verification	is knowing and certifying the data is accurate and have integrity based on independent evaluation of data standards and techniques
Presentation	Visualization of the results and reports through some proper methods such as tables and graphs

Table 6: KPI Development Table Attributes



Key Performance Indicators

Attachment 3 - Example of maintenance productivities and effectiveness hierarchy components

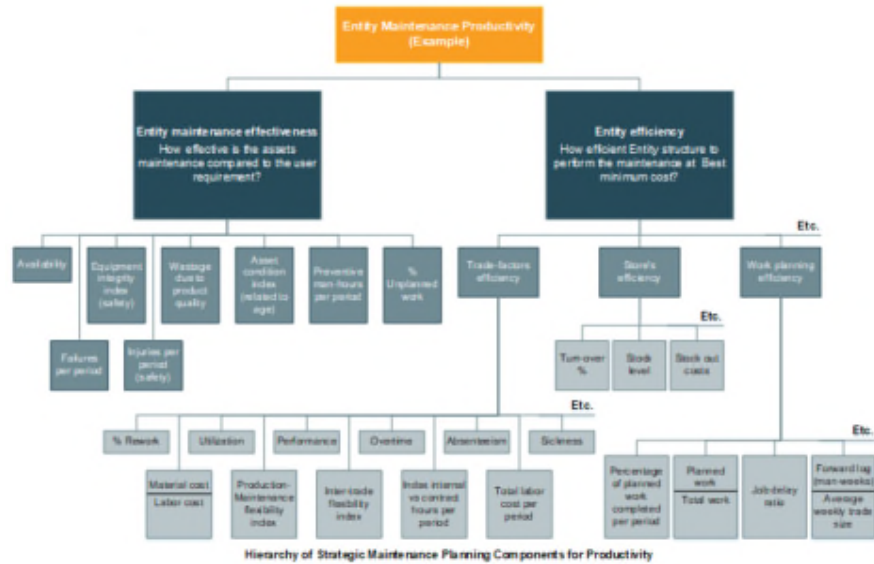


Figure 15 (A): Maintenance Productivity - Example

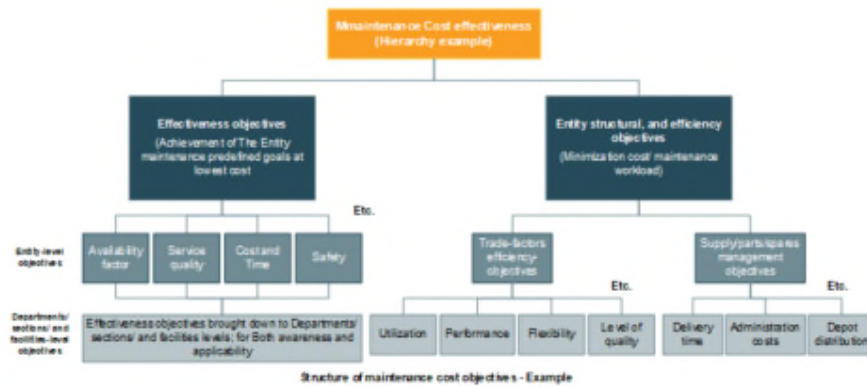


Figure 15 (B): Maintenance Cost Effectiveness - Example



Attachment 4 – Samples of common A&FM KPIs within current industry

Performance monitoring is an approach where the Entity applies several monitoring and measuring tools, ensuring that the O&M process, projects, departments, systems, and employees are all progressing towards pre-set goals and objectives as established by senior level management and the relevant stakeholders involved in decision making. These performance monitoring tools shall be in line with the Entity's mission, goals, and strategies, identifying good and bad progress, which inevitably improves the overall Entity performance.

This attachment illustrates some examples of a good common KPIs that are utilized within the current industry. Below are descriptions of the 6 pillars found within the Modular Maturity Assessment, created to score the Entities within the Kingdom of Saudi Arabia, on their efficiency within the O&M of a facilities. The KPIs samples included within the table below are aligned with these 6 pillars.

