



Rail Enterprise Asset Management System

Mass Rapid Transit Corporation, Malaysia

Industry

Rail

Challenge

Manage complex rail asset information throughout the project lifecycle

Solution

Trapeze Enterprise Asset Management (EAM)

Overview



103.2km of track



107 train sets



63 stations & 3 depots



1,500km² geographical area serviced



266m annual ridership



600 employees

Results

- ✓ Improved asset efficiencies and effectiveness
- ✓ Real-time asset condition monitoring and cost tracking
- ✓ Improved asset governance



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Mass Rapid Transit Corporation (MRT Corp.) uses Trapeze’s Enterprise Asset Management solution to improve rail asset effectiveness and reliability – increasing efficiencies and reducing costs.

Background

The Klang Valley is a highly urbanised area in Malaysia, which includes the capital city, Kuala Lumpur, and surrounding cities and towns. The area is serviced by a network of multimodal transport options such as extensive road systems, integrated rail networks, and other public transport modes.

The Klang Valley Mass Rapid Transit (KVMRT) project is part of this transport network. The project will eventually be a three-line, modern railway system which aims to improve public transport services, while reducing traffic congestion across Kuala Lumpur. MRT Corp. is a Malaysian government corporation that was established in 2011 as the owner of the KVMRT project.

The first, 51-kilometre Kajang Line, was completed in July 2017. Construction is underway for the second 52.2-kilometre-long Putrajaya Line, which will be completed in 2023. A third line is currently in the planning phase. All lines will become part of the Klang Valley Integrated Transit System.

The Challenge

All rail organisations face the challenge of managing large numbers of diverse assets from an ever-increasing list of sources – including rolling stock, tracks, stations, and depots. Rail maintenance managers and asset management teams need to make sense of these often-complex data streams. Rail organisations require an accurate, up-to-date equipment inventory to keep assets in a constant state of good repair, in compliance with ISO 55000 - Asset management - Overview, principles and terminology.

As the KVMRT project is one of the largest infrastructure projects ever undertaken in Malaysia, rail maintenance can be a complex task, especially when maintenance crews need to manage many assets. MRT Corp. had built the first Kajang Line without implementing a Computerised Maintenance Management System (CMMS) before construction commenced. As there was no CMMS in place, asset information needed to be configured from the ground up before the Kajang Line was handed over to the operator. This was a difficult and labour-intensive task, as the construction firms involved had completed their contracts. This meant the asset dataset provided contained gaps and inconsistencies requiring re-work and investigation before the Kajang Line had a centralised source of asset information.



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The lessons learnt from this experience meant that MRT Corp. wanted to implement a CMMS during the construction phase of the Purrajaya Line – well before an operator was appointed. This would allow MRT Corp. to build an inventory and manage the life cycle of the asset dataset from its creation by the civil and engineering partners, through to handover to the operation and maintenance partner. MRT Corp. needed a better understanding of all rail asset maintenance requirements and potential capital and operational expenditure costs. Theyagarajan Bala Krishnan, Senior Project Engineer and Technical Specialist at MRT Corp., explains why:

“Among the challenges we faced included unorganised maintenance, the inability to track Original Equipment Manufacturer (OEM) requirements during the warranty period, not being able to plan and manage resources and materials efficiently, and not delivering quality and reliable services to passengers. For example, when one of our technicians was absent, who was assigned to complete a preventative maintenance task, the supervisor had to go through the training record manually to check and identify a technician with similar skills to reassign the task. It was also important that the system included asset data from contractors so that this could be compared against contractual requirements.”

Theyagarajan Bala Krishnan, Senior Project Engineer and Technical Specialist at MRT Corp.

One of the main challenges of constructing and operating a large infrastructure project is quickly capturing and retrieving accurate asset information and associated maintenance activities.

Data capture needs to be an easy, user-friendly process and be as close to real-time as possible. Rail assets usually have short maintenance windows as they are often highly utilised. Pre-empting failures based on condition data is an effective strategy to extend asset lifespan and reduce downtime.

The Solution

MRT Corp. went through a rigorous process to capture, identify, and analyse all construction, operational and maintenance requirements. Multiple departments were involved via a series of workshops, discussions, and meetings before evaluating potential Enterprise Asset Management (EAM) systems as the CMMS of choice.

Theyagarajan says, “I first heard of Trapeze Group through a recommendation by our senior management team based on their past experience. MRT Corp’s focus was specifically on finding a computerised maintenance management system to manage MRT Corp’s assets, and the Trapeze EAM system met our evaluation criteria.”





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The Trapeze EAM system gives MRT Corp. a 'single source of truth' - having all asset data located within one central technology solution. All information is stored and accessed digitally, which eliminates manual processes and forms - enabling increased efficiencies. While a manual process might take several days, the EAM system can achieve the same result within minutes. The EAM system ensures asset information integrity, as data from the concept and design phases of the Putrajaya Line has been accurately captured. This capability can be extended for future KVMRT lines.

