Commissioning of OpenTAMS

Business Principles

TAMS Asset Services
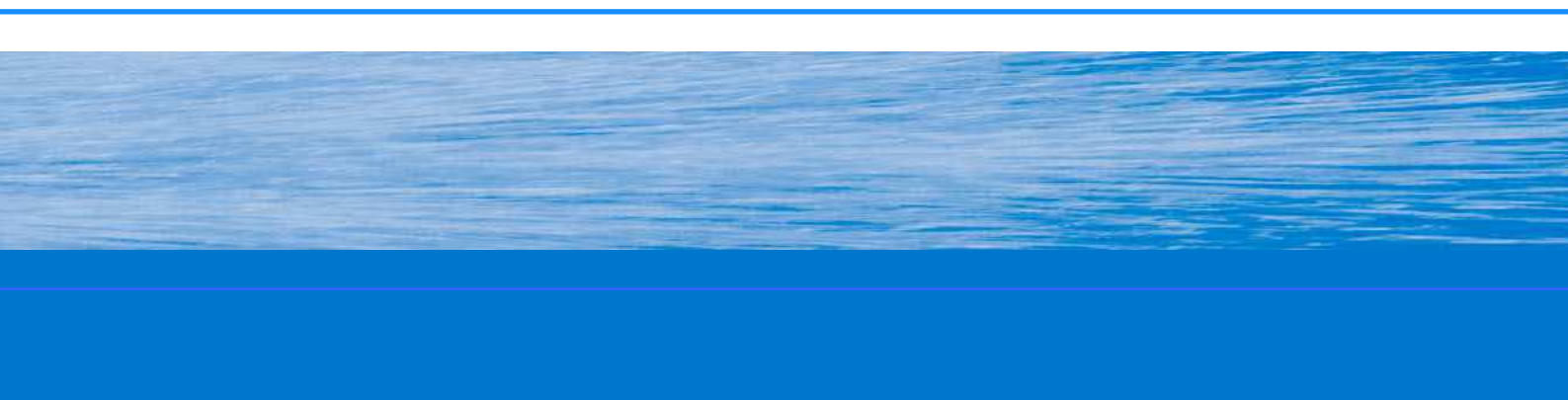
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Document Management

Except for commercial information, TAMS Asset Services documents are available in the Questions? page of www.tams.nsw.gov.au.

Document names are prefixed according to their main audiences:

- ADM: Administration;

- DAT: Data, ITC specialists;

- MGT: Management Oriented, including reports and milestone;

- RES: Resources, Project Management;

- TCH: Technical Documentation, ITC specialists;

- USE: User.Oriented.

Contents

List of changes

Table 1 – Quality Assurance And Version Control

Version	Date	Description	Responsible
1	10 April 2009	Draft to Robert Parker for review and contribution.	R. Molyneux
2	10 April 2008	Draft to Chris Jefferd for QA and release	R. Molyneux
3	17 April 2008	Draft to Robert Parker for review and contribution.	R. Molyneux
4	22 April 2008	Reworking and addition following review by Chris Jefferd.	R. Molyneux
5	24 July 2009	Addition of section on Development And Support Approach	R. Molyneux

Business Environment

Councils in New South Wales are required to comply with the Local Government Act 1993 and conform to directives from the NSW Department of Local Government (DLG) with regard to aspects of Asset Management.

The Act led to the creation of the TAMS (Total Asset Management System) product and services by a consortium of the then NSW Public Works Department, the NSW Road Traffic Authority, and the NSW Department of Land and Water Conservation, and its use by most local government agencies to develop asset registers and financial reporting functionality.

Apart from this inescapable regulatory requirement, councils have over the years, to varying degrees, adopted sound Asset Management Strategies.

The DLG has a regulatory role in promoting council actions in this regard. Thus, from 2007, local governments have been required to report to the DLG Fair Values of their assets, starting with Water & Sewerage systems, then Property & Buildings[1], and finally Road assets.

A key to asset management strategies and easy compliance with government reporting obligations is the development of comprehensive asset registers ("know what you have") together with systematic monitoring of asset conditions ("assess their fitness for purpose"), maintenance management ("keep assets fit for purpose") and cost effective use and management of the resources available to ensure that the councils' clients, their ratepayers, can live, work and play using their community's assets ("establish and maintain service levels and the resources needed to meet them").