Pillar 1 - Asset Management Strategy KPIs

An organization's stakeholders expect its needs to be delivered through the asset management system, the asset management itself and the assets. It directs, coordinates, and controls asset management activities. Objectives derived from the organizational goals to strategic asset management objectives are translated into a hierarchy of Key Performance Indicators.

An Entity's current processes and capability can be measured against the requirements of ISO 55000, determining the areas that shall be developed to support the functioning of a compliant asset management system and any corresponding improvements of the capability required.

An asset management system and activities should be scaled to the size and complexity of the organization and its critical assets. Some examples include, but are not limited to:

- System Integration progress
- Asset register and CA progress
- Compliance to documentation entries to the AMS systems
- Response and resolution times from Help desks

Pillar 2 – Operations KPIs

Operational performance management (OPM) aligns all business units within an organization to ensure that they work together to achieve core business goals. Operational KPIs would be monitoring the day-to-day processes and policies set out by an Entity to run the organization effectively and efficiently. Operational tasks track the progress of individuals or assets against a planned timeline. An operational objective would have processes in place to monitor data but are not limited to:

- Availability, utilization, calibrations, and operating conditions (IE, temp, vibration) of assets
- Data including energy efficiencies and sustainability
- Risk management data capture and monitoring
- The training requirements and needs for the staff at the Entity/Facility
- HSE compliance data could be part of operational KPIs

Pillar 3 – Maintenance KPIs

Most of the time, in maintenance, KPIs are grouped into 5 categories. The efficiency and effectiveness of the maintenance system play a pivotal role in the organization's success and survivability. Therefore, the system's performance needs to be measured using a performance measurement (PM) technique. Usually, the indicators we work with can fit into several of these categories simultaneously. In line with Volumes 6 of the NMA&FM below are some KPIs but not limited to:

- Customer Satisfaction related indicators
- Cost related indicators
- Reliability indicators (equipment related)



Key Performance Indicators

- Materials Management indicators
- Work order management indicators

Pillar 4 – Data & Performance KPIs

If Data is accurate and entered adequately into the CAFM system, information can be translated into performance measuring. Managers from this point can determine the corrective actions and continuous improvement for meeting the objectives. Below is an example of data and performance objectives but not limited to:

- Manage maintenance in one central location
- Fully automate work order requests and streamline fulfillment processes
- Meet compliance and safety standards
- Increase productivity of Maintenance schedules
- Create accurate and dynamic spare parts inventory log
- Expand lifespan of equipment and assets

Pillar 5 – Contracts Management KPIs

Contracts Management KPIs shall demonstrate qualities that ensure the contract is performing efficiently with the desired outcomes. The KPIs establish performance benchmarks and monitor key outcomes that the contracting approach has been designed to deliver. The Entity and contractor work together, throughout the life of the contract, to achieve satisfactory performance of the contract and the delivery of O&M services. Clear definition of a series of objectives and indicators by which to measure contractor performance. Some of the contractor management KPI's one would expect to see in an Entity include but are not limited to:

- Achieve less than the variation percentage deviation from the baseline cost of the contract.
- Obtaining price reductions below the original cost baseline as decided by the Entity
- Timely identification and mitigation of risks and outstanding issues potentially causing disputes.
- Timely issuance of payment certifications to the contractor
- The contractor performance measurement shall be assessed by the Entity's technical specialist and contract specialist in consultation with the contractor's representative
- Starting contract activities within achievable timescales, for example contract renewal, extension, etc.

Pillar 6 – Supply Chain Management KPIs

There are many moving parts to the success of Supply Chain Management. Including but not limited to Procurement, Inventory control management, Supplier relationship management, etc. There are many performance indicators which will be decided upon by the stakeholder's strategy and objectives. Some of the KPIs that set out in Supply Chain Management include:

- Goods and services are provided in good volume and quantity
- All deliveries are accepted in good condition
- Orders filled and delivered on time as per SLA's

Note: The KPI examples below are just examples. The bespoke Entity must ensure it has a clearly defined strategy and objectives in order to build the required metrics, PIs and KPIs.

