

REPLACING A STATEWIDE PAVEMENT MANAGEMENT SYSTEM

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This is one of a series of case studies being published by NAMS.AU as a resource to assist asset management practitioners. The contribution of these case studies by our NAMS.AU Consultant Supporters is gratefully acknowledged.

Abstract

The RoMan Pavement Management System has been in use by Western Australian Local Government in varying forms for over 25 years. It has served the industry well by providing a basic decision support tool that aided in the management of a variety of road network types at both the strategic and operational level. Due to the ever evolving IT environment, RoMan is nearing the end of its' life. This case study looks at the history of RoMan, it's use and place in the industry and the exciting next stage of the project with the RoMan replacement.

Introduction

For Local Government, the provision and ongoing maintenance of infrastructure assets is an ever increasing challenge. Local Governments are under increasing financial pressure and are being forced to stretch already sparse budgets further to provide appropriate levels of service to an expectant community. Asset Management systems are now more important than ever to help Asset Managers deliver the highest level of service in the most cost efficient and sustainable manner.

Effective Asset Management requires an organisational capacity and systems at both the strategic and operational levels to ensure all assets deliver an acceptable level of service from commissioning to disposal. Opportunities for minimising whole of life costs are greatest at the planning stage. Planning for optimal asset maintenance and renewal can provide significant cost savings while ensuring acceptable service standards. Planning requires investment in explicit knowledge of assets – their location, capacity, value, condition, and estimated

residual life. This knowledge can only efficiently be gained from information available from an appropriate asset management system

Road assets represent the most significant investment by local governments as well as providing the most challenges to manage. Having effective and most importantly safe road networks is essential to the community for both economic and social reasons. Managing the expansion of the road network and associated lifecycle costs and ensuring the existing network is also maintained can be a difficult balancing act.

History of RoMan

For over 25 years Western Australian local government have been in a unique position by having the RoMan Pavement Management System as a tool to help them make informed road network management decisions. Developed by Western Australia (WA) local government engineers in conjunction with Main Roads Western

Australia (MRWA), the system has been used by the majority of Local Government across the state in both metropolitan and rural areas. The system has only been available to WA local government and the Department of Environment and Conservation who are also road network managers of some 50,000km of mostly unsealed road across Western Australia.

Owned by MRWA and the Foundation for the Advancement of Local Government Engineering (Institute of Public Works Engineers Australia) and managed by the Western Australian Local Government Association (WALGA) with support and training services provided by Cardno, RoMan provides a tool to predict future road network preservation works requirements as well as asset valuation functionality to satisfy financial reporting requirements. Having a uniform system has lead to the development of an industry wide common dataset that is exchanged with MRWA for calculation of grants funding and to give a holistic state wide appreciation of both the Local and State road network.

The advantages of this approach using RoMan have been:

- Investment can be prioritised at a State level using uniform criteria;
- Relatively easy to use;
- Local government staff are familiar with the system and do not have to re-learn new systems/processes when transferring to another local government;
- Provision of good data to support funding submissions;
- It is a practical tool that produces realistic outputs if adequately maintained;
- It provides benchmarking opportunities; and
- It is cost-effective to local government, particularly the smaller local governments

RoMan Structure

Originally, MRWA provided WA local government with an inventory database known as the PC-UIS (Personal Computer Unclassified Inventory System) for the purposes of data exchange to update and synchronise the MRWA corporate database. Along with the existing inventory and the addition of required surfacing and pavement condition data fields, the PC-UIS dataset would be used as the basis for a standardised local government road network dataset.

The intention was to retain the use of the system as a method of data exchange between local government and MRWA but also to add functionality that would give the local government engineer or asset manager a tool for decision support when considering the whole of life cycle of the road asset. The inventory and condition dataset provides the required data for use in the asset valuation and predictive modelling components as well as facilitate a data exchange to MRWA as shown in Figure 1.