Strategic planning of the construction, maintenance, development and enhancement of these critical community assets needs human intelligence and creativity, the marshalling of a range of public and private sector resources, and the availability and management of a wide range of information derived from raw data in a wide range of databanks.

The OpenTAMS software application, developed, maintained and supported by NSW Public Works has been designed and built expressly to support the local government sector and its demands for information.

The "Open" addition to TAMS reflects our commitment to make available to appropriate expert staff all the data, information and tools needed for all aspects of strategic total asset management systems and services.

This document sets out the context for the work done in commissioning OpenTAMS.

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[1] See for example the DLG Circular No 08-07 "Valuation of Property, Plant & Equipment at Fair Value" for the rationale and approach to this, including the level of detail required with regard to asset registers, associated data, and auditable processes.

Information Architecture

The following diagram illustrates the sorts of information systems typically used in local government. Refer to "TCH – High Level Block Architecture" for an A3 version.
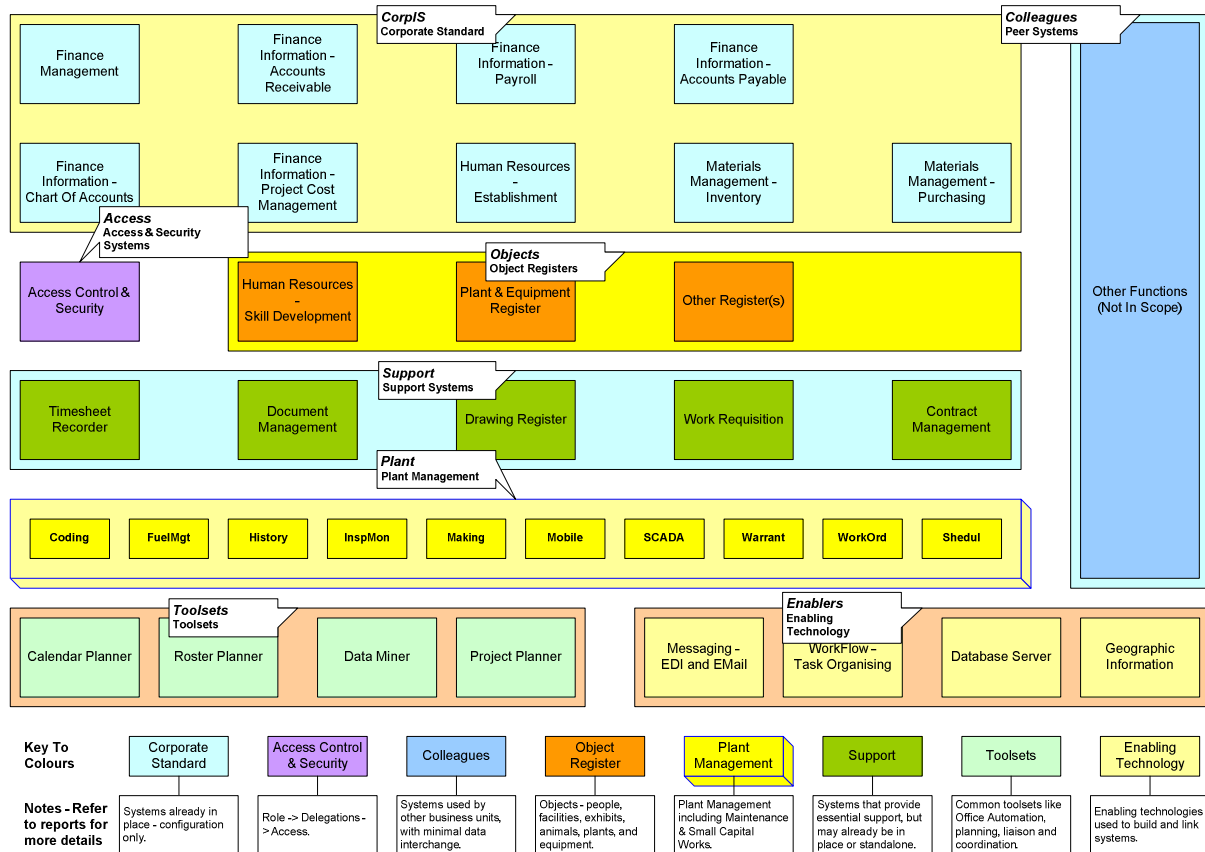
Thus, local governments are complex organisations needing a wide range of systems, using a wide range of technologies. Councils and their system providers have wrestled with this complexity over many years. Depending on their size and wealth, councils have tried to obtain "corporate solutions" – complete systems supplied and maintained by large companies (for example SAP), or they have tried to integrate various systems, or they have had to make do with spreadsheets.