Legend – In line with the six pillars of the Modular Maturity Assessment.

P1 P2 P3 P4 P5 P6

- P1** Asset Management Strategy
- P2** Maintenance
- P3** Operational
- P4** Data and Performance
- P5** Organization
- P6** Supply Chain Management



Key Performance Indicators

A&FM KEY PERFORMANCE INDICATORS EXAMPLES

S	Key Performance Indicator	Unit	Description	Formula	Frequency	Entity/National Level	NMA&FM Vol
1	Percentage of assets with structured strategies	%	This metric shows percentage of assets with structured strategies information against assets without such an information. Documentation and asset strategies for an Entities asset crucial to the success of the facility and Entities. The more information obtained and registered in some form of document control the better. Asset information, policies, processes, limitations, procedures, manuals, spare parts lists, and life cycle information. on each of the assets important to the organization helps understand what needs to be done, why and how. Costs will decrease as the assets are clearly structured.	$= \frac{(\# \text{ SS Assets } \setminus \text{ Total})}{\text{Total}} \times 100$	Monthly	Entity	Volume 2
2	Percentage of sites using CMMS data for asset strategies	%	This metric shows percentage of data and activity usage per site. The objective is to achieve a target of having all assets, especially critical assets entered, monitored and tracked in a computerized maintenance management system whereby the O&M of these assets can be monitored to ensure life cycles are achieved. It is in the best interest of the Entity to work towards a % increasing monthly or quarterly for data entry for their asset base, in line with the asset registers. As a site or facility implements some form of data register will improve the performance.	$\% = \frac{\text{\% Software Data Usage per site}}{\text{Total}} \times 100$	Monthly	Entity	Volume 2
3	CAFM\CMMS recorded man-hours vs total	%	This metric shows actual recorded man hours (actual work performed) activity against total spent (total of all activities). This can only be used where systems attended are monitored on a computerized system.	$\text{Recorded man hours} / \text{total man hours} = \% \text{ of utilization of manpower}$	Daily	Entity	Volume 2
4	Asset Registered % of Total Assets	%	This KPI will keep track of the progress of ensuring that the assets within the Entity are registered and in the AMS, CMMS or CAFM systems. It ensures that data recording, monitoring, and a history is comprehensive. The more assets registered the better control over the assets in all forms of operations and maintenance.	$\% \text{ of registered assets} = \frac{\text{assets registered}}{\text{total assets}} \times 100\%$	Monthly	Entity	Volume 2
5	Asset Condition Assessments Performed % Of Total Asset	%	This KPI shows the compliance with performing CAs on assets. In a schedule of CAs on the assets compared to the total number of CA's that should be completed on the assets.	$\% = \frac{\text{CA of assets}}{\text{\% of assets requiring CA's}} \times 100$	Monthly	Contractor	Volume 2/3
6	Budget Compliance	%	This indicator expresses the difference between budgeted and actual figures for a specific accounting category. Depending on the size of the Entity, managing the FM budgets can be the responsibility of many. Accurate data is very important.	$\frac{\text{Actual budget (per contract or per service)}}{\text{Planned budget}}$	Monthly/quarterly	Entity/Contractor	Volume 2
7	Average Response Time	H:M	The average response time is defined as the time it takes for maintenance personnel to respond to a complaint for maintenance of	The average amount of time (e.g., in minutes)	Weekly	Contractor	Volume 2



