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Volume 15, Chapter 3

Dashboard Management Guideline

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1.0 PURPOSE

This document lays out standards by which Government Entities' Dashboards, shall be set. The procedure includes International Best Practices, wherever applicable.

The procedure aims to enable Entities to follow **best practice guidelines** during their Dashboard development process, thus ensuring that they produce effective and efficient dashboard information, leading to informed decisions, continuous improvement, and success.

This document provides a foundation to the Entities' management-level, regarding Dashboard concept, importance, framework, process, and utilization. The document may be utilized by any Entity to help managers to visualize their performance indicators, and thus lead them to compare and improve the overall outcome, based on their pre-set objectives.

2.0 SCOPE

This document is developed as a guideline for the management-level within government Entities, and in the context of Asset & Facility Management (A&FM)–It describes fundamental aspects of Operations and Maintenance (O&M) Dashboard development, and functions. Although references are made to commonly used O&M Dashboard characteristics, each Entity shall design its own specific Dashboard attributes, based on its strategic objectives, and O&M requirements.

The purpose of this document is not to explain, develop or design a specific Dashboard for any particular Entity; rather, its intent is to demonstrate the key aspects of Dashboard development to the Entity's Management, including Dashboard concept, value to the Entity, framework, high-level architecture, and reporting techniques It also lays out the manager's contribution to the Dashboard-development process, and how they may utilize the Dashboard efficiently. Expro standards and guidelines should be fulfilled by all Entities, during the Dashboard-creation phase.

Mapping between job levels, Dashboard main types, and an organization's common functions, are demonstrated in Figure 1. To simplify the concept of Performance Monitoring within Entities, this model has been divided into two main Dashboard scopes: 'Management Dashboards' and 'Users Dashboards'.
This guideline will focus on the Management Dashboard, while the next chapter within this volume will focus on the Users' Dashboard.

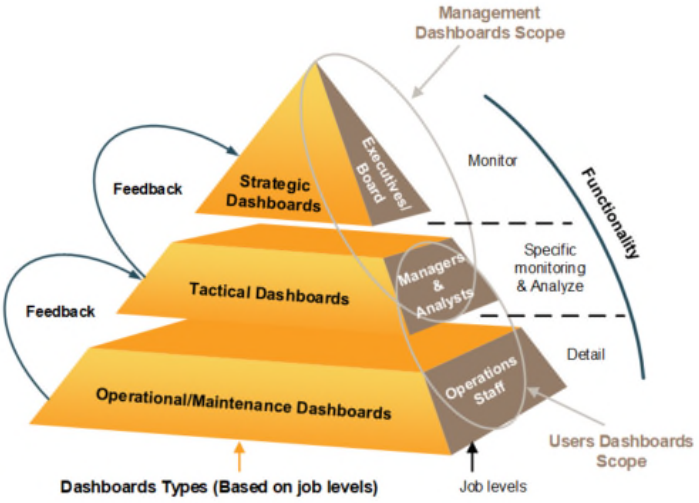

Figure 1: Mapping between Main Job Levels, Dashboard Main Types, and an Entity's Common Functionalities

2.1 Defining Dashboard

A Dashboard is a visual reporting tool, developed to meet the needs of audiences at various levels in an organization and which allows users, at a glance, to absorb and comprehend the progress towards achievement of one or more objectives. Dashboards may represented, categorized, and arranged on a single or multi-layered screen(s), sometimes called “Large Screen Display (LSD)”. LSDs often process real-time data, while Dashboards usually do not.

A Management Dashboard is a tool used to illustrate all strategic and important Key Performance Indicators (KPIs). Its purpose is to support top levels of management to measure performance, and help them make informed decisions based on current, accurate information. This is known as a “data-driven decision” approach. The rest of this document will discuss Dashboard from the management viewpoint.

Dashboards drive business processes by enabling organizations to monitor, manage, and improve their business performance appropriately.

2.1.1 Why Do We Need a Dashboard for Executives and Managers?

Managers and Executives need clarity when it comes to understanding the performance of their organization. The easier it is to understand overall performance, the better it is for all concerned. The fish-bone diagram below (Fig. 2) summarizes the main components and subcomponents, which describe an Entity’s operation in terms of scale and complexity. It also shows that with careful planning and capturing of information, as well as transparent, valuable, and reliable reporting, organizational performance can be achieved.

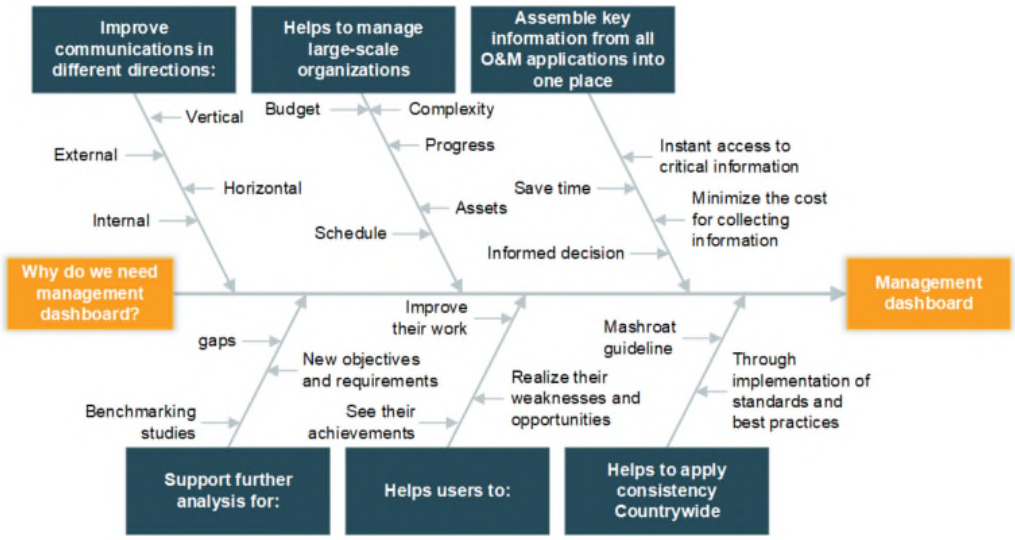

Figure 2: Main Reasons for Developing ‘Management-Dashboards’

