

IT Solutions for Delivering Enhanced Integrated Planning in a Utility

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i. Abstract

A report was prepared exploring the various IT solutions available to a utility to aid in enhancing integrated planning. For the purposes of this report integrated planning was broken into three separate problem domains; manpower and materials planning, knowledge sharing and collaboration and dynamic reporting. In each problem domain two alternative solutions were investigated and discussed.

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1. Introduction

A utility is a company that maintains the infrastructure for a public service such as a gas, electricity or water network. Maintaining this infrastructure usually involves a wide variety of activities such as construction and replacement of infrastructural assets, maintenance and decommissioning of said assets and customer driven activities such as new connections. These activities can have high resource requirements with some resources working on a variety of different types of work. Depending on the business model a mixture of internal and external resources can be used to carry out this work. In addition to this, the work itself may require a mixture of short or long lead materials and consumables. All of these variables lead to a complex work load that can present a number of planning challenges. This complexity combined with a greater demand from customers for better service and value is a driving force for increasing efficiency in modern utilities.

Regulatory pressure is also a driving force for increasing efficiency. Utilities, by their very nature, tend to operate as monopolies. This is necessary as economically it makes little sense to construct parallel networks, such as having two parallel electricity or gas networks competing for the same customers, simply for the purpose of competition. In utilities operating as a monopoly, a high level of regulation is necessary to ensure an efficient and cost effective service due to this lack of competitive pressures.

Regulation of utilities and its aims are influenced by political factors and changing economic circumstances. There are many different regulatory approaches which can be adopted to regulating a utility but at its core, regulation of utilities is focussed on ensuring a quality service and fair price. As utilities and utility regulators become more mature, more focus is put on the delivery of a high quality of service while simultaneously keeping prices low. These regulatory pressures encourage utilities to drive efficiency into their business.

One method of achieving efficiency is through integrated planning. Integrated planning involves achieving a consolidated view of all work required to be completed over a period of time across departments and functions. By achieving this consolidated view, cross functional requirements can be managed better, constraints on shared resources managed, duplication reduced and further efficiency opportunities identified.

Integrated planning can drive efficiency in a utility by offering the following benefits:

- Optimising internal labour usage, reducing overtime and managing materials / stock efficiently.
- Predicting times when external resources will be required.
- Ensuring resource availability for capital projects without falling behind on maintenance.
- Sharing knowledge dynamically between departments.
- Identifying efficiency opportunities.

At the core of integrated planning lies communication. Communication both within and outside of a department or business function is to key being able to gather the required information to plan effectively, optimise cross functional plans and ensure all stakeholders are aware of what activities they are expected to do and when they are expected to do them.

For the purpose of discussing IT solutions in this report integrated planning will be broken down into three key areas:

1. Manpower and Materials Planning

Manpower and materials planning looks at some method of capturing all work a utility will carry out so that resource and material requirements and schedules can be consolidated into a plan where efficiencies can be identified and possible obstacles removed and risks mitigated.

2. Knowledge Sharing and Collaboration

Somerville & Craig (2006), estimated that 22% of knowledge in a working environment exists on personal devices such as PCs and 42% of knowledge is within the heads of personnel themselves. This issue can be further compounded by the physical distance between teams operating over a large geographical area, as is common in utilities. An effective method of sharing knowledge and collaborating on work is essential for performing the planning function of a business well.

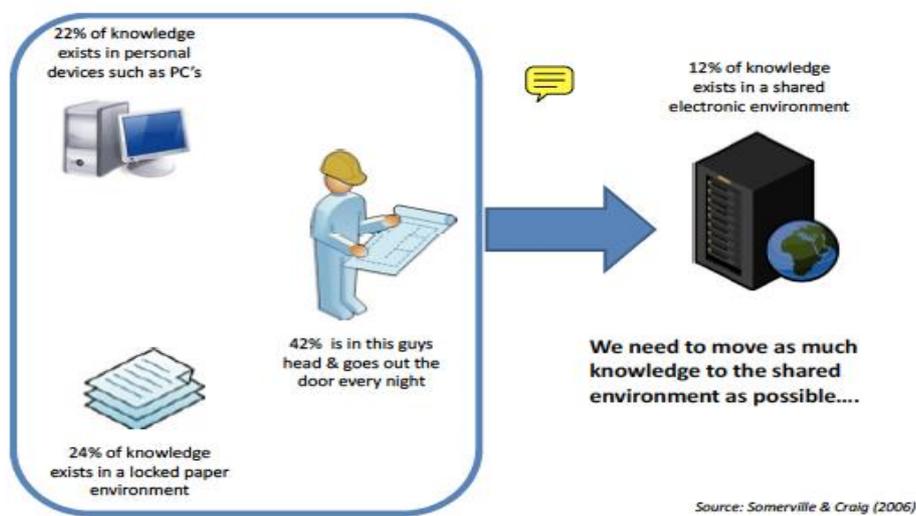


Figure 1. Knowledge Sharing and Collaboration, Somerville and Craig (2006)

3. Dynamic reporting

Large volumes of work bring with them large volumes of data. Data attained through the completion of work, if captured and presented well, can lead to increased business intelligence and an improved decision making process. For integrated planning different types of data is required such as resource availability and skillsets, financial performance, activity durations and forecast activities. These different types of data need to be captured and somehow combined and presented together so that informed decisions can be made regarding future activities.