All else being equal, the keys to the success of any information systems are the quality of data held therein ("garbage in = garbage out") and especially the training and ingenuity of the people who use them.

OpenTAMS has been designed to mesh with other systems, and to support the technologists and "knowledge workers" involved in strategic asset management.

OpenTAMS Components And Functions

OpenTAMS comprises:

- A powerful versatile asset register, with assets displayed in a multi-level hierarchy, and a Geographic Information System (GIS). Together, these allow for navigation to assets by their place in the hierarchy, or their place in space, or a combination of these location techniques. In addition, a Street Directory allows for location of assets by their street addresses;

- A wide range of asset information, structured into "topics", for example construction details, dimensions, costing, and condition;

- A user-configurable function to enable any other data to be collected against any asset, including time-series data;

- Document management, allowing for any sort of electronic document to be associated with any sort of asset, and a register of hard-copy documents;

- Financial data and reporting (original cost, current value, depreciation) meeting Australian Accounting Standards;

- A Catalogue providing for costing of assets by quantity (for example pipes using length and $/m) as well as adjusting for other factors such as Survey, Investigation and Design (SID), Remoteness, and Contingencies. Rates are automatically updated according to Cost Price Indices published by appropriate authorities.

- Provision for Modern Engineering Equivalent Replacement Assets (MEERA) to be registered. For example, pipes of vitrified ceramic have been made obsolete by plastic. This supports both Fair Value calculations (using the MEERA rate rather than that for the existing asset) and planning for refurbishment projects.

- Condition rating using the ROCOND method for roads, and allowing for user-configuration of any alternate set of criteria appropriate to any sort of asset. For example, the new techniques of road condition assessment using automated laser measurement can be supported.

- Disposal of assets including allowing for holding asset data that may be obsolete but which may be required in future, such as hazardous buried waste;

- Planning of new assets / capital works to allow for a smooth progression from concept through to design and construct and maintenance, that is whole-of-life planning;

- The TAMSMap Geographic Information System (GIS) allows for the creation of maps with selected objects displayed therein. For example, incidents and events (for example, traffic black spots) might be displayed against relevant assets (for example, traffic signage and traffic calming devices), and used for work planning. TAMSMap is designed to run in conjunction with other GIS sources, based on the MapInfo table format. TAMS uses "spatial operators" based on the registered locations of assets and places of interest with Easting / Northing and Latitude / Longitude coordinates being supported.

- Work Management covering:

  o ad hoc work (small jobs not associated with assets);

  o routine, condition-based and preventative maintenance (associated with existing assets);

  o projects (larger works associated with any combination of existing and proposed assets). The approach to Project Management is outlined in a later section;

  o Breakdown of work into Work Requests, Work Orders, Jobs (trade packages, for example) and Tasks, to get the level of control and distribution of responsibility needed when using a mix of internal and external resources;

  o The ability to select assets for work to be done by asset attributes (for example, "all bus shelters") or by spatial location (for example, "all bus shelters in Community A") or a combination of both (for example, "all Roads and Stormwater assets in Precinct A".

- Reporting is encompassed by a large number of standard reports, with the ability to register and save user-configured and developed reports using the supplied Report Writer;

- Analysis of data can be done either within OpenTAMS, or through export of data into spreadsheets for ad hoc analysis, or through export into specialist systems.

- Integration with other computer database systems can be done through customised Application Programming Interfaces and by industry-standard data transformation toolsets. This infrastructure is aimed at enabling effective inter-connection of databases with minimal data replication and maintenance effort, while allowing the "best of breed" functionality to be used. Some examples of this are described later.

The configuration of OpenTAMS to maximise use of its native functionality, and to mesh with other corporate systems to maximise their overall effectiveness, requires careful planning and effort. Planning and management of this effort is addressed next.