2.1.2 What Should be Included in a Manager’s Dashboard?

Information for the ‘Managers’ Dashboard’ should be selected and displayed, based on the following main points:

1. Management-Level Metrics
2. Related Subject Matter

Understanding management’ needs at all levels, is a critical factor in deciding the type of information that needs to be displayed. For example, C-level Management “Executives-Top management level

(Department and above-based on the Entity sturucture)" require comprehensive information concerning the organization's overall performance and progress. By contrast, lower-levels of management will be concerned with information regarding the performance of their own respective department's, and their team's progress.

The subject-matter is another key factor that influences the type of information displayed on the Dashboard. For example, the general manager or Chief Executive Officer (CEO) and Ministers, should have a high-abstraction Dashboard, which summarizes the most significant factors that impact the Entity such as:

- Main Objectives
- Budget
- Strategic Plan Schedule

C-level Management should also be aware of the above Dashboard, but they also require Dashboards catering to their own domains, such as:

- General managers, and Deputy ministers.
- The operations manager or Chief Operating Officer (COO) should have an "Operations-related Dashboard"
- The IT manager or Chief Information Officer (CIO) should have an "IT activities Dashboard"
- The finance department manager or Chief Financial Officer (CFO) should have a "Financial Dashboard," including income, outgoings, net-profit, overall expenses, asset maintenance cost, and asset operational costs

Management Dashboard information is the output of KPI analysis, where both are designed and developed based on specific, management-level (stakeholder) concerns, as illustrated in the O&M Dashboard context diagram below (Fig. 3).

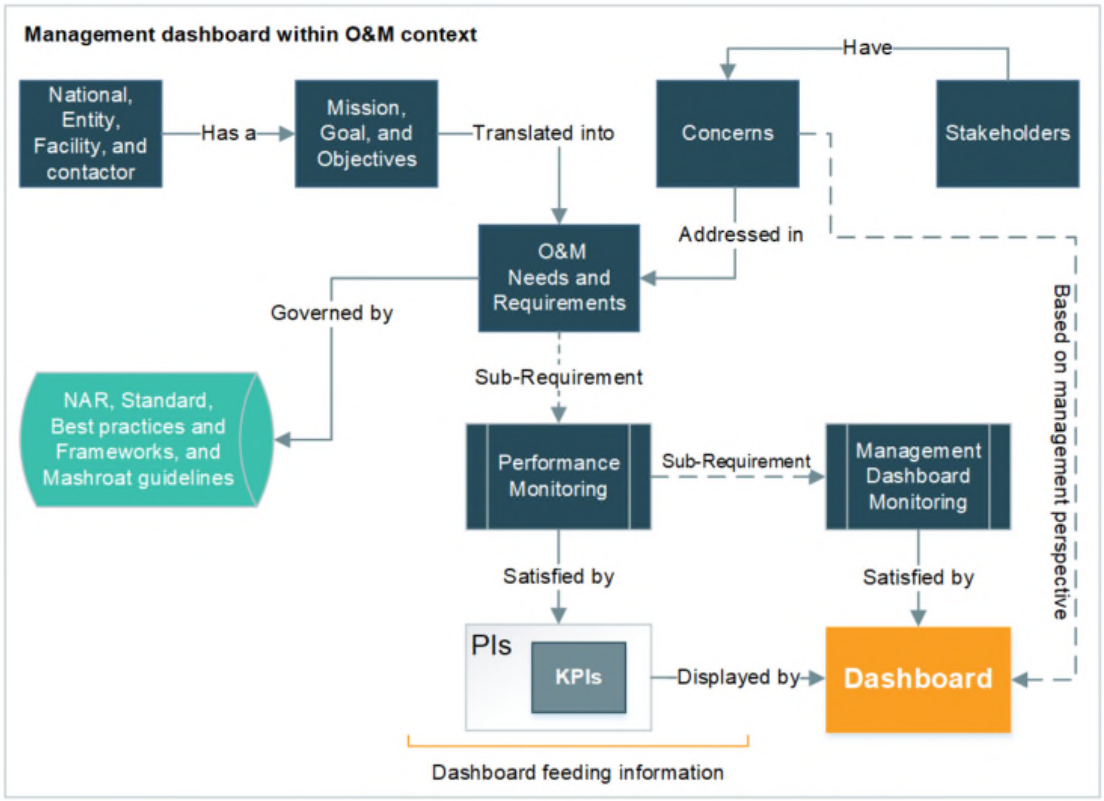

Figure 3: Dashboard Context within the Entity O&M Scope

A classic Dashboard comprises three elements as follows:

- A title, explaining the Dashboard's scope and content;
- A diagram illustrating KPI-metrics;
- Brief text, numeric, or symbolic descriptions in the diagram;

2.1.3 When Should a Dashboard be Developed?

Before starting a Dashboard design, Entities should define and plan their goals, objectives, and processes, addressing every context possible, including Dashboard development. Thus, the creation of an effective Dashboard, should be formally included within the Entity's strategic planning phase. In the later stages of the business process, as the information needs of the Entity become clearer, the Dashboard concept will evolve. However, it should always be linked to the predefined O&M objectives, requirements, and KPIs.

2.1.4 Where Should the Dashboard be developed?

This question is related to 'Dashboard-environment'. Each Entity should have the required Information Technology (IT) infrastructure and A&FM system (i.e., AMS) that allows for automation process including extracting, categorizing, and displaying information. Where a technology-based Dashboard solution is not an option, the Entity could use paper-based reports that replicate the output if IT-Dashboard screens.