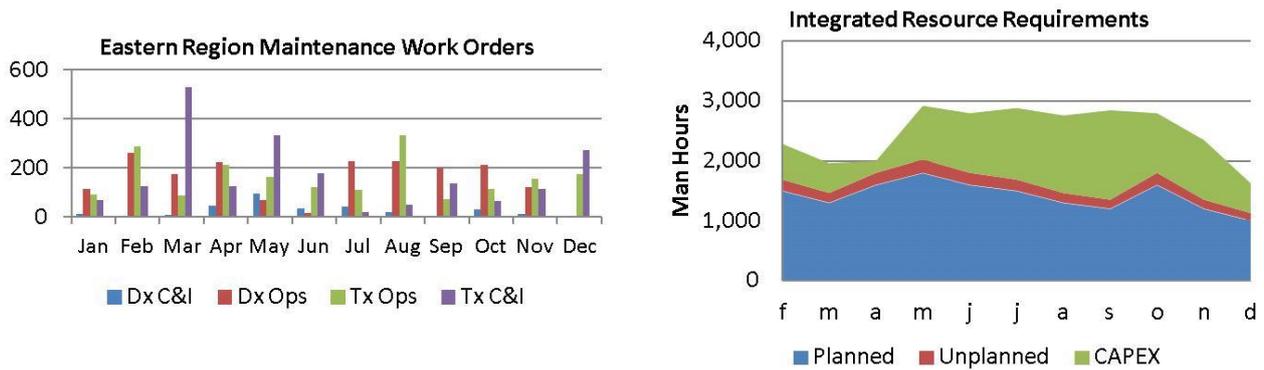


Figure 2. Example of graphs that could be used in developing an integrated plan.

The planning challenges facing a utility are numerous. They can be involved in high volume, high complexity work over a large area involving a large amount of people. Manual “job card” based work management solutions serve a purpose and can be used successfully to manage work however work planning activities of a utility can clearly benefit from the structure, automation and analytic capability offered by specialised IT systems. This report is focused on looking at a number of these IT systems available that can be used to help deliver more effective planning.

2. Objectives

The purpose of this report is to explore the various solutions available to a utility for use in enhancing integrated planning. As introduced in Section 1, integrated planning will be discussed under three headings.

- Manpower and materials planning
- Knowledge sharing and collaboration
- Dynamic reporting

The objective of this report is to present and discuss two alternative information technology solutions for each of the three headings above. These solutions will then be discussed as a whole in the context of how they can be combined to help deliver an effective integrated planning function.

3. Manpower and Materials Planning

3.1 Bespoke Workflow Management System

Overview

Bespoke software is software that is specially developed for a specific organisation or user to serve a specific purpose. This can be contrasted with commercial off the shelf software which is developed for a wider audience. Bespoke systems can accurately capture the organisation / end user's particular preferences and expectations for their required IT system and can be designed and built piece by piece to ensure all user requirements are captured and built into the system before it is completed. Bespoke software was often used in the past to satisfy IT requirements before the widespread availability of commercial off the shelf software. Today, it is used for critical or specialist processes or to complement the functionality of existing or legacy systems. A bespoke workflow management system can be designed with the specific problem domain in mind. The client can have a system built for them which looks at the specifics of the work they carry out and can be used to provide a manpower and materials plan which suits the business. This can be especially useful to a utility where the particular strategies for materials ordering and storage, contractor management and internal industrial relations can be managed effectively.

Example

Gas Transportation Management System (GTMS) is the IT system in place in Bord Gáis Networks (BGN), Ireland's natural gas transportation and distribution utility, which provides for the commercial arrangements set out in the Code of Operations. This Code governs the relationship between Transporter and Shippers of gas on the Irish natural gas transportation network. The complex rules agreed upon by the Irish gas market in this Code of Operations are specific to Ireland and so a bespoke IT system was chosen instead of any available off the shelf solution.

GTMS is used by shippers on the Irish natural gas transportation system to book capacity and nominate for commodity. Capacity corresponds to reserving a certain amount of space in the natural gas transportation network for transporting gas at a later date and can, and usually is, booked long in advance. Commodity nominations correspond to a request on any given day to transport an amount of gas from an entry point on the network to an exit point. The natural gas network is operated in accordance with the nominations received on GTMS and customers are billed accordingly. Integrated planning is achieved through the aggregation and analysis of entry and exit nomination, both past and future, through GTMS.