How OpenTAMS Is Deployed

OpenTAMS is built on a powerful and flexible Relational Database Management System (RDBMS) and tool-kit (Paradox) and various third-party products. Thus:

- The database is located on a suitable file server. A dedicated database server is NOT required. All users need to be able to connect to this server in exactly the same way;

- The Borland Database Engine (BDE) handles connection to the Paradox databases and possibly other databases relevant to the Asset Management System. A single BDE can be used, located on the server, or multiple BDEs located on the user's workstations can be used. OpenTAMS uses the latter approach;

- The OpenTAMS programs (forms, reports, scripts, queries, libraries of code) are located on the file server;

- Paradox is located on the user's workstation. Each user has to have a licenced copy of Paradox. This is used to run the OpenTAMS application, using the programs and data on the file server;

- Paradox comes in two varieties, namely RunTime (Paradox RT) and a full version. Paradox RT is freely available ($0). The full version is a licensed product, for which a fee is payable (~ $150);

- Either version of Paradox can be used to run OpenTAMS;

- Paradox RT is a "black box" – it allows full use of OpenTAMS, but only via the OpenTAMS application. It does not support some functions that require the full capability of Paradox;

- The full version allows the user to modify the OpenTAMS data directly. It provides a rich environment for manipulating OpenTAMS data to meet any requirements of "knowledge working". Like any powerful tool, it can be used to shoot oneself in the foot!

In addition to the Paradox database, third party products are used for some functionality.

The most expensive of these is the MapInfo MapX product (~$500), which is used by the TAMSMap Geographic Information System. This is a licensed product which must be installed on the workstation of the user. Organisations using MapInfo and / or other applications using MapX may already have valid licences that can be used.

The licensed third-party products will typically be centrally tracked and managed by the customer's IT Department to meet copyright requirements.

Refer to "MGT – Price And Conditions Schedule" (available on request, in confidence) for current information about the licensing of OpenTAMS products and services.

OpenTAMS provides an internal user registration process so that an administrator can limit users to certain modules and functionality. This closely matches typical local government practice where the Asset Management teams are allocated particular major classes of assets (for example, Roads, Property, Water & Sewerage).

Deployment of OpenTAMS is readily amenable to the following scenario:

- Install the OpenTAMS database and system on a suitable file server, in a location available to all engineering services staff;

- Configure a user group (say OpenTAMSGroup) which alone has read – write rights to the OpenTAMS directory;

- Install the full version of Paradox for use by the designated administrator / custodian of OpenTAMS;

- Install Paradox RT for use by one or more business experts responsible for major asset groups / one or more modules;

- Commission the use of OpenTAMS as a "pilot" – that is, a small scale project, with an appropriate milestone / quality check after, say, 3 months;

- Consider whether to make Paradox RT a standard application for all engineering staff, maintained by the organisation's standard operating environment (SOE);

- In stages, introduce other business experts to the use of OpenTAMS. This simply requires the users to be made members of the OpenTAMSGroup and configuration of Paradox RT to use the appropriate database;

- Provided that network security is effective, and appropriate training is provided, this gives OpenTAMS functionality to all business experts with minimal risk and effort.

OpenTAMS can be deployed in two other modes:

- The entire application can be installed on a lap-top. Files on the lap-top can be synchronised with files on the server semi-automatically. Data within tables can be synchronised at the record level semi-automatically.

- Remote connection approaches such as Terminal Server, Citrix and ProPalms can be used. These require configuration meeting the corporate standards set in place, and may require customisation of OpenTAMS.

A major issue confronting many of Australian regional customers is the ability to recruit, train and retain skilled staff. The availability of modern high-speed telecommunications allows for deployment of systems and skilled people more flexibly. The deployment approaches just described allow for scenarios such as:

- Installation and maintenance of database systems centrally (at NSW Public Works), with access by the client's remote / distributed / local asset management staff via telecommunications;

- Installation and maintenance of database systems locally (on customer networks), with access by NSW Public Work's centralised specialist staff via telecommunications;

- Mixing and matching these approaches, with scarce expert staff available from NSW Public Works providing specialised services (for example annual reports) and backup of routine services (for example, maintenance planning) for local staff.

The deployment of OpenTAMS requires project management, described in a later section.

Once OpenTAMS has been installed and commissioned, and staff trained in its use, there has to be an on-going process of support and maintenance. This is described next.