2.1.5 Dashboard – KPIs' Relationship

Dashboards are strongly related to KPIs because their main function is to represent KPI analysis output, in simplified visual form, for the intended stakeholders. The framework of KPIs is explained in the National Manual of Assets and Facilities Management (NMAFM) Volume 15 Chapter 2: Key Performance Indicators.

The dashboards as explained in this document, are involved in the KPI framework Reporting phase (3), but the dashboard development process should not be confused by/or conflict with the KPI development process.

3.0 DEFINITIONS

Term	Definition
Expro National Dashboard	A digital display Monitors Entities A&FM strategic performance and reports to Governmental Highest Management
BABOK	"The Business Analysis Body of Knowledge" is a family of guides, published by the International Institute of Business Analysis (IIBA), and which focusses on standardized and accepted, business analysis practices.
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.
Capability Maturity Model Integration (CMMI)	An approach developed to improve an organization's process in delivering product or services.
Dashboard	A visual reporting tool that is developed to meet the needs of audiences at various levels within an organization, and which allows users to absorb and comprehend, at a glance, the progress towards achievement of one or more objectives; Information is represented, categorized, and arranged on a single screen, or multi-layered screens.
Entity	Entity includes Government Ministry, including government agency, government commission, any regulatory authority of any government/semi government.
IDEF0	IDEF0 is a composite acronym: "ICAM Definition for Function Modeling", where "ICAM" means: "Integrated Computer Aided Manufacturing").

Term	Definition
	The IDEF0 Functional Modeling technique is used to model decisions, actions, and activities, of an organization or system.
KPI	"KPIs are quantifiable measurements, agreed by stakeholders, which reflect the critical success factors of assets, or the operations or the services to be delivered." (IFMA definition)
Expro	Government Expenditure & Projects Efficiency Authority
Operations and Maintenance (O&M)	Operations and Maintenance (O&M) of Facility and assets. The Entity may be required to enter into single or multiple agreements with other-parties to perform O&M works, or services
Performance Evaluation	An internal form used to evaluate and record a performance results for future analysis work for an Entity
Acronyms	
BIFM	British Institute of Facilities Management (now known as IWFM).
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CIO	Chief Information Officer
CMMI	Capability Maturity Model Integration
COO	Chief Operating Officer
DFD	Data Flow Diagram
DT	Dashboard Team
IAM	Institute of Asset Management
ICAM	Integrated Computer Aided Manufacturing
IDEF0	Integration Definition for Function Modeling
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IFMA	International Facility Management Association
IIBA	International Institute of Business Analysis
ISO	International Organization for Standardization
IT	Information Technology
IWFM	Institute of Workplace and Facilities Management
KPI	Key Performance Indicators
LSD	Large Screen Display
NCLOM	National Committee for Legislation and Standardization of Operation and Maintenance
NMAFM	National Manual of Assets and Facilities Management
O&M	Operations and Maintenance
OOAD	Object-Oriented Analysis and Design
AMS	Asset Management Software

Table 1

4.0 REFERENCES

- British Institute of Facilities Management (BIFM) – Sourcing Strategies
- ENT-PD0-GL-000002 – Dashboard Data Guideline
- ENT-ZA0-SD-000001 – Asset Management System Standard Requirements
- ENT-ZA0-SD-000002 – Assets Register Standard Requirements
- National Manual of Assets and Facilities Management – Volume 15 Chapter 2: Key Performance Indicators
- EXP-IT0-PL-000005 – Expro Dashboard Development Scope
- EXP-P00-PR-000001 – Expro Monitoring and Evaluation Operating Procedure
- NCLOM Project of Survey and Study of the current Operation and Maintenance work statues at government Facilities – Executive Report (31st Jan 2016)

The Industry Best Practice considerations referenced in this document will be:

- Institute of Asset Management (IAM)
- Institute of Workplace and Facilities Management (IWFM) KPI Register
- ISO 55000 family: International Standards for Asset Management
- ISO-42010:2011 Systems and software engineering
- IWFM KPI Guidance – 2017

5.0 RESPONSIBILITIES

Role	Description
The Government Entity	Responsible to set the Dashboard's main goals and objectives, based on the Entity's overall mission and goal.
Dashboard Team (DT)	Responsible for: • Exploring Dashboard requirements; • Designing Dashboards based on needs and viewpoints; • Developing Dashboards that are aligned with KPIs; • Maintaining Dashboards; • Reviewing and Improving Dashboards;
Entity Management	High-level management should assign/form a skilled "Dashboard-Team" (DT), to develop, maintain and improve, the required Dashboards for the Entity.

Table 2: Responsibilities

6.0 DASHBOARD DEVELOPMENT FRAMEWORK.

Dashboard Development from a management perspective framework is a conceptual structure, created to guide users towards building something beneficial. This Dashboard framework (Fig. 4), has been developed to guide Executives and Managers, within government Entities Management, through the Dashboard's process, requirements, architecture, reporting mechanisms, and its use.

The framework should act as a guiding principle to:

- Ensure consistency between Entities countrywide;
- Develop and use current Dashboard techniques that are based on existing best practices;
- Simplify its process in a scientific manner, without neglecting any important aspect for the user-level Dashboard;

6.1 Process Description

This framework describes a Dashboard development process that should be applied in a specified and logical order, to help prevent any gaps arising prior to reaching the Dashboard deployment phase; this will save time, and costs. The following steps explain the visual process, as seen in Figure 4 above.

- To develop a proper Management Dashboard, the top management of the Entity need to identify the 'problem-context'. Once this is done, a team of individuals with Dashboard expertise, needs to selected and assigned to develop the required Dashboard(s), according to the overall goals and objectives of the Entity. They will be the Dashboard Team (DT) and two points need to be considered during their selection process, which are:
    - The selection of the DT members depends on the audience of the dashboard; a higher-level audience will require that the selection be made from individuals higher up in the organizational hierarchy.
    - Other key-members could be involved when required, if they are not included within the DT.