The BGN GTMS team worked with an IT management and consultancy company, Logica, to design and develop GTMS in line with the Code of Operations. As changes are made to the Code of Operations, these changes are incorporated into GTMS. It would have been difficult to find an off the shelf solution which could be adapted to accurately reflect the Code of Operations and in this case a bespoke solution was preferential.

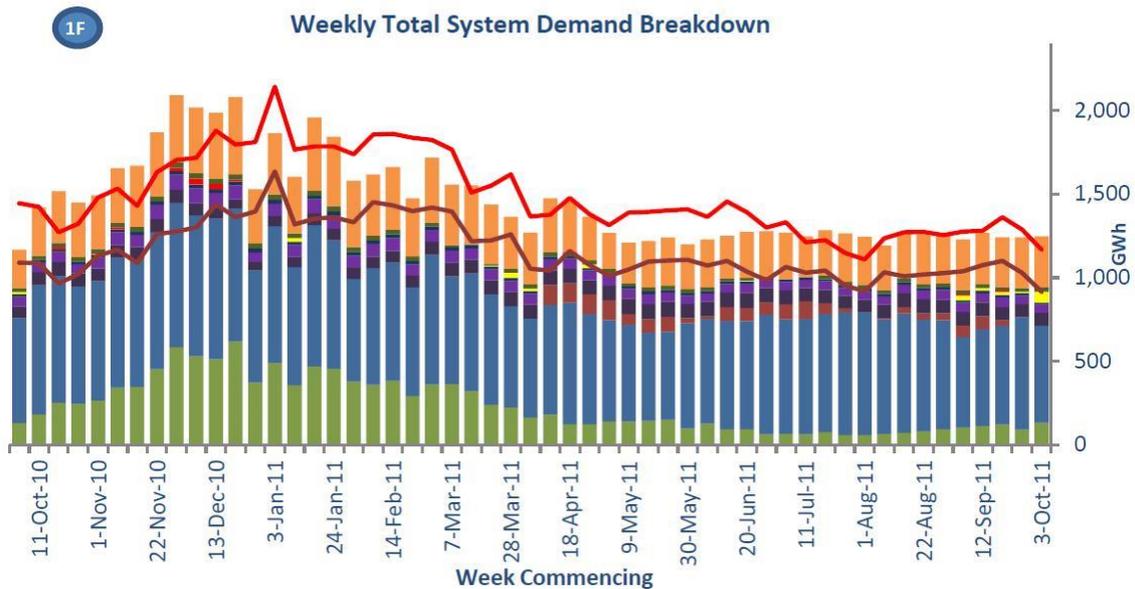


Figure 3. Demand Breakdown graph produced from information sourced in GTMS.

Advantages

- Fully customisable solution which can be designed to fully incorporate existing “as-is” business processes.
- Internal expertise can be developed throughout the process of designing and building the software system.
- Freedom from licensing costs and fear of product support being discontinued / updates needed.
- System can be designed and built stage by stage ensuring that any required functionality left out of the initial specifications document can be accounted for before the system is complete and thus save on costly change requests.

Disadvantages

- A lack of community shared learning that comes from a product being used in multiple companies.
- Specialist resource requirements when hiring external IT resources to work on the system and a steep learning curve depending on how well knowledge is managed within the company.
- The system will only contain functionality which is specifically requested by the client. The client must be sure that they have considered every use case of the system before it is designed.

Use

Bespoke software can be useful in integrated planning where a company specific activity or specialist area of expertise needs to be systemised however, as a whole, the activities surrounding an integrated manpower and materials plan are common across a wide variety of organisations stretching from utilities to

manufacturing facilities to electricity generation stations and so there exists a number of well-established, well developed and well supported IT systems which can be used for such a purpose. Bespoke systems do however still serve a purpose in this problem domain for filling any organisation specific gaps in commercial off the shelf software.

3.2 Commercial-Off-The-Shelf Workflow and Asset Management System

Overview

Commercial off the shelf software is software that is pre-built by a 3rd party vendor with a view to leasing, licensing or selling the software to a number of different organisations. By adopting an already available solution, an organisation does not need to spend time in designing or specifying requirements for basic functionality. Instead the organisation may focus on ensuring that their needs can be mapped onto the functionality of the existing system in a way that satisfies their requirements and that the software can be integrated into the business well.

The general activities involved in manpower and materials planning for a utility are activities that are shared across a great number of organisations and a number of off the shelf solutions are already widely available and in use. Use of one of these systems not only allows an organisation progress on their goal of enhancing integrated materials and manpower planning but can also allow the organisation to leverage off of the experiences of other organisations whose early experiences of the software system may have been fed back into updates and improvements to the system.