On-Going Support And Enhancement

If they are not properly supported and enhanced, computer systems fade away. Once again, people are critical to this. Our strategy includes:

- A standard Agreement (please see our website at www.tams.nsw.gov.au and the Frequently Asked Questions page, and "What licence agreement applies");

- For work done for a particular client, resultant system component modifications and enhancements are guaranteed for 3 months. Where results are incorporated into the standard OpenTAMS product, support is covered by the TAMS Club agreement;

- Developing and maintaining contact between system developers and users, to promote "knowledge transfer" between the parties. We are corporate and individual members of the Institute of Public Works Engineering;

- Developing and maintaining contact between industry experts and specialists. We recognise the value of experts from other organisations and commit to liaising between our customers as appropriate;

- Developing opportunities for interaction and interoperability between systems. We are committed to moving towards industry standards as they emerge. We will liaise with other system developers and providers to explore opportunities for building complementary systems as practicable;

- Respect for the Intellectual Property of all parties;

- Commitment to the Business Ethics Statements of Councils for all business dealings;

- A straightforward approach to licensing of OpenTAMS components throughout a customer organisation. This is discussed in "MGT - Price And Conditions Schedule" (available on request, in confidence).

Project Management

This section outlines our approach to Project Management. The implementation of any computer system has risks, and usually requires coordination and liaison with many parties both inside and outside the organisation.

OpenTAMS specifically supports Project Management functions.

Project Management includes:

- ensuring that the appropriate organisation is established to manage the project;

    o OpenTAMS includes an organisation hierarchy which can be linked to the responsibility and custodianship of assets, including computer systems.

- identifying all risks;

    o OpenTAMS includes risk analysis and risk mitigation functions. These categorise risks by their sources (People, Technology…) and mitigation options (Training, Research…).

- establishing issue resolution processes;

    o OpenTAMS includes issue documentation and resolution and functions, using email and electronic document management to track information and to ensure the appropriate parties receive it. These structure issue resolution according to the appropriate parties (Steering Committee, Project Manager, Business Experts…)

- planning the major project work components and their relationships;

    o OpenTAMS allows for the definition of Projects and Sub-Projects and information such as scoping and inter-dependencies.

- obtaining and assigning appropriate resources;

    o Both internal and external human resources can be registered and assigned to work objects at various levels. A Person database is

used in conjunction with the Organisational Hierarchy database to register roles and incumbents, and contact details.

- monitoring work done, and tracking remaining work;

  o Work from all sources (ad hoc, maintenance, projects) can be reported against user-configurable milestones.

- maintaining the project budget and timeline;

  o Budgets and timelines can be handled within OpenTAMS (structured data and simple Gantt charts) or via external documents such as MS Project plans.

- reporting progress and any issues to management for resolution;

  o Electronic document management and email are available from within OpenTAMS.

and

- if necessary, making a timely decision whether to abort a project.

  o Refer to "View Of System Engineering" and "Risk Management And Contracts" for structuring projects into manageable chunks - whereby this last resort can be as painless as possible.

OpenTAMS includes functions in Work Management that assist with some of these tasks.

The next sections present views on System Engineering and Risk Management. These considerations drive how projects are structured and their risks mitigated.

A View Of System Engineering

Computer-based information systems are intangible. Unlike bridges (thousands built since Roman times, and able to be modelled with everything from Meccano to AutoCAD) they cannot be shown to users in advance of their construction. Unlike water and sewerage systems, their real value may be illusory at worst, or less than first claimed.

For even moderately complex systems, only about 10% of the total effort is programming, that is in making the system components. The rest is spent on trying to understand what the system is supposed to do, documenting user requirements, documenting design of various system objects, developing testing and training manuals, liaison and project management.

Typically, the end users of systems cannot specify exactly what they want the system to do (sometime in the future), while system developers do not understand exactly what the end users need to do (now, and sometime in the future). Humans being human, misunderstandings occur.

The end result is that about 70% of systems do not do what they were supposed to, and are delivered late, and cost more than budgeted – or all of these.

Mitigating these risks includes:

- Use commercial off the shelf software (COTS) systems;

- Where an existing system is not available, use prototyping to ensure that end-users and system developers understand exactly what is required, and the technical feasibility of delivering it. Prototyping needs good tools and expertise;

- Use pilot projects to phase in systems to a small group of users, including all functionality, before rolling out the system to all users;

- Ensure that projects are organised to timelines of 3 months or so. This is to ensure that a system continues to meet the business needs of an organisation, and has not been made obsolete by changes in the business environment;

- Use appropriate contracts and project management techniques.