- After the selection process, the development tasks start and they should part of DT responsibilities. The DT should report their development progress to the organization's top management on a regular basis, or when required.

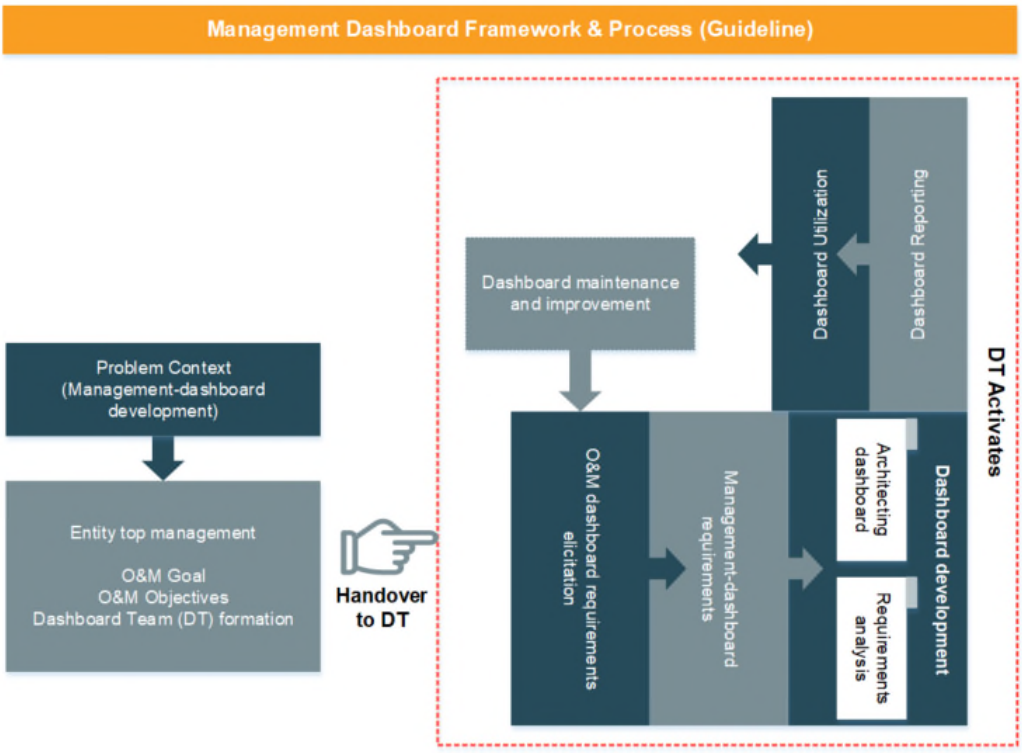

Figure 4: Management-Dashboard Main Development Process

6.2 O&M Dashboard - Requirements Elicitation

'Requirements Elicitation' is the process of finding, uncovering, and obtaining, information/data from users and any related stockholders, which satisfies predefined requirements, scopes, and objectives. A project's success greatly depends on capturing the intended requirements accurately, throughout the Dashboard-development process.

The six main activities within the red box (Figure 4) are DT responsibilities. These activities start with 'Requirements Elicitation', from the O&M organization.

In this step, the DT should extract and build concrete O&M Dashboard requirements, constructed upon the overall objectives of the Entity, as well as specific O&M objectives. Though there are different processes and methods for conducting 'Requirements Elicitation, one of the best practices was introduced by Tim Kasse in 2008; which developed Dashboards according to the Capability Maturity Model Integration (CMMI) standard approach.

Another method is the one explained by the Business Analysis Body of Knowledge (BABOK) series, which has been proposed by the 'International Institute of Business Analysis'. In Figure 5, common processes and techniques are illustrated using the Integration Definition for Function Modeling (***IDEF0***) diagram, to guide the Entity during their 'Requirements Elicitation' procedure, which is written according to the current best practices. Explaining each process or method included within the diagram, is beyond the scope of this guide.