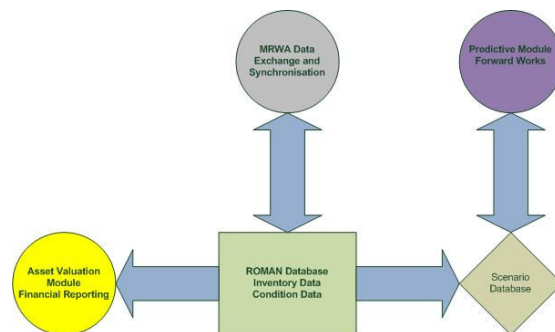


Figure 1 RoMan Pavement Management System Structure

At the core of the system is the RoMan inventory. It contains network definition and attribute data such as pavement width, seal type and is based on level of construction of the road. The level of construction, referred to as cross section type, dictates the minimum required dataset for both sealed and unsealed roads and is enforced by hard coded validation rules.

Predictive Modelling Functionality

Several WA Local Government engineers were involved in the development of WA specific surfacing and pavement deterioration algorithms along with industry specific business rules. Combined, the algorithms and business rules provided a deterministic model that could be localised through the manipulation of basic parameters and used across a diverse range of network and environmental conditions.

The model required only basic road network inventory and condition data which could be deteriorated to predict future network conditions. The application of the business rules including user defined intervention levels and unit rates can determine the effects of different treatments with the objective being to determine the optimum road network preservation and maintenance works requirements including associated costs.

Originally released for the MS-DOS operating system the system quickly became entrenched in local government operations and was migrated to the Microsoft Windows environment in 1996. The models were essentially retained but amended as required following the necessary translation across coding languages.

The minimum condition dataset required to make use of the predictive modelling functionality in RoMan is collected via visual inspection although there is capacity for use of mechanistic data such as roughness. This allows local governments with few resources to be able to capture required condition data for surfacing and pavement. Typical condition data required included:

- Asphalt/chip seal condition (oxidisation, stone condition);
- Local surface defects (severity and extent);
- Cracking (type, severity and extent);
- Pavement deformation (severity and extent);
- Edge break (severity and extent);
- Shoulder condition;

- Unsealed road shape; and
- Gravel depth.

Severity is measured on a coarse scale of 1 (as new) to 4 (unserviceable) and extent on a 1 (as new) to 5 (unserviceable) scale representing percentage of area affected. The data is typically captured using hardcopy data capture sheets in the field and entered into RoMan as a desktop exercise.

Valuation Functionality

Following the migration to Windows, an asset valuation module was added that would satisfy Australian Accounting Standard 27 – Financial Reporting by Local Government. This standard requires Local Government to report replacement values based on applied user defined rates and depreciated value of the road network using either the revaluation or cost methodology.

RoMan can utilise both methods whilst having the option of using age or present condition as the basis for establishing current condition and modelled age. The revaluation module utilises the same deterioration algorithms as the predictive modelling module to deteriorate stored condition variables to a user prescribed year. This is then equated to a modelled age and compared to the life expectancy of the separate road elements of formation, pavement seal and kerb to derive a depreciated value. The advantage of using condition is that it does not rely on having accurate age data and can be a more accurate depiction of the performance of the road and its residual life.

RoMan Replacement Project

Being a tool developed specifically for WA local government, the product has been kept relevant in a market where there is a diverse range of industry needs. RoMan has been required to satisfy both well resourced metropolitan Local Governments who have reasonably complex networks under their control as well as rural Local Governments who have mostly basic unsealed road networks and have few resources available. The system has needed to be easy to use

whilst delivering useable outputs that can be utilised at both strategic and operational levels.

Throughout the years RoMan has responded to the evolving needs of the industry and has been generally embraced by asset management practitioners. This has been in no small part due to the long term efforts of WALGA and IPWEA through their championing of asset management in the Local Government industry and the ongoing support for systems such as RoMan.

Whilst it has been a robust and serviceable tool, like any software system RoMan has required significant investment to enable it to continue to function in an ever changing IT environment where new operating systems are introduced regularly. The RoMan project objective was to deliver a uniform tool to Local Government as part of a complete asset management system and not completely focused on software.