MRT Corp. had the following goals for the EAM system:



Increase asset efficiencies for all project stages, using lifecycle information.



Reduce costs and risks from change and configuration management.



Ensure 'As-Built' asset information is the same as 'As-Maintained'

Theyagarajan continues, "The Malaysian government has invested heavily to develop the urban railway system in the Klang Valley. MRT Corp. was mandated to ensure that government investments benefit the public, as such, an EAM system was required to capture, organise, operate, and maintain the assets in order to maximise the use of invested capital, and increase the life span of the assets."

The EAM system also incorporated the existing and operational Kajang Line. The system contains a complete registry of asset information where replacement parts are traced back from original design blueprints, ensuring parts comply with design and maintenance standards.

“Our key performance targets were realised by minimising manpower usage, mitigating failures in advance, and having an organised chain of command to manage maintenance costs efficiently in terms of manpower, time and spares utilisation.”

Theyagarajan Bala Krishnan, Senior Project Engineer and Technical Specialist at MRT Corp.



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Benefits of Implementing the EAM System Early

By implementing the EAM system early in the Putrajaya Line project lifecycle, MRT Corp. now has accurate asset information to meet their requirements. These requirements include asset classification, asset type and function, equipment identification, location, maintenance standards and other asset-related specifications (Figure 1).

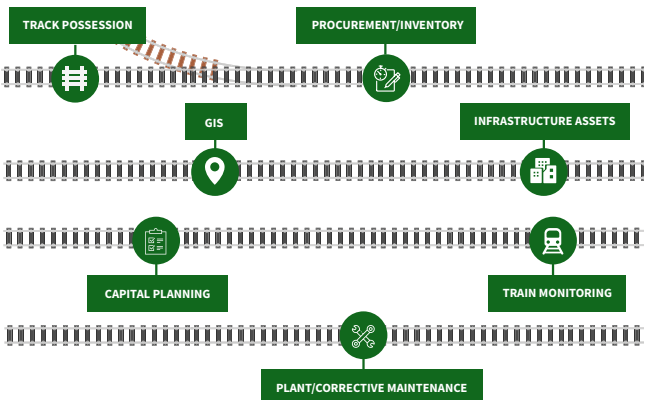


Figure 1: Rail asset information for a 'single source of truth'

All design standards were safeguarded and captured for the Putrajaya Line. The Trapeze EAM system provides MRT Corp. a seamless, paperless connection to multiple systems to consistently maintain asset information throughout the asset lifecycle - reducing rework and improving the lifetime efficiency of asset information governance.

Condition Based Maintenance

Condition-based Maintenance (CBM) allows rail operators to determine when to conduct preventative maintenance to minimise the likelihood of equipment failure and potential outages. The importance of CBM means the EAM system monitors asset condition and automatically alerts maintenance crews when potential asset failures may occur. The system enables compliance with MRT Corp.'s RAMS (Reliability, Availability, Maintainability and Safety) requirements and improves their asset reliability measures, as well as mean-time-before-failure targets.

With the Trapeze EAM system, MRT Corp. has accurate asset and maintenance records and a current view of above and below-ground rail assets - such as tracks, tunnels, bridges, signals, cables, sleepers, bearings, and electrical wiring. Asset data and associated records, work orders and service requests are viewable in real-time. From this information, effective maintenance plans are developed and implemented for rail assets. Ir. Major (R) Mohamed Shuhaidi Bin Omar, Head of Asset and Facilities Management comments:

"The KVMRT operator can easily identify assets that require maintenance and can allocate the right staff to undertake the work. The Trapeze EAM system and reports allow the operator to manage their workloads, and our data is consistent and easily trackable – and many processes are automated."

Ir. Major (R) Mohamed Shuhaidi Bin Omar, Head of Asset & Facilities Management Department, MRT Corp.

The EAM system ensures assets keep operating at acceptable levels by intervening only when required. The Trapeze EAM solution can also integrate with intelligent, self-monitoring assets to enable predictive maintenance.

Optimising Maintenance Schedules

With an EAM system purpose-built for rail, MRT Corp. can better manage asset and workforce activities to operate more efficiently, while reducing maintenance costs and improving safety. Maintenance times are also optimised via a view of available skilled engineer hours across multiple locations to schedule against upcoming maintenance work - reducing reactive maintenance times. The system also allocates and rotates maintenance crews as required, enabling "resource-levelling" of workforce requirements.

Theyagarajan says, "work orders are successfully assigned to the dedicated technicians using the scheduling features, for example, group and individual maintenance."



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The EAM system also allows for a better understanding of how planned maintenance schedules can affect asset availability through improved governance, ensuring that assets remain in an optimal condition.

The Trapeze EAM system does this by tracking an asset’s condition throughout its useful life. Understanding asset condition in real-time enables maintenance plans and inspections to be adjusted for each individual asset.