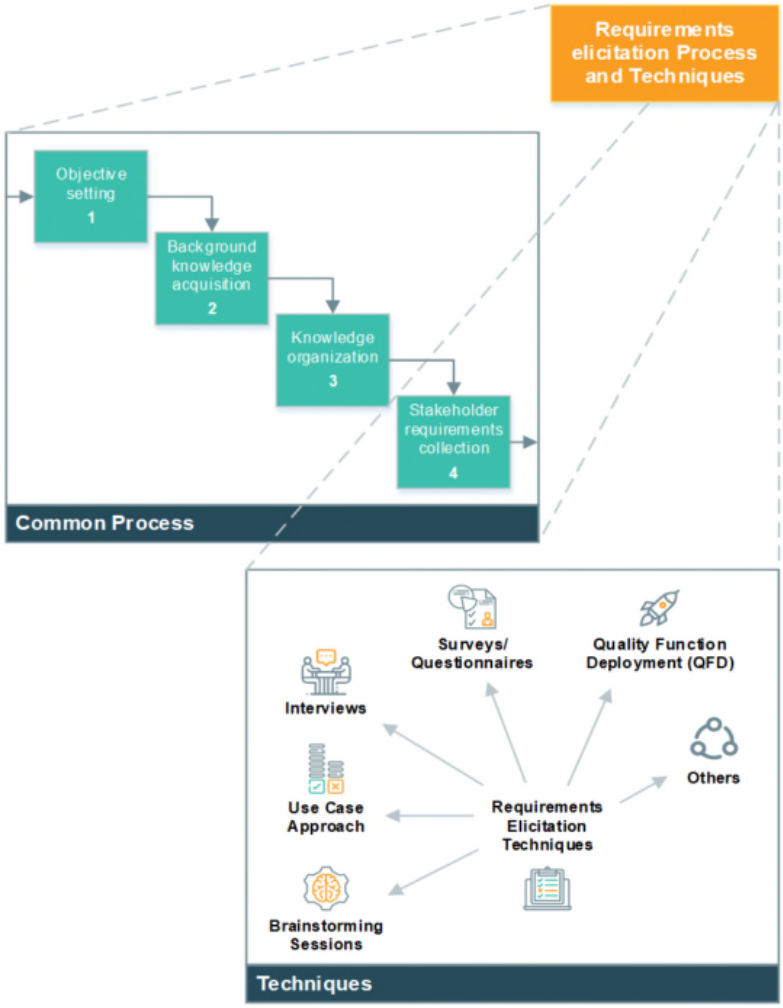

Figure 5: Requirements Elicitation - Process and Methods

6.2.1 Management-Dashboard Requirements

Once the DT has gathered the essential O&M Dashboard requirements, specific Management-Dashboard requirements should be developed and represented, either by textual and/or modelling languages (e.g., Components-Connectors). Management-Dashboard requirements should be scoped to managers, and senior analysis levels within the Entity, as illustrated in Figure 3 (Section 2.1.2).

These types of Dashboards could be one or several, depending on the size of the data and requirements. However, this level of Dashboard requirements should be driven by both strategic and tactical viewpoints.

Some basics to consider during this process are as follows:

At a strategic level:

- Aligning business viewpoints through the usage of the same data, the same metrics, and towards the same strategy.
- Improving communication through the use of proper tools of strategic collaboration between managers and staff, through a well-designed, Management-Dashboard, and according to predefined objectives and specific needs.
- Coordinating among sub-entities and departments to improve visibility and compliance, through visualization of information at both levels: strategic and tactical.

- Avoiding the common, “operational” Dashboard that may not support decision-making at higher levels during development of the Management-Dashboard.
- Consider Expro requirements to report to the National A&FM Dashboard

At a tactical level:

- Incorporate data (detailed and aggregated) from multiple sources, both historical and real-time for managers and analysts at tactical level.
- Categorize data based on Managers’ common use and specific use (financial or operational). Also, list the information required, based on different manager’s needs, for further analysis and Dashboard design.

All collected requirements should be documented and categorized in a systematic way, for use and tracking purposes. Many reliable sources that describe ‘Document Requirements’, exist in the industry today.

Furthermore, different dashboard models and methods are existing within current industry today, each one do have specific scope. For Example, the dashboard model that proposed by (Adam and Pomerol, 2008), which do have detailed technical scope that is intended for dashboard skilled developers. Thus, it is not appropriate to be included in this guideline. Nevertheless, their model could be helpful for the Entities’ developers as a conceptual technical guide, during their Dashboard-development process.

6.3 Management Dashboard Development

Management-Dashboard development consists of two main, high-level, subcomponents:

1. Requirements Analysis
2. Architecture.

If the DT team gets these two components right, the rest of the development components, from designing to the acceptance-testing, should be satisfactory. The following sub-sections will explain these two components in brief.

6.3.1 Requirements Analysis

‘Requirements Analysis’, sometimes, called ‘Requirements Engineering’, are processes, methods, techniques, and tools used to determine if user expectations for a new or modified product/service,

have been met.

After requirements preparation, collection, and documentation phases are done, these collected requirements should be analyzed and clustered, based on the four main perspectives below:

- Viewpoints
- Business Flow
- Use Cases
- Prioritizations

Figure 6 shows an example of the analysis from ‘Viewpoints’ perspectives, and could be expanded as needed. Entities could select/add any analysis perspective/techniques that could satisfy their objectives, as applicable.

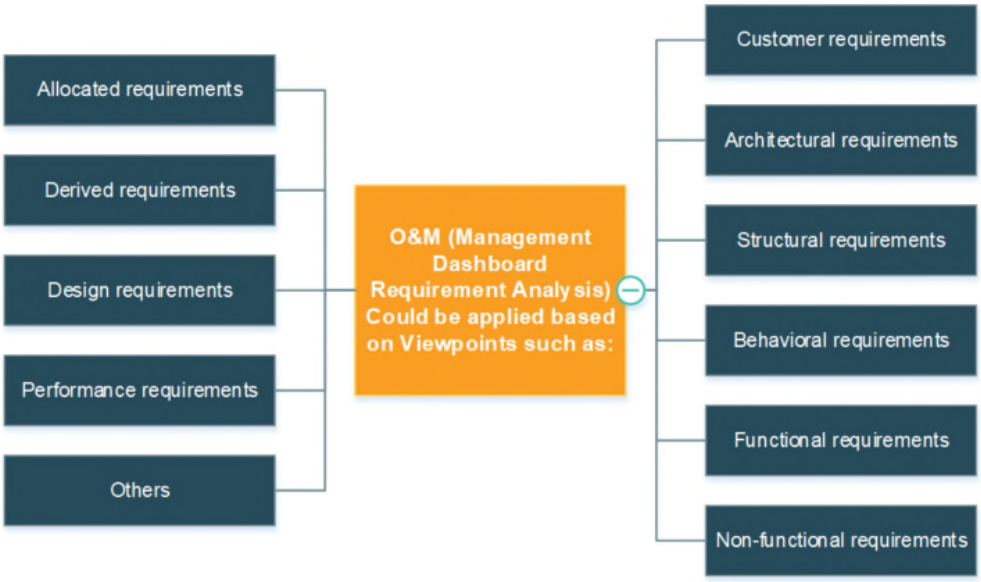

Figure 6: Examples of Analysis Viewpoints

The following list illustrates examples of techniques that could be used during Requirement Analysis:

- Gap-Analysis using Different Tools
- Business Motivation Model
- Customer-Journey Mapping
- Data Flow Diagram (DFD)
- User Stories
- Question and Answer Strategy

There are many reliable references such as the BABOK guide, International Institute of Business Analysis (IIBA), and 'Effective Requirements Practices', by Ralph R. (2001), that could be helpful to any Entity during this process.