Example

IBM's "Maximo Asset Management" is a software system for asset and workflow management. It is broken into a number of different modules for managing different elements of the business. An example of the available functionality and modules can be seen below:

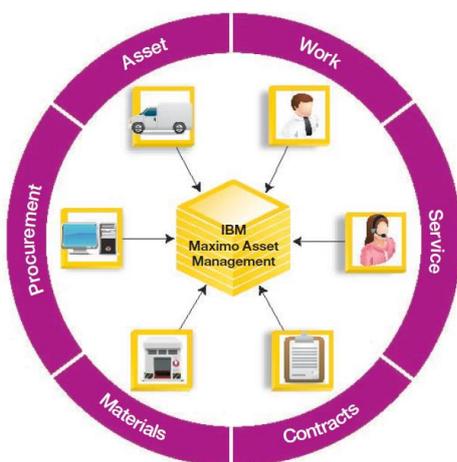


Figure 4. IBM's Maximo Asset Management Software Overview

Assets / Locations: These modules act as an “asset register” containing details of all assets owned by the organisation and the location at which each asset currently resides.

Contracts: The contracts module captures details on contracts in place with vendors for the supply of services and materials. The contracts application can be used to manage these contracts by tracking how much has been spent on each contract to date and on which items / services.

Procurement: The procurement module can be used in conjunction with the contracts module to facilitate payment of third parties for services provided.

Work: The work modules are made up of modules for managing projects, preventative maintenance, customer driven work as well as functionality for creating and managing unplanned work.

Materials: Materials can be managed in the materials module and the availability of materials in all stock rooms held by the company can be reviewed. These materials can be assigned to projects and work as required ensuring a clear trail from procurement to use.

Service: The services modules can be used by customer service representatives to manage customer requests.

As can be seen above, Maximo Asset management can be used across a number of the core functions of a business and because of this there can be a requirement for a large number of other core business systems to be interfaced with Maximo. BGN currently use Maximo as an Asset and Workflow management tool. The following is an example of some of the other business systems that interact with Maximo.

IUS: Integrated Utility System (IUS) is a legacy work management system in use in BGN up until 2010. IUS is still used to manage information on end users and it is through IUS that the interface with BGN’s market messaging system is still managed.

GIS Smallworld: GIS Smallworld is used to manage geographical and locational data relating to BGN’s network.

Oracle Accounting Package: Oracle is used to manage the company’s financial accounts and facilitate payment to third parties.

Oracle Middleware: Oracle Middleware is used as a hub for communications between BGN systems.

Data Warehouse: A data warehouse is used to store data from numerous BGN systems for use in conjunction with a business intelligence system.

Click Scheduling: Click is used to schedule work to technicians for completion.

Syclo Mobile Workforce Management: Syclo is used as a solution for allowing mobile workers access information regarding their assigned activities in the field.

Integrated Planning is facilitated through Maximo through a number of different modules in place to plan and schedule work. By planning and scheduling the different elements of work and keeping track of how past work was completed an integrated plan can be put in place and managed through the use of various reports drawing on information made available in Maximo and other applications.