Ease of Use

Theyagarajan also sees the value in how the Trapeze EAM system is user-friendly and how the information it provides is used to make informed decisions.

“Since the Trapeze solution is a web-based design, it is convenient for the maintainer to perform tasks on-site and update information quickly via mobile devices without ever going to a physical desk or the office. We can obtain summary reports every month from the operator to understand the actual condition of MRT Corp. assets to realise the investment made is being utilised as required. It fulfils our railway asset maintenance requirements.”

Cradle to Grave Asset Management

By using the Trapeze EAM system, MRT Corp. captures, processes, and manages accurate asset information for their operator.

The EAM system ensures asset performance is measured and monitored to improve the efficiency, sustainability, and reliability of its assets over the entire project – from construction to decommissioning.

All asset information is traceable to the planning and design stage, which is useful when asset audits are conducted.

Asset management processes are also improved continuously to increase performance at all lifecycle stages (Figure 2). When making decisions to balance costs, risks, and opportunities against desired asset performance, MRT Corp. can incorporate information from the entire asset life cycle.

“The Trapeze EAM provides an organised maintenance regime for MRT Corp’s assets. In addition, it eases the operation and maintenance of assets for all KVMRT lines. We have been able to extend asset life span, optimise the use of resources and reduce our carbon footprint.”

Theyagarajan Bala Krishnan, Senior Project Engineer and Technical Specialist at MRT Corp

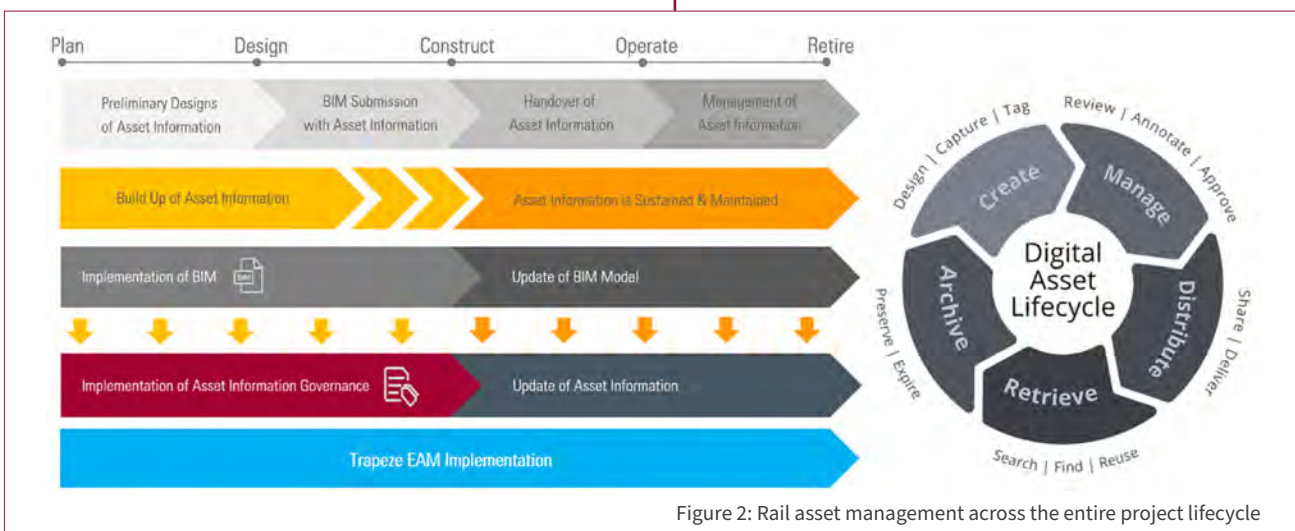



Figure 2: Rail asset management across the entire project lifecycle





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MRT Corp. EAM System Achievements and Success


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Improved asset efficiencies and effectiveness - asset management processes are improved continuously to increase performance at all lifecycle stages, while reducing costs.




Effective Condition-based Maintenance - the EAM system automatically alerts maintenance crews of potential asset failures.
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Real-time asset condition monitoring and cost tracking.




Optimised maintenance schedules – reducing maintenance times and costs.
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Improved asset governance and accurate records - all rail asset data is centrally located, and can be traced back to the planning and design stage.



Reduced carbon footprint from greater efficiencies and decreased resource use.
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Reduced complexity from automated, user-friendly, digital processes based on rail industry workflows which shortens process times from days to minutes when compared to manual procedures.



The ability to consider the whole life cycle value of assets when making decisions to balance costs, risks, and opportunities against the desired performance of assets.

TRAPEZE GROUP

Trapeze Group works with public transport agencies and their communities to develop and deliver smarter, more effective public transport solutions. For more than 25 years we have been Here for the Journey, evolving with our customers around the world to helping them move people from point A to Z, and everywhere in between.

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