6.3.2 Architecting Dashboard

Architecting activities within an organization can be undertaken by a "person or a group of people and facilities with an arrangement of responsibilities, authorities, and relationships," and/or in the form of an "endeavor with defined start and finish criteria undertaken to create a product or service in accordance with specified resources and requirements" [ISO/IEC 12207, ISO/IEC 15288].

6.3.3 Management-Dashboard Architecture Context

In order to have a valuable Management-Dashboard, Entities should develop their own dashboards based on current best practices and standards. Figure 8 illustrates the context of developing Dashboard system/services within a system domain. This context-diagram is based on the latest architecture ISO-42010:2011 standard. The figure shows the relationship between Management-Dashboard components, and the main components within ISO-42010.

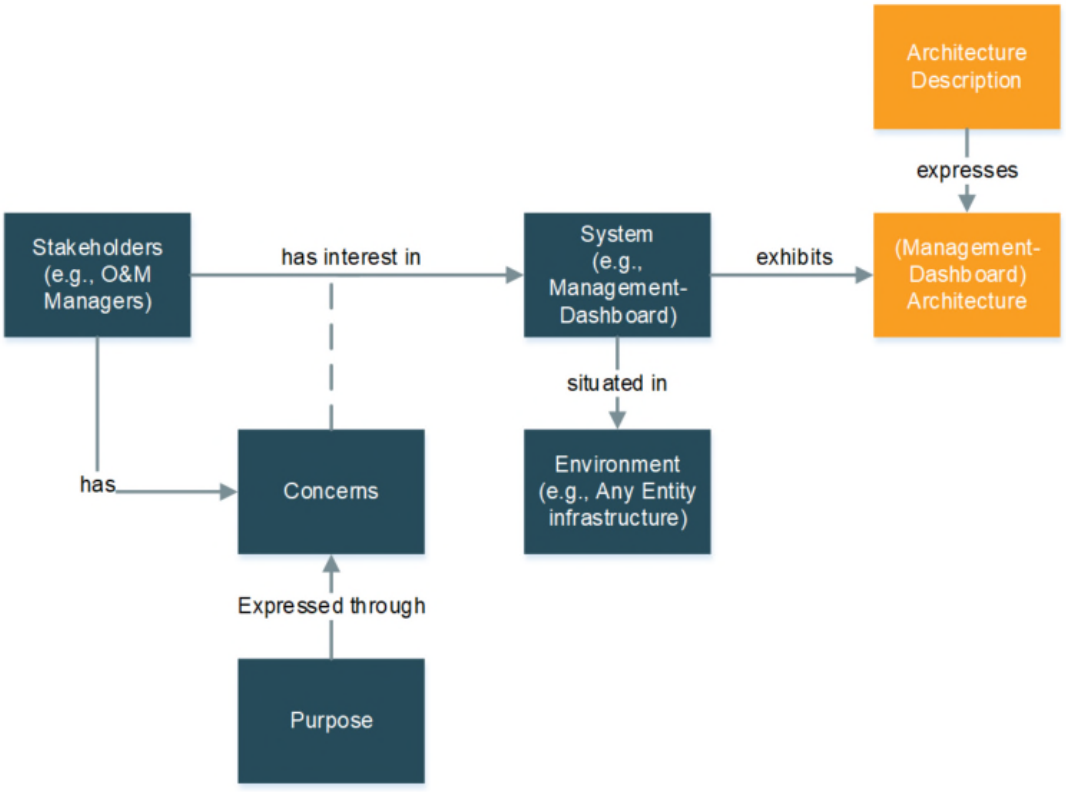

Figure 7: Management-Dashboard Architecture Context Diagram, based on ISO/IEC/IEEE 42010:2011

6.3.4 Seventeen Recommendations for Developing Dashboards

There are many published recommendations available, regarding Dashboard-development in the industrial, government, and academic sectors. However, Figure 9, shows the best, common-recommendations from all the three sectors, which were obtained through research, and from best-practices and standards.

