

ASSET MANAGEMENT: LOCAL PROBLEMS, GLOBAL SOLUTIONS

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ABSTRACT. Concrete structures, irrespective of their intended application, exposure or required function, should be designed, constructed and operated, so that it meets a predefined level of service. This is the only criteria by which it can be measured, when determining its adequacy in meeting the needs of the present without compromising the ability of future generations to meet theirs. To recognise this goal, it is accepted that every new piece of infrastructure leads to a commitment for future maintenance. Maintenance is required to ensure that it fulfils its purpose and lasts for its intended design service life. Consequently, reactive and proactive life cycle asset management, is a critical component to be considered in ensuring resilient design of new and the management of existing structures. Outlined in this paper, is an overview of the processes and components involved in the development of an asset management strategy, taking account of the internationally recognised ISO Standards for Asset Management.

Keywords: Asset Management, ISO 55000, ISO 50001, ISO 50002

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INTRODUCTION

Concrete structures are normally considered to be designed so that they are durable, long lasting and capable of withstanding the environments to which they will be exposed [1]. However, historically and more recently, there are examples which demonstrate how structures are deteriorating at accelerated rates, causing corrosion of embedded steel reinforcement and subsequent spalling of concrete as corroding reinforcement expands [2, 3, 4]. As such, existing concrete infrastructure requires interventive maintenance management strategies throughout their designed service life and cannot currently be considered as a maintenance free.

Worldwide, the current volume of critical concrete infrastructure is substantial and continues to grow. Taking Great Britain as an example of a mature nation, a large quantity of our current infrastructure is established and of an aging nature. Most recent figures suggest that the one-off cost of the total maintenance backlog for council-managed road bridges alone, stands at approximately £7bn [5].

Therefore, it is reasonable to expect that as mature and maturing nations continue to develop their critical infrastructure, total volumes of infrastructure will continue to grow, alongside which, total maintenance burdens will also continue to increase. This is reasoning itself, as to why its management and maintenance is of critical importance. In addition to developing strategically effective maintenance strategies for existing, it is of great importance that new infrastructure is designed to be resilient and durable. This will ensure it meets serviceability requirements, whilst reducing its future maintenance burden through unplanned intervention maintenance activities.

THE ISO 55000 SUITE OF STANDARDS

The practice of asset management seeks to ensure the way assets are used and how long-term decisions concerning their operational requirements are made, are aligned to the strategic needs of an organisation. Historically, asset owners adopted varying practices, one of which was to align these aspirations to organisational goals. However, the introduction of the three ISO Standards for Asset Management in 2014, represented a structured change in approach. The Standard contains three documents:

- ISO 55000 Asset Management - Overview, Principles and Terminology [6];
- ISO 55001 Asset Management - Management System - Requirements [7], and;
- ISO 55002 Asset Management - Management System - guidance on the application of ISO 55001 [8].

ISO 55000 describes the major dimensions assets, asset management and the Asset Management Management System (AMMS), along with outlining the principles of asset management, terms and definitions. The ISO 55001 specifies the requirements for the establishment, implementation, maintenance and improvement of a management system for asset management. Lastly, ISO 55002 follows the same layout of contents as in ISO 55001 but has no “requirements”, instead focussing on providing further clarification of the intent of the requirements clauses in ISO 55001.

These series of standards are now internationally recognised as the standards that assist organisations to pro-actively manage the lifecycle of their assets, from acquisition to decommission. An asset's life cycle includes all the stages that an asset experiences over its asset life, with ISO 55000 defining asset life as the period from conception to end-of-life for an asset. Asset management life terms can be complicated as differing organisations purchase, operate and dispose of assets at different stages. Generally, it is left to the organisation to determine how to define and name each stage of the asset life cycle. Overall, this system is designed to help manage the risks and costs associated with owning assets, in a structured, efficient manner that supports continual improvement and on-going value creation.

ASSET MANAGEMENT PRINCIPLES, GOVERNANCE, POLICY & STRATEGY

In committing to introducing an asset management system that complies with best practice, the development and agreement of key principles, at the beginning of the journey, is critical to its implementation and overall success. A key set of principles that take due account of long-term financial, societal and environmental impacts, help deliver the asset management strategy, in a manner that is demonstratable. Principles should be developed and agreed, in conjunction with all stakeholders of an organisation, as a set of principles that will provide a sense of common purpose from the outset. Principle's may be associated with issues, such as, the need to balance cost, risk and performance or, that of the asset management life cycle, which is specific to asset management. The following non-exhaustive and high-level principles should be considered in the development of any asset management plan:

- A register of all assets with up-to-date information;
- A risk management framework to form the basis of investment decisions;
- Roles, responsibilities and accountability for asset management should be deigned;
- Performance and condition requirements for ensuring the required level of service;
- Risks associated with the non-delivery of maintenance, refurbishment and capital investment activities should be identified and controlled;
- An agreed, funded and prioritised delivery plan should be established for required maintenance, refurbishment and capital investment activities, and;
- A procedure for reviewing, monitoring and improving should be developed to report on the effectiveness of the asset management process.