Key Performance Indicators

			an asset from the time a call was made to a Help desk representative or call center with the complaint being raised.	between the detection of an incident and the first action taken to repair the incident.			
8	Average Resolution Time	H:M	This is an average time defined as the time it takes for the entire process to be completed from Help Desk initial call to close of the work order for the complaint being raised.	Time in minutes as an average.	Weekly	Contractor	Volume 2
9	Building Maintenance Annual Cost per SQM	SAR / SQM	Total Annual Cost "Building Maintenance" divided by the Internal Area. Note that the annual maintenance cost of a building will depend on what critical assets are in that building.	Total Annual Cost "Building Maintenance" divided by the Internal Area	Custom	Entity	Volume 5
10	Statutory inspection activities are completed as per the monthly schedule.	%	This KPI show that the Entity management is focused on ensuring that operations and maintenance is run with quality control and assurance. Completed inspections as per the schedule show a commitment to compliance.	% Inspections complete = planned inspections – completed inspections / planned inspections * 100%	Monthly	Entity/ Contractor	Volume 5
11	Percent Reactive Maintenance	%	This is a measure of the amount of reactive maintenance against all maintenance costs. As the value decreases it demonstrates stronger FM practices. The industry rule of thumb says to aim for only 20% of your maintenance time to be devoted to reactive maintenance.	% RM = Reactive maintenance costs / Total maintenance cost. RW (%) = (WBS/TML) *100	Monthly	Contractor	Volume 6
12	Work order cycle time or average word order duration	Days	This is the time from the creation of a work order until it is closed in the Computerized Maintenance Management System (CMMS). This KPI demonstrates the efficiency of the resources responsible for closing work order management. Calculating cycle time is important as it gives us insights on how to tweak processes and work policies to be more efficient and cultivates a mindset for continuous improvement.	Work Order Cycle Time = Work Order Completion Date – Work Order Creation Date (in Days)	Monthly, Quarterly, Annual comparison	Entity	Volume 7
13	Maintenance Costs as a % of Total Operating costs in the period	%	Maintenance cost over total operating cost with selected period of time. As the maintenance of assets continues based on the asset condition. This KPI can highlight areas of concern as the assets age. It can identify the need to look closer at those assets which are running higher than normal maintenance costs to look at more depth and detail for a team to improve or reduce maintenance costs from a people, tools and processes potential and determine the effectiveness or efficiency of the assets over time. Can be used for critical assets of high value. Allows for future planning. Repair vs replacement	% = Maintenance cost / total operating costs	Monthly/ quarterly	Entity	Volume 6
14	PM compliance	%	If high, then it indicates reactive maintenance is dropping and asset health meeting specification. This is a leading indicator to asset health	% = # of planned maintenance activities	Weekly/ Monthly	Entity	Volume 6



Key Performance Indicators

			and performance. Planned maintenance activities are completed as per the monthly schedule.	completed/ scheduled PPM's			
15	Maintenance Costs as a % of Asset Replacement value	%	This KPI will allow the Entity to make strategic decisions based on current maintenance costs cumulative over a period of time vs what the cost of replacing the asset would be.	% = Maintenance Cost/Asset replacement value	As per request	Entity	Volume 6
16	Reactive Vs Preventive	Ratio	This KPI is a Technical KPI measuring the reactive maintenance of assets compared to the preventative maintenance of the assets. Tracking work orders issued over a period of time	RM: PPM	Monthly	Contractor	Volume 6
17	Planned Vs Executed	%	This shows the number of planned preventative maintenance work orders planned over a certain period of time vs how many of the planned tasks were actually executed in the prescribed time frame. It will show the Entity the compliance with the PPM maintenance schedules for the assets it holds.	% PPM complete = Planned (PPM) / Executed PPM *100%	Monthly	Contractor	Volume 6
18	Waiting for work to commence	Days	This KPI allows the Entity managers visibility on how well the procurement of parts and materials is being managed. Long lead times indicates a lack of service which can lead to contract reviews of SLAs and penalties.	Work orders waiting for parts & materials/ all orders	Monthly	Contractor	Volume 7
19	Man-hours Utilization	%	This element is used to monitor the proper utilization of the available resources. It is derived by taking the total man-hours spent (actual hours) and divided by the available capacity. Good supervision and resource planning can help manage the labor force.	Man Hours Utilization= (Actual man hour/ Available man hours) x 100	Monthly	Entity	Volume 7
20	Actual hours to planning estimate.	% +/-	This metric is the ratio of the actual number of labor hours reported on a work order to the estimated number of labor hours that were planned for that work order.	Actual Hours to Planning Estimate = (Actual Work Order Hours / Planned Hours) x 100	Weekly, monthly, quarterly, annually	Entity	Volume 7
21	Planning variance index	% +/-	This metric measures the percentage of planned work orders closed in which the actual cost varied within +/- 20% of the planned cost.	Planning Variance Index = (Number of closed planned work orders in which actual costs are within 20% of planned cost / Total number of planned work orders closed) x 100	Time basis: Weekly, monthly, quarterly and/or annually	Entity	Volume 7
22	Mean Time Between Failure	#	The average length of uptime periods between failures for a plant or individual piece of equipment.	MTBF = Operating time (hours) / Number of Failures	Monthly (Up to Date)	Entity	Volume 2
23	Facility Condition Index (FCI)		Facility Condition Index (FCI) A key performance indicator (KPI) which is used to objectively quantify and evaluate the current condition (IE, physical health) of a facility and to make two types of benchmark	FCI = DM/CRV	As per request	Entity	Volume 7