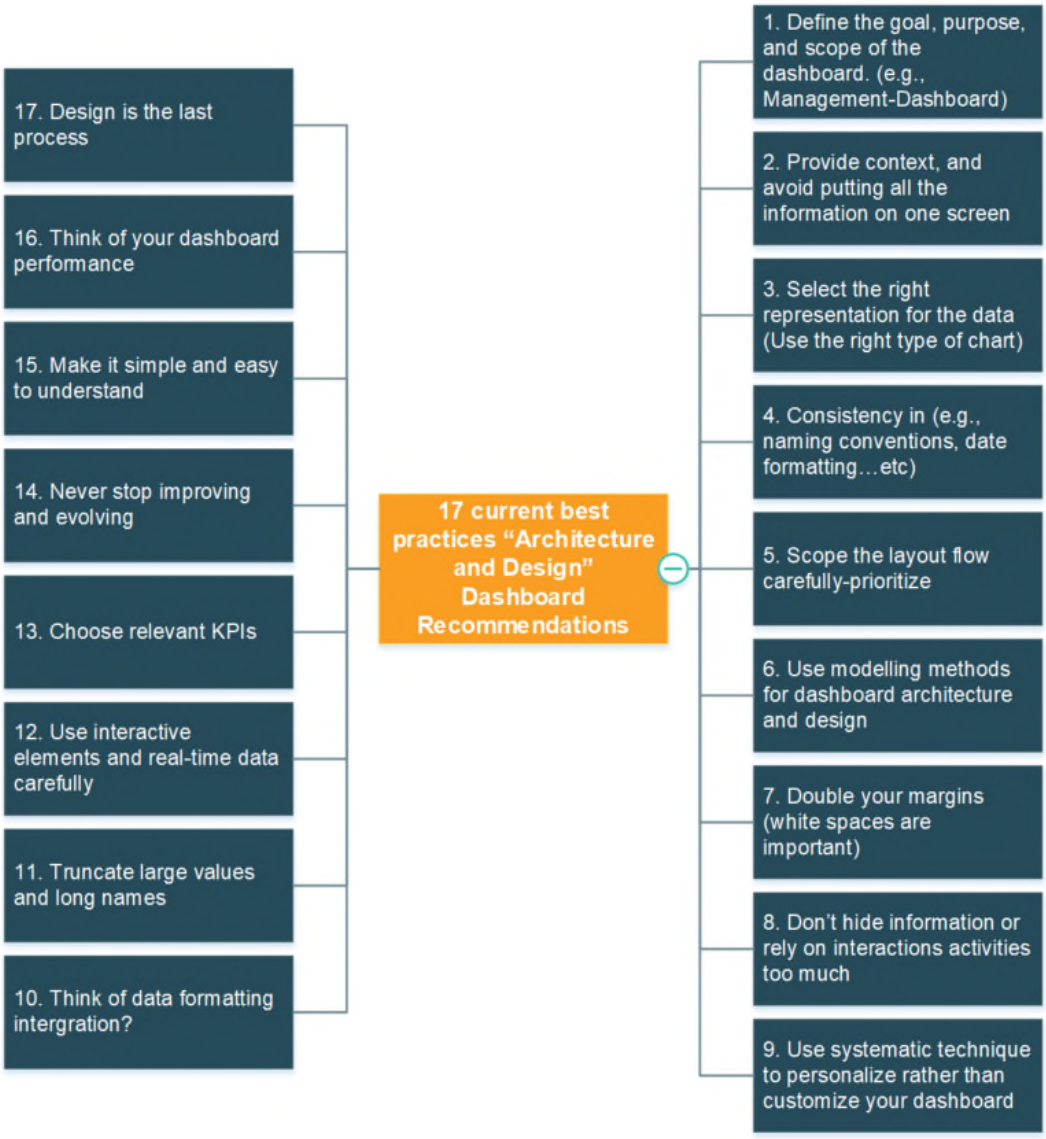

Figure 8: Seventeen Dashboard Development Considerations

6.4 Dashboard Reporting

A Dashboard report is usually a selected method used to track and monitor the health of an organization/Entity, or divisions/departments within that Entity by reporting/visualizing predefined KPIs and business metrics, mostly with software support.

Management-Dashboard reporting mechanisms could be different, and based on several factors, such as:

- Dashboard Goal
- Audience
- Information Type
- Required Level of Detail
- Domain (e.g., Financial, Technical)
- Others

Dashboards could be reported through simple text documents and spreadsheets, or sophisticated diagrams developed with a suitable methodology. Data results are reported for multiple time periods to show trends over time and include benchmarks or goals to put performance into context.

Executives, managers, and analysts should select their indicators carefully. The KPI development framework has been described within Volume 15 Chapter 2: Key Performance Indicators. Despite there being many Dashboards tools in the market today, what matters most is that the Dashboard architecture and design, is carried out independent of any tools. The main functions of the three Dashboard that are mentioned in Figure 1 are:

1. Operational Dashboards - to show any operational activities within an organization;
2. Strategic Dashboards - to track KPIs for top management and executives;
3. Analytical Dashboards - to process data and identify trends

Management-Dashboards mostly use strategic and analytical viewpoints to ensure that the organization's objectives are being met. User Dashboards mostly use operational and analytical viewpoints to empower workers, and to follow daily/weekly/monthly operational activities, whereas the strategic dashboards utilized by higher-level managers, ensure that the organization's objectives are being met.

Management-Dashboards should elevate data, improve the visibility of organizational performance, helping top managers in organizations to stay in control of their business at all times, and support senior analysts to establish targets based on insights into historical records/data.

6.5 Dashboard Utilization by Executives & Managers

Entity management levels: executives, managers, and senior analysts should use Dashboards according to their needs whenever they want, and without time-constraints. Their main tasks are to answer questions such as:

- Are we achieving KPIs targets?
- Are the key processes visible?
- Are there any performance issues within the Entity that could prevent it from achieving any of the predefined objectives?
- What can we improve?

6.6 Dashboard Maintenance & Improvement

Any Dashboard should be maintained and improved on a continuous basis, unless it becomes outdated.

Changes to the Entity's objectives or indicators should be reflected on all Management-Dashboards when applicable. Well-designed Dashboards should have well-designed, data-structure relationships. Thus, if one unit of information changes, it should be reflected on all related equations, metrics, or algorithms accordingly. The following section shows some snapshots of Expro Dashboards as examples.

7.0 ATTACHMENTS

All attachments were taken from Document No. ENT-PD0-GL-000001 Rev 00A, with authorization.

1. Strategic Dashboard Screenshots (example)
2. Tactical Analytic Dashboard Screenshot (example)

Attachment 1 – Strategic Dashboard Screenshots (example)