To ensure that asset management processes and procedures are applied effectively and efficiently it is necessary to implement governance procedures. A strong defined governance function should be developed, and this can be implemented through the establishment of an Asset Management Oversight Committee (AMOC). The AMOC should be representative of the broader organisation and represent the full breath of the organisation.

ISO 55001 refers to an Asset Management Policy as a short statement that sets out the principles by which the organisation intends to apply asset management to achieve its organisational objectives. The policy should set out the commitments regarding achieving an organisations strategic business plan through asset management. The policy provides the framework around which the asset management strategy, principles and plans are implemented. It should be consistent with the organisation's overall approach to risk

management and investment planning. Line of sight is the term referred to for aligning the top down aspirations of an organization with the bottom up realities and opportunities of their assets [9]. Line of sight is making sure that the focus stays on the outcomes and it requires information sharing and optimization that begin before an asset is brought into service/bought and continues until after it is decommissioned/replaced.

Thereafter, ISO55001 refers to the Strategy as the Strategic Asset Management Plan (SAMP). The SAMP is used to outline intended achievements that an organisation aims to achieve from its asset management activities, taking account of future capability and performance requirements of assets, asset systems and asset portfolio. This is the document that specifies how organizational objectives are to be converted into asset management objectives, the approach for developing asset management plans and the role of the asset management system in supporting achievement of the asset management objectives. The SAMP is commonly considered as the second stage of an organisations line of sight.

ASSET MANAGEMENT ORGANISATION

When considering the implementation of an asset management organisation it is important to consider the following two aspects:

- asset management organisation structure, and;
- asset management organisation culture.

Typically, a question asked by leadership within an organisation is, “where should an organisation place asset management within its organisation?”. There is no one correct structure or answer as every organisation is different. However, where asset management sits in the structure can provide an indication of how seriously it is taken and how much of an influence it has on the running of such an organisation. Should asset management not be positioned sufficiently near the top, this makes it very challenging to implement change across an organisation and for good practice to be applied consistently.

Organisational structure refers to the way in which people are organised and the groupings in which they undertake their roles and responsibilities. The asset management structure of an organisation is important because:

- The way people are organised affects how effectively they work together;
- It is a key enabler to the ‘line of sight’;
- It influences the effectiveness of how information is communicated between key stakeholders (e.g. clients, staff, supply chain, regulators, shareholders), and;
- It can have a major influence on the culture of an organisation.

When an organisation is at the stage of considering what the most appropriate asset management structure should be, several factors need to be considered including:

- Size;
- Industry sector and the type of products or services provided;
- Diversity and ownership;
- Maturity of the business;
- Cultural background, and;

- Control of the services it delivers (i.e. the degree of regulatory involvement).

Thereafter, one of the most important elements of asset management is the role of organisational culture. Culture refers to a long-lived set of values, beliefs, attitudes and assumptions which affect behaviour and performance over the longer term [10]. A management system, no matter how well detailed and well implemented cannot specify, command or monitor all employee activities and actions. Culture is the key reference point as building an organisation with a healthy culture is a significant part of effective leadership for the following reasons:

- The organisational structure created by senior management can have a major influence on the culture of an organisation;
- Creating an appropriate organisational culture is integral to achieving the level of integration between functions that good asset management requires;
- An organisations senior management need to ensure that the structure and culture are conducive to what they want to achieve, and;
- Sustaining cultural change requires consistent behaviours, especially from management at all levels.

Experience has shown that a great deal of time and resources can be spent on rewriting and amending processes to improve asset management performance. This leaves less time and resource availability to influence and improve the culture and behaviours of an organisation. The reality is that processes are often adequate, with poor implementation and/or a lack of compliance. To avoid these issues, there are several values that should be applied when developing organisational culture:

- Be clear on the organisations purpose;
- Ensure visible support and engagement from top management;
- Be consistent across the entire organisation;
- Ensure everyone understands the need for collaboration and teamwork;
- Ensure everyone is clear about correct communication channels to be applied and that communications are received as intended;
- Ensure that actions are unambiguous properly assigned and reviewed, and;
- Most importantly, ensure that the authority of individuals match their level of accountability.