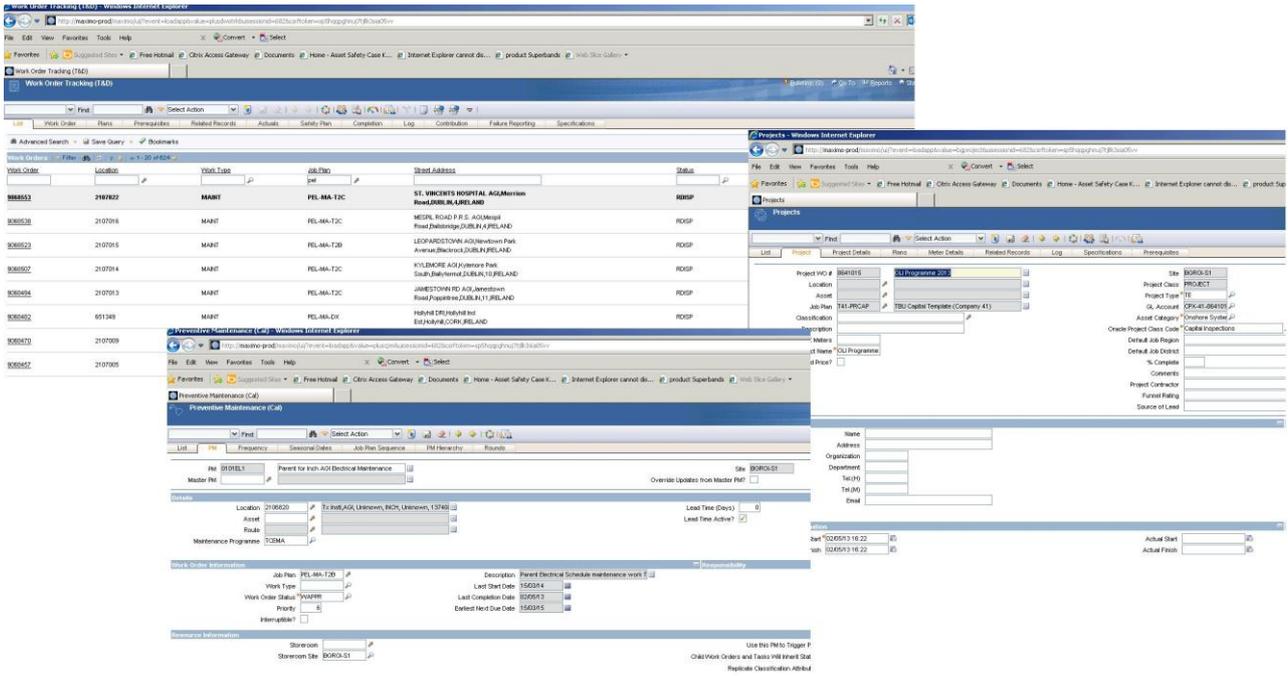


Figure 5. Example screenshots of various Maximo Modules

Advantages

- Benefits from community learning and incremental improvements that come from market driven software being used in multiple companies.
- Can be easier to hire technical IT resources that have previous experience in this particular software system.
- Products can be high quality and reliable as competition improves product quality and its use in multiple organisations increases the population of users testing and logging bugs.
- Can be cheaper to license / buy than writing a bespoke system.

Disadvantages

- It can be difficult to map existing business processes into these applications without some element of change to company structure and business processes.
- It can be difficult to map existing data in a company into the required format of the new system depending on how data was stored previously.
- Potential for a company to opt for more functionality than they need just because it is available in the product which can lead to increased administrative burden. The company would need to carefully consider what is required and what is not.
- Implementation costs can be high depending on how much configuration is required to suit the organisations particular use case.

Use

The activities surrounding an integrated manpower and materials plan are common across a wide variety of organisations and within these organisations these activities touch on most business functions. The use of off the shelf workflow and asset management solutions for manpower and materials planning in a utility can be advantageous for a number of reasons. Learning from other organisation's past experiences, leveraging off of industry best practice and cost factors are all key considerations which may convince an organisation to choose an off the shelf software solution.

4. Knowledge Sharing and Collaboration

4.1 Online Document Collaboration Systems

Overview

Cloud based document storage and collaboration services such as Box, Dropbox, Google Drive and Microsoft SkyDrive have all increased in popularity over the last number of years. These services allow users to access and work on files from any device, from anywhere in the world. These services also allow users to share particular files or folders with other users thus allowing collaborations between teams no matter how dispersed the members are. These services can make it easy for organisations to share information conveniently both within and outside of the organisation. In the case of each of the services mentioned above the documents are not stored within the organisation but are instead stored in the cloud by a third party.

Example

Google Drive is a file storage and synchronisation service provided by Google. Google Drive not only enables cloud storage and file sharing but also comes with a suite of online document editing tools which can be used to edit files such as documents, spreadsheets and presentations. Users are allowed up to 15GB free storage but pay for the service based on the amount of online storage space they require after that. An overview of subscription options can be seen below.



Storage	Monthly Rate
100 GB	\$4.99
200 GB	\$9.99
400 GB	\$19.99
1 TB	\$49.99
2 TB	\$99.99
4 TB	\$199.99
8 TB	\$399.99
16 TB	\$799.99

Figure 6. Google Drive Subscription Plans

Google Drive comes as standard with online tools for creating and editing documents, presentations, spreadsheets, forms and drawings and in addition there are a variety of additional web applications available from the chrome store which can expand the online collaborative functionality of Google Drive. Below is an example of some of the web apps of interest to Utilities available through the Chrome App Store.



Autodesk ForceEffect is a tool for static systems analysis using free body diagrams.



Ganttter is a web based project scheduling application that works with Google Drive to allow the user to open and edit MS Project files.

Google Drive can be used as an effective cross platform document sharing and collaboration solution being compatible with Windows, Linux and Mac and with apps available for Android, Iphone and Ipad.