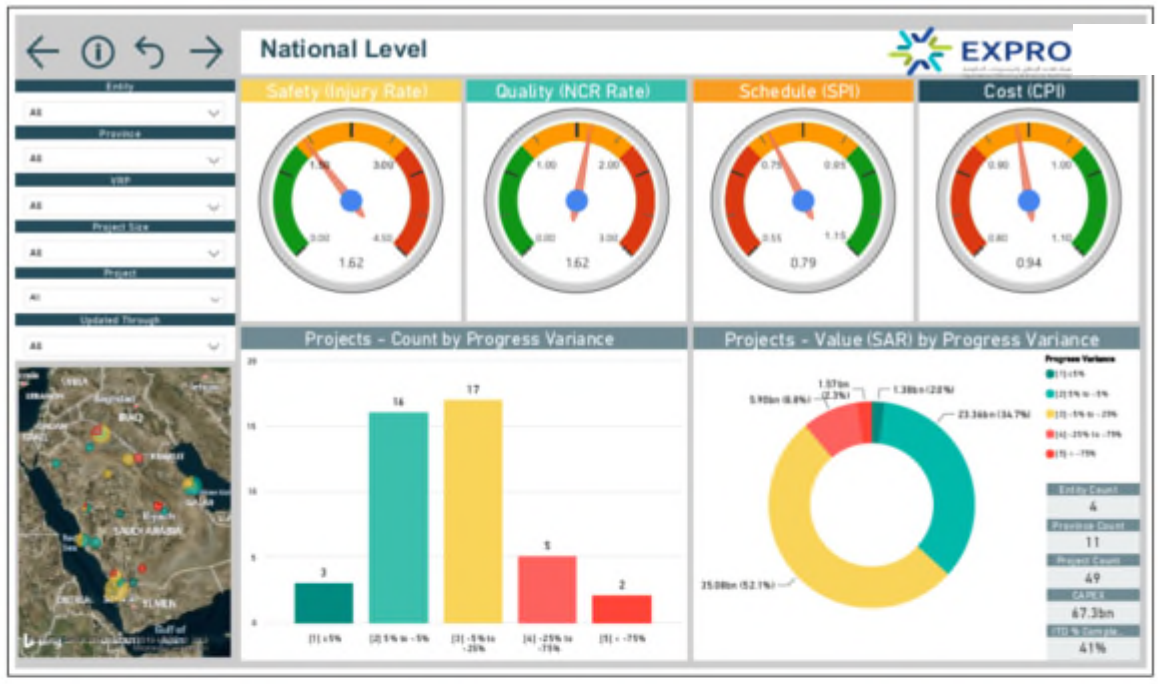

Figure 9: Strategic Dashboard Screenshots

Attachment 2 – Tactical Analytic Dashboard Screenshot (example)

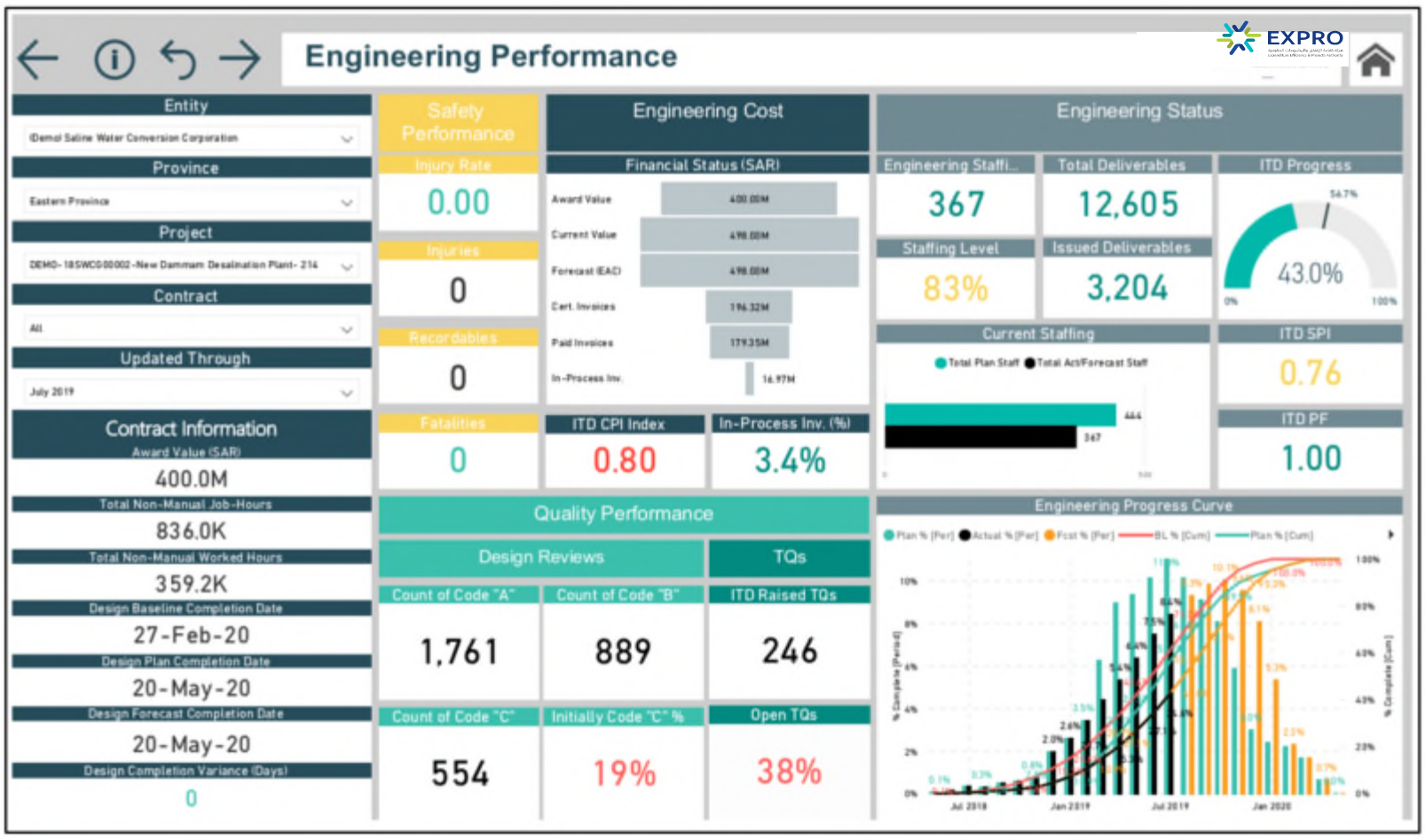

Figure 10: Tactical Analytic Dashboard Screenshot