In 2007 it was decided to enter into a process to investigate an off-the-shelf system to replace RoMan. This approach was investigated as a preference to redeveloping the existing RoMan system. Overseeing the management of a software product had historically proven to be challenging and an area that may be best overseen by a specialist partner with an already highly developed system and product management structure. This would ensure the system will continue to deliver industry best practice to WA local government for the long term.

This process involved a request for proposal which was written to give proponents the opportunity to demonstrate innovation in their solution, to not only just replace the existing functionality of RoMan but improve on it in terms of:

- Reliability – the current product had become unreliable in an IT environment that changes quickly;
- User friendliness;

- Scalability – the ability to provide the best fit system to an individual local government;
- Flexibility – user definition, ability to be adapted in the future;
- Spatial capability;
- Disengagement of the network model and condition data; and
- Accessibility – able to be utilised across an organisation.

These are just a sample of areas of possible improvement. It would be left to the proponents to demonstrate how the use of their proposed solution would improve the business practice of WA local government. To that end it was emphasised that the solution should not be limited to software alone and should provide a component of asset management education to help develop the level of understanding and appreciation of the role of software management tools as part of a broader asset management system.

Four proponents were short listed and following a demonstration phase one proponent, Australian Road Research Board (ARRB) in partnership with CJN Technologies were selected to enter into a negotiation phase. The system proposed is known as RAMM and is used by the majority of New Zealand Councils in a similar manner to RoMan. The system represents an exciting next step in this project.

The system has been a proven performer in a similar role in New Zealand with the majority of local government utilising the system. It shall be intended to keep the system as close to it's original form as possible however it is realised that some localisation of the product may have to occur, mostly in terms of terminology and translation of rating systems.

The system utilises dTIMS (Deighton Total Infrastructure Management System) as the modelling engine that will replace the predictive deterioration modelling functionality existing in RoMan. This system is recognised worldwide as a market leader in asset modelling. A challenge with the inclusion of such a powerful tool is to harness the

functionality it can offer without introducing excessive levels of difficulty. The system will be required to be used by small councils with few resources. This can partly be dealt with effective initial and ongoing training and support but also a change in mindset in regional areas towards utilising a common resource. This may involve a regional council investing in the training or recruitment of one skilled operator to service the region. This project is as much about refining and improving the way local government do business as introducing a software system.

To date a robust technical due diligence of the proposed system has been carried out with the objective of confirming the proposal functionality and overall suitability of the system. From this process any fundamental technical issues are identified with a clear plan for resolution formulated. This process will form the foundations for a contract document detailing the development needs, implementation plan including training and support and any subsequent commercial considerations.

Following the successful signing of the contract, the proposed implementation plan will involve a period of development and customisation. In parallel with that, WALGA will be undertaking a rigorous marketing campaign to make the industry aware of the change in system and the need for preparation to make the transition as smooth as possible. This will be across a variety of events such as industry events such as IPWEA Conferences, regional group meetings and print media. The objective is to

maximise and realise the benefit of investing in a Statewide uniform system by achieving maximum buy-in.

Conclusion

Implementing a replacement system across the entire state represents a considerable challenge. Critical to the success of the due diligence and subsequent implementation is the involvement of representatives from the industry itself from not only the technical community but also the financial and political sectors. The involvement of user groups and specialist technical and non-technical committees will ensure the new system will fulfil the needs of WA Local Government asset management practitioners. The input and support of bodies such as IPWEA will again prove critical to this process and the ongoing success and acceptance of the system.

RoMan has served Western Australia well over the past 25 years. Local government asset management practitioners are looking forward to the next phase of the development of the State's road asset management system.

Author



Dale has managed the support contract for the existing ROMAN Pavement Management System for the past 8 years. He has considerable experience in the development of asset management systems and the management of data collection projects having overseen road data capture projects for over 50 Local Governments in both rural and metro areas. For these projects Dale has had to develop procedures, manuals and appropriate forms to ensure the data collected is consistent and suitable for its intended use. Dale also manages a range of projects in the area of Asset Management including the preparation of Strategic Asset Management Plans and manages infrastructure data collection, entry and validation projects around the State.