Risk Management is discussed in the next section.

Risk Management And Contracts

Risk Management involves the identification of likely risks, their mitigation with appropriate activities where possible, and development of contingency plans. Generally risks can be translated into money. Commercial contracts generally attempt to apportion responsibility for risk to determine which party is responsible, and to set a money value for the responsibility.

It must be borne in mind at all times that system development has a very high level of risk, and that mitigating different sorts of risks can have unexpected results which are not necessarily obvious.

For example:

- Documenting user requirements so that they are completely clear and unambiguous takes considerable time and effort, which grows exponentially as the number of users grows, especially if they work in different teams, and in different organisations.

But:

- the chance of any users really checking the end result is slight, and the chance that their requirements have changed over time, and that the original users have departed is great.

For example:

- Tendering requires careful specification (time-consuming – see above) of the deliverables sought and contract negotiation (time-consuming and requiring expensive expertise).

But:

- Any ambiguity, error or omission in the specification (very likely – see above) exposes the purchaser to contract variations. These may well be priced at whatever the service provider chooses, rather than at the price used to gain the contract during competitive tendering.

It is possible to use "partnerships" and "alliances" and different sorts of contracts to mitigate and spread risks (once clearly recognised by all parties), but it must be borne in mind that buyers and sellers of goods and services do not have the same objectives.

ObjectTAMS includes a Risk Analysis function, with examples of the sorts of risks involved in computer system projects and approaches to risk mitigation.

Project Management has to be structured based on the nature of System Engineering, Risk Management, and an appropriate mix of contracts for the different project components.

Development And Support Approach

The following diagram illustrates the approach to development and support.

**Master OpenTAMS System**   **Various Customer OpenTAMS Systems**
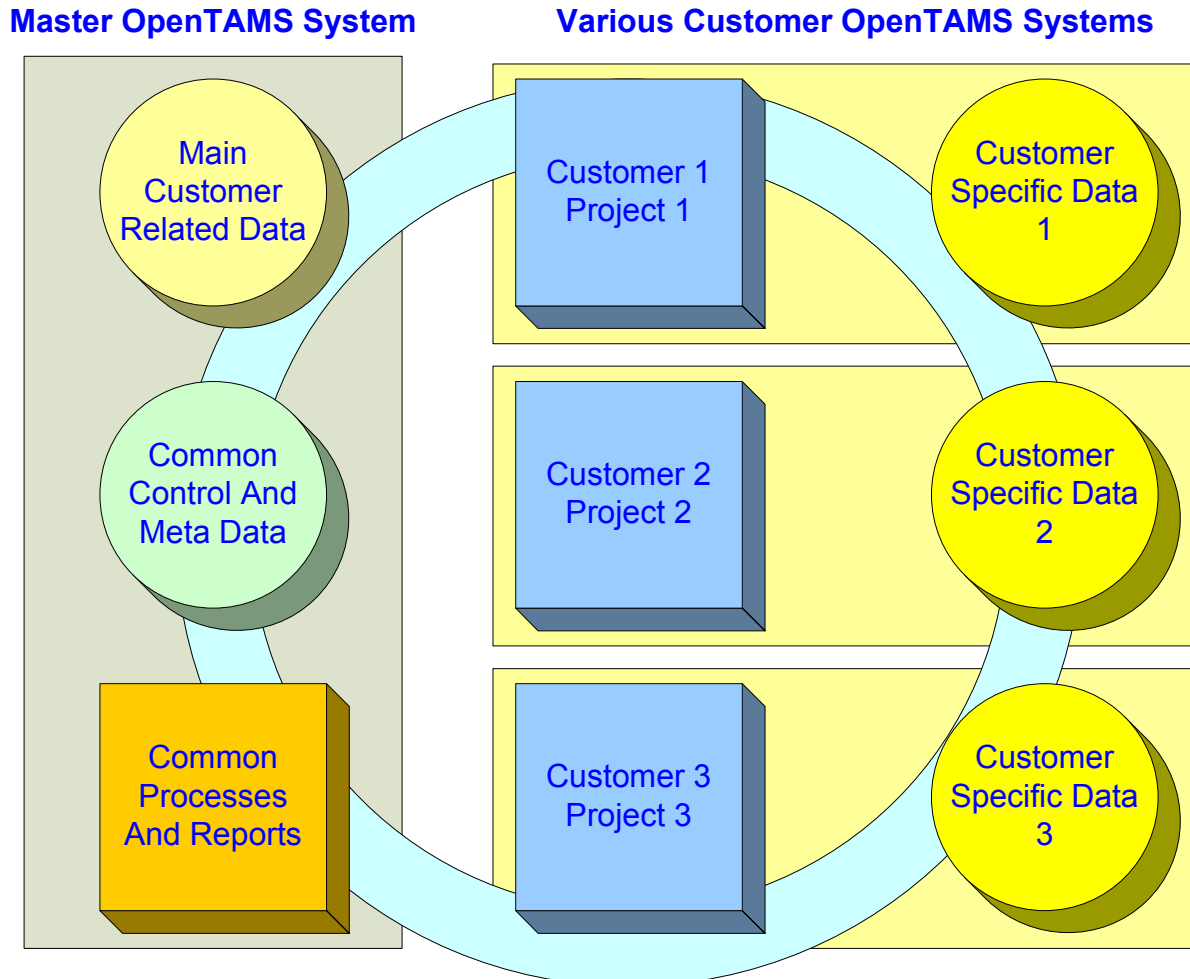
Continuous Development And Enhancement By Customer-Focused Projects