Key Performance Indicators

			comparisons on the relative condition of that facility in relation to the current replacement value of the asset. (DM) means deferred maintenance The DM value is also obtained in a variety of ways at the discretion of the stakeholder. This would include life-cycle cost projections, detailed facilities condition analysis, in-house evaluation, or educated guesses. (CRV) is Current Replacement Value.				
24	# Hours without an accident	#	The number of labor hours without an incident helps the Entity understand the compliance with HSE. Health, Safety and the Environment. Zero Harm needs to be achieved for success. I	Metric for HSE # of hours	Monthly	Entity/ contractor	Volume 5
25	# Of lost time incidents/200,000 hr	#	This KPI measures the # of lost time incidents per 200,000-man hours of work. It demonstrates the safety record of the contractor.	#LTI/200,000-man hours	Hours	Contractor	Volume 5
26	Customer Satisfaction	#	Used to track the number of complaints within an Entity to understand the feedback from you're the customers. A decreasing number indicates a level of satisfaction is achieved. As overall FM improves customers' complaints using the facilities should decline. Demonstrates the effectiveness of the O&M staff.	# Of complaints for services can be tracked by week or month.	Weekly/m onthly	Entity	Volume 2
27	Training progress reporting	#	This KPI will show the training plan progress for the skills, abilities, qualification and experience for each proposed position. It will identify the gaps and how they are to be filled with tracking the progress of the training.	# Of employees - % of training completed as a form of progress.	Quarterly	Contractor	Volume 5
28	Total Supply Network Lead Time	%	Timely delivery of the order as set out in the Agreement/Contract/PO In order to understand the contribution of each functional area to the lead time, and hence, areas for improvements	Timely delivery of the order as set out in the Agreement/Contract/PO	Monthly	Entity	Volume 8
29	Inventory to Consumption Ratio	Ratio	The Inventory to Consumption Ratio KPI is one metrics that helps evaluate the overstock that will also tell us whether we are able to face unexpected demand situations	Divide the available inventory for consumption by the daily or monthly average of quantity actually consumed	Daily or Monthly	Entity	Volume 8
30	Cost of Contract Extensions	\$ Value	The cost associated with contract extensions, which can be avoided if there is communication amongst the stakeholders to review contracts and continually improve the contracts.	Cost of Contract Extensions	Monthly	Entity	Volume 9
31	Stock outs	%	This metric is the measure of the frequency that a customer goes to the storeroom inventory system and cannot immediately obtain the part needed.	Stock Outs (%) = (Number of Inventory Requests with Stock Out / Total Number of Inventory Requests) × 100	Monthly	Entity	Volume 8