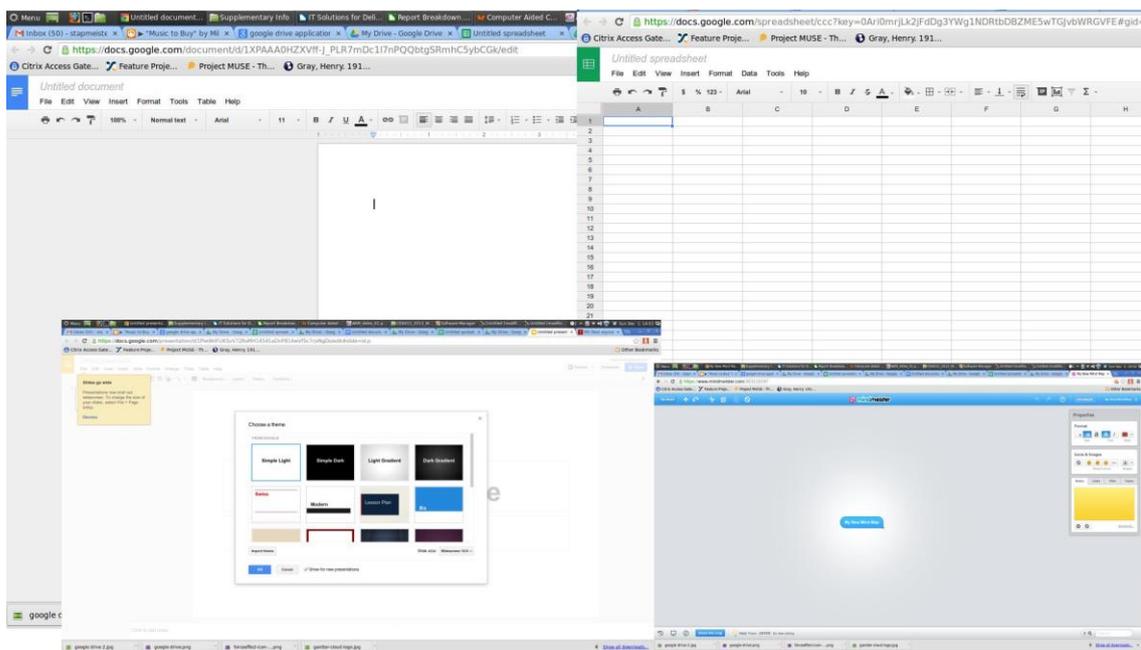


Figure 7. Example of Applications that can be used with Google Drive

Advantages

- Can be relatively quick and easy to set up in an organisation.
- Can easily facilitate sharing outside of the organisation.
- Relatively little user training required.

Disadvantages

- There can be security concern for any system where data is stored on servers outside of the organisation which can be accessed freely over the internet. The licensing conditions of some companies may state that data must be stored within the country it is operating in.
- Such a system may not scale well when a vast amount of data must be stored and collaborated on by a large group of users. The layout and functionality of the system does not lend itself well to sorting, searching and version controlling large amounts of documentation.

Use

At the core of integrated planning is communication. Knowledge sharing and collaboration are key for building a combined view of all activities the organisation is required to carry out. Utilities tend to cover large geographical areas and the activities utilities are involved in can be completed by a mix of core internal resources, strategic long term partners and small specialist vendors. Knowledge sharing and collaboration between these groups can at times be difficult to facilitate. Online document collaboration systems such as Box, Dropbox or alternatively an internally hosted solution such as Openbox can be used effectively by a company for these purposes however attention must be paid to any security concerns and consideration given to the scalability of such a service. Online document sharing and collaboration services can be used to great effect in utilities for sharing project specific documentation between project teams, especially when these teams rely on a mix of internal and external labour however a more all-encompassing solution for a utilities knowledge sharing and collaboration needs such as Microsoft's SharePoint may still be necessary.

4.2 Document Management Systems

Overview

Document management systems are systems that are used for storing, sharing, and document controlling files. Many modern document management systems also contain functionality to support workflows to automatically manage small processes such as escalations and approvals. Collaboration can also be facilitated through a number of different means such as the easy creation of areas or "sites" for particular teams or even for particular meetings, easy creation of blogs or discussion forums and document control and permission controls are generally built into the system.

Example

Microsoft's "SharePoint" is a popular document management system. SharePoint is the main document management system in place in BGN and is used for a number of different purposes:

Managing Information: SharePoint is used to house document repositories for everything from operating procedures and work instructions to monthly reports and project specific planning information. Permissions are in place to control what users have access to view and edit documents in each SharePoint site and document and version control is managed within the application. Meta-data can be assigned to each

document to assist in searching for documentation and getting more information regarding who created the document, when and for what purpose.

Collaboration: Collaboration is facilitated on SharePoint through the use of project and meeting specific SharePoint sites where a team may store shared documentation and collaborate through the use of events lists, task lists, discussion boards and announcement lists.

Risk Escalation and Basic Workflows: Risks are managed in SharePoint on both a project level and a departmental area. Risks are assigned owners and severity / probability ratings and severe risks are escalated and made visible to senior management.

One feature that makes SharePoint a flexible knowledge sharing and collaboration system is the level of customisation available to the user and the ease at which changes can be incorporated. In BGN each department has a “super user” who is trained in the basic administration and creation of functionality in SharePoint. These users have the ability to maintain their departments SharePoint sites with only advanced queries needing to be escalated to the IT department.