We aim to achieve an efficient and cost-effective continuous development and enhancement of OpenTAMS through customer-focused projects.

The major revision of TAMS to OpenTAMS has been completed. However, the TAMS Team continues to **use OpenTAMS regularly** for various customer-initiated projects. Examples include major projects to produce Fair Valuations of civil infrastructure. During this work, opportunities arise to fine-tune OpenTAMS to provide better and / or easier functionality.

These improvements are being passed on to customers as soon as possible. That is, rather than making wide-spaced releases of OpenTAMS, customers that are involved in projects receive updates as they become available.

The diagram illustrates the essential components of OpenTAMS, namely:

Main Customer Related Data
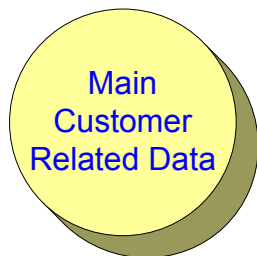
OpenTAMS comprises a large number of **database tables** designed to hold the complex data required for an organisation to fully manage its assets. The structures and inter-relationships of these tables must be carefully safeguarded.

Common Control And Meta Data
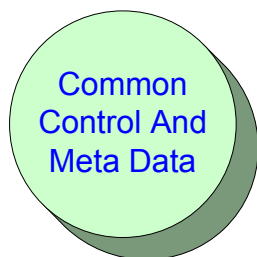
OpenTAMS uses a large number of database tables containing data used for controlling processes (sometimes called "**Meta Data**"). These are not specific to any one customer, but each customer needs to maintain an appropriate set. Generally, these draw on customer experience (eg sets of valid asset types) and are made available to all customers to minimise effort in configuring OpenTAMS.

Common Processes And Reports

OpenTAMS includes a large number of **processes** (forms, scripts, reports, queries) that have been developed over many years. There is an on-going effort to improve these driven by customer experience and projects.

Customer 1 Project 1
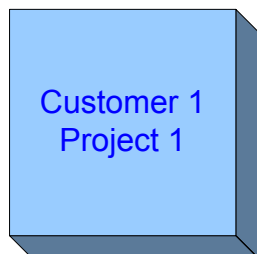
OpenTAMS is regularly used by customers and OpenTAMS consultants for worthwhile projects – for example Fair Valuation exercises. During these **Customer**

Projects customer data will be audited, quality assessed and improved and new processes and reports may be developed.

Customer Specific Data are those data that specifically relate to the customer's business. OpenTAMS provides a range of functions for inter-meshing with all relevant customer data in any format – ranging from other databases to various electronic forms.
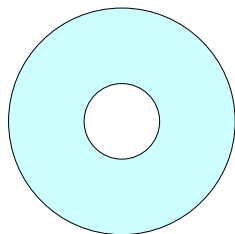
Continuous Development And Enhancement requires working with customers and their IT support to ensure that the changes and improvements to processes and data are brought back into the Master OpenTAMS System, and then promulgated back to the customers – without damaging or losing their specific data and customisation of their database.