ASSET INFORMATION SYSTEMS

Good asset information, enables better decisions to be made, resulting in better outcomes for an organisation. When developing an asset register it is important to consider the following:

- The strategy for managing asset information;
- Asset information standards, and;
- Asset information systems themselves and what type of information should be held to enable effective decision making.

An asset information strategy assesses the current position and clearly articulates an 'end state' or intent. The strategy should define how the organisation intends to store, utilise, assess, improve, archive and delete asset information, to sustain levels of data quality

required to support asset management activities. The asset information strategy should consider the life cycle costs of the provision of asset information and the value the information adds to the organisation. It should also be clearly aligned with the organisation's asset management objectives and strategy. Overall the asset information strategy should contain objectives relating to the proposed improvement in asset information that are Specific, Measurable, Achievable, Realistic and Timebound (SMART).

Asset information standards are required to ensure that asset information is collected, categorised and provided to agreed levels and agreed timescales. Asset information standards should also define the quality standard appropriate for the different types of information, considering the criticality of the decisions made using the asset information.

Asset information systems can range from sophisticated integrated Enterprise Asset Management (EAM) products, to mixed environments software's, bespoke applications and spreadsheet-based analytics. The optimum mix of applications will depend on the size and complexity of the organisation and its regulatory environment.

RISK BASED ASSET MANAGEMENT

A major function of asset management planning is the prediction of future risk, and the adoption of the most cost-effective strategy to mitigate that risk. It is crucial that risk tolerance should be stated by the organisation in relation to essential services as a guide to inform the level and extent of asset management required. The tolerance can usually be expressed as the maximum allowable unplanned outage (loss of service), and/or the maximum acceptable number of outages (asset availability). Asset management plans are generally the most widely accepted mechanism to record the optimal strategy that has been identified to manage a specific class of critical assets. They will inform asset and maintenance planning, and therefore the minimum level of funding required to maintain that class of assets. In a complex infrastructure-rich environment, there may be many asset management plans.

The definition of levels of service, from the users' point of view, has the very significant benefit. Infrastructure assets, such as concrete assets, tend to deteriorate with age or use, so the risk of failure increases over time. The optimal timing of asset renewal/replacement or refurbishment may depend on the criticality of the asset, or on the 'risk cost' incurred by its loss of service. One of the key drivers of asset management is the need to ensure that the assets can provide the service levels required on a sustainable basis at the lowest total cost of ownership. In practice, not all assets are equal in importance to the organisation. Certain assets are characterised as 'critical' because essential services cannot be sustained if they fail. Conversely, other assets may have minimal impact if they fail. These characterisations enable different management strategies to be deployed.

This makes it possible to establish the effort required to achieve the levels of service, permitting an optimal strategy to be identified and adopted. The optimal strategy is a trade-off of risk (that the required levels of service may not be achieved) and cost (of the whole-of-life asset management activity required). Risk from the users' point of view is often described or valued based on either the cost of an alternative service to the one that is lost, or on the measurable cost of the loss.

Best practice asset management includes the development and regular review of asset management plans for all important asset categories. These plans are based on an assessment of current asset condition and the identification of issues that could affect service levels in the planning horizon. They evaluate options available to address these issues and inform cost effective strategies to be adopted. Determining the most cost-effective time for asset renewal or refurbishment requires assessment of the risk to the required levels of service of an asset failure and the cost of the intervention required to reduce that risk.

CONCLUDING REMARKS

Asset management as a discipline and professional practice has come a long way and the advent of the ISO 55000 series of Standards was a major milestone in that journey. This paper has highlighted the components that should be considered in complying with the process of the standard. It also identifies several areas where a theoretical and evidential based approach is necessary to ensure the success of the asset management system.

Assessment of compliance to ISO 55001, requires extensive documentation of the business processes and systems involved. The process descriptions themselves are not enough and must be demonstrably in use and embedded in other documentation.

Overall, organisations are placing a clear emphasis on financial management and future needs planning. Return on investment through the realisation of value from their assets and increased overall asset value are key drivers to these processes. Furthermore, many public facing industries are seeing increased expectations from consumers with regards to quality and resilience of services. Integration of an ISO 50000 series compliant asset management system can benefit organisations not only from a governing viewpoint, but also by providing them with a competitive advantage. They will ensure that they are effectively manage their assets, which will drive cost efficiencies and service reliability.

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