The screenshot shows a SharePoint site for Bord Gáis Networks. The breadcrumb trail is: NetPoint Home > Projects Area > Projects Area > Opex Programmes > 2013 OLI > Programme Documentation. The page title is 'Programme Documentation'. On the left, there is a navigation pane with sections: Documents (Programme Documentation, Meeting Minutes, Status Updates, Operational Documentation), Lists (Risks), Discussions, Sites, and People and Groups. The main content area shows a table of documents:

Type	Name	Modified
Content Type: Networks Document (18)		
Document	11th July 2013 OLI Budget Estimate V2	17/07/2013 19:01
Document	2013 OLI Programme Plan	17/07/2013 18:58
Document	2013 OLI Programme Risks DRAFT	10/07/2013 11:11
Document	2013 OLI Schedule 5th Jul	05/07/2013 09:44
Document	2013 OLI WO Management	17/07/2013 19:02
Document	Balough to Ories Temp Filtration HAZID Close Out Session	01/07/2013 12:15
Document	Balough to Ories Temp. Filtration HAZID Close Out	01/07/2013 12:15
Document	Cappagh South to Goat Island Temp. Filtration Risk Assessment Close Out	01/07/2013 12:15
Document	Cappagh South to Goat Island Temporary Filtration HAZID 1st May 2013	01/07/2013 12:15
Document	EnviroKIT Rev 01 - Balough to Ories OLI Without Temp Filtration Hazid	01/07/2013 12:15
Document	EnviroKIT Rev 01 - Cappagh South to Goat Island OLI Without Temp Filtration Hazid	01/07/2013 12:15
Document	EnviroKIT Rev 01 - Ories to Cappagh South OLI Without Temp Filtration Hazid	01/07/2013 12:16
Document	Maximo Project Layout	17/07/2013 19:02
Document	Ories Cappagh South Temp. Filtration Risk Assessment Close Out	01/07/2013 12:16
Document	Ories to Cappagh South Temporary Filtration HAZID 1st May 2013	01/07/2013 12:16
Document	Pipeline Order Option 7th May 2013	23/05/2013 20:00
Document	Stakeholder Communication Plan DRAFT	05/07/2013 09:50
Document	Work Breakdown Structure 7th May 2013	04/07/2013 16:03

Figure 8. Example SharePoint site.

Advantages

- A wide variety of additional communication functionality is available such as project / meeting specific workspaces, workflows for escalating risks, version control, user access control, personal profiles, technical blogs etc.
- A high level of customisation is available and can usually be managed within the business itself.

- Can sit within the companies own servers ensuring all data are safely stored and a high level of security is maintained.

Disadvantages

- There can exist some challenges in allowing external contractors access to certain parts of the knowledge repository if it is sitting on internal company servers.
- Depending on the level of customisation there can be an increased level of administrative burden in setting up the system and for users to manage and contribute to it.

Use

Document management systems can form the main method of document sharing and collaboration within a large organisation. They can be configured to not only act as a document repository but also to promote a collaborative environment between geographically dispersed teams. The advanced features available in document management systems can be put into good use by a utility for integrated planning purposes as they not only allow sharing and collaboration on documents but also allow the flexibility to create new areas and workflows within the document management system by the business users themselves without the need for additional code to be written.

5. Dynamic Reporting

5.1 Within Application Reporting

Overview

Many modern applications come with some element of reporting functionality build into the system itself. The level of reporting depends highly on the application in question with some applications providing more functionality than others. Basic functionality is usually present in workflow / asset management tools used for materials and manpower planning however in most cases a separate application would need to be used to handle more complex queries. The ability to select what fields the user would like to report on and some method of exporting this data to excel is usually present even within application specific reporting and for some users this can be sufficient for most needs.

Example

Business Intelligence and Reporting Tool “BIRT” is the embedded reporting tool in IBM’s Maximo as introduced in section 3. BIRT reporting offers a number of different options for reporting:

Out of Box Reports: Depending on the Maximo package there are up to 150 standard “out of box” reports that are available to the user. The usefulness of these reports is dependent on the level of customisation that the organisation made to the system when implementing it.

Custom Reports: Custom reports can be created in Maximo using BIRT reporting however the functionality and ease at which these reports can be configured does not compare to a dedicated business intelligence application.

Ad-hoc Reports: Ad-hoc reports can be created by all users as required by performing searches within a particular Maximo application and selecting the fields the user wishes to report on. One limitation is that reports cannot easily be made that query more than one module.

The embedded reporting tool in Maximo is very useful for users to interrogate data in relation to their particular functions however it is not a flexible tool for combining data from multiple sources even within the Maximo application itself.

ID	Description	Job Plan	Estimated Next Due Date	Priority	Site
0101	Parent for KNOCKTOBER AGI Electrical Maintenance	PEL-Ma-19/03/2015	19/03/2015	6	BGR01-S1
0103	Parent for NASS ROAD BV. (An Post) AGI Electrical Maintenance	PEL-Ma-15/02/2015	15/02/2015	6	BGR01-S1
0105	Parent for WALKINSTOWN AGI Electrical Maintenance	PEL-Ma-15/02/2015	15/02/2015	6	BGR01-S1
0107	Parent for ARDRABEG AGI Electrical Maintenance	PEL-Ma-10/01/2015	10/01/2015	6	BGR01-S1
0109	Parent for SUIR ROAD AGI Electrical Maintenance	PEL-Ma-15/02/2015	15/02/2015	6	BGR01-S1
0110	Parent for FORBES ST AGI Electrical Maintenance	PEL-Ma-08/03/2015	08/03/2015	6	BGR01-S1
0113	Parent for Aghada CC/GT AGI Electrical Maintenance	PEL-Ma-01/03/2015	01/03/2015	6	BGR01-S1
0114	Parent for BALLVADAM AGI Electrical Maintenance	PEL-Ma-10/01/2014	10/01/2014	6	BGR01-S1
0115	Parent for A.I.B. AGI Electrical Maintenance	PEL-Ma-15/02/2015	15/02/2015	6	BGR01-S1
0301EL1	Parent for Whitegate AGI Electrical Maintenance	Tx Inst,AGI,Unknown,WHITEGATE,Unknown,193231,01-SEP-77		5	Priority
0302EL1	Parent for Aghada AGI Electrical Maintenance	Tx Inst,AGI,Unknown,AGHADDA,Unknown,193234,01-SEP-77		6	Site
0303EL1	Parent for MARINO POINT AGI Electrical Maintenance	Tx Inst,AGI,Unknown,MARINO POINT,Unknown,198936,01-SEP-77			
0403EL1	Parent for Cork Gas AGI Electrical Maintenance	Tx Inst,AGI,Unknown,CORK GAS,Unknown,194442,02-MAR-00			
0500EL1	Parent for Rochestown Road AGI Electrical Maintenance	Tx Inst,AGI,Unknown,ROCHESTOWN ROAD,Unknown,05704,06-JUL-99			
0501EL1	Parent for OLDCOURT AGI Electrical	Tx Inst,AGI,Unknown,OLDCOURT,			

Figure 9. Screenshot of BIRT Reporting in use in IBM's "Maximo".

Advantages

- A level of reporting can be achieved by users themselves without a requirement to purchase licenses for an additional system.
- Users from the business can create reports inside of an application which they are already familiar with.
- By allowing users access to create ad hoc reports it can expand their knowledge of the systems, practices and business processes in use in the company.

Disadvantages

- Application specific reporting tends to not be as powerful as standalone systems being fed from a data warehouse and there is often a limit on the amount of analysis that can be incorporated into these reports easily.
- Cannot present data from multiple applications in one report.

Use

Within application reporting can serve an important function within integrated planning in a utility. The sheer volume of data and complexity of the activities being carried out can make it difficult for a standard report in a dedicated reporting application to be made for every possible query and the relative simplicity of within application reporting means that a larger population of the organisation can be trained in its use. This can have the result of reducing the workload of any dedicated reporting department within the organisation.

and empowering employees to source and interrogate data themselves. The limitations of within application reporting, within the context of integrated planning, can lead to a need for a dedicated reporting application pulling information from multiple sources but it is none the less an important tool.

5.2 Centralised Data Warehouse and Business Intelligence Application

Overview

A data warehouse acts as a central repository for data originating in an organisation's other business applications. A data warehouse can store data from a number of different sources in the one place for easy retrieval from a single business intelligence application or query engine. Data warehouses can improve data quality by maintaining a consistent structure for data, identifying in and in some cases fixing data errors and facilitating an amount of pre-processing of data where required. A business intelligence application can then be used to query data from the data warehouse. One key advantage of this approach is that data from multiple sources can be combined within the business intelligence application into the one analysis or report.

Example

A centralised data warehouse is used in BGN to collect data from a number of different business systems. SAP Business Objects is a business intelligence tool which takes data from the data warehouse and allows users to build dashboards, analyses and reports based on the data stored in the warehouse. The user has the flexibility of selecting what "Universe" they wish to base their query on and also has the ability to pull data from multiple queries into the one report. Custom fields can be created in Business Objects to perform calculations based on data from the warehouse and filters can be used to allow the user a high level of customisation. Business Objects is a good application from dealing with complex queries relying on a high quantity of data.

Business Objects is used in BGN to support integrated planning by creating a number of reports presenting service delivery performance by region and skill type. Planned maintenance is also forecast forward using data from the work management system allowing manpower and material requirements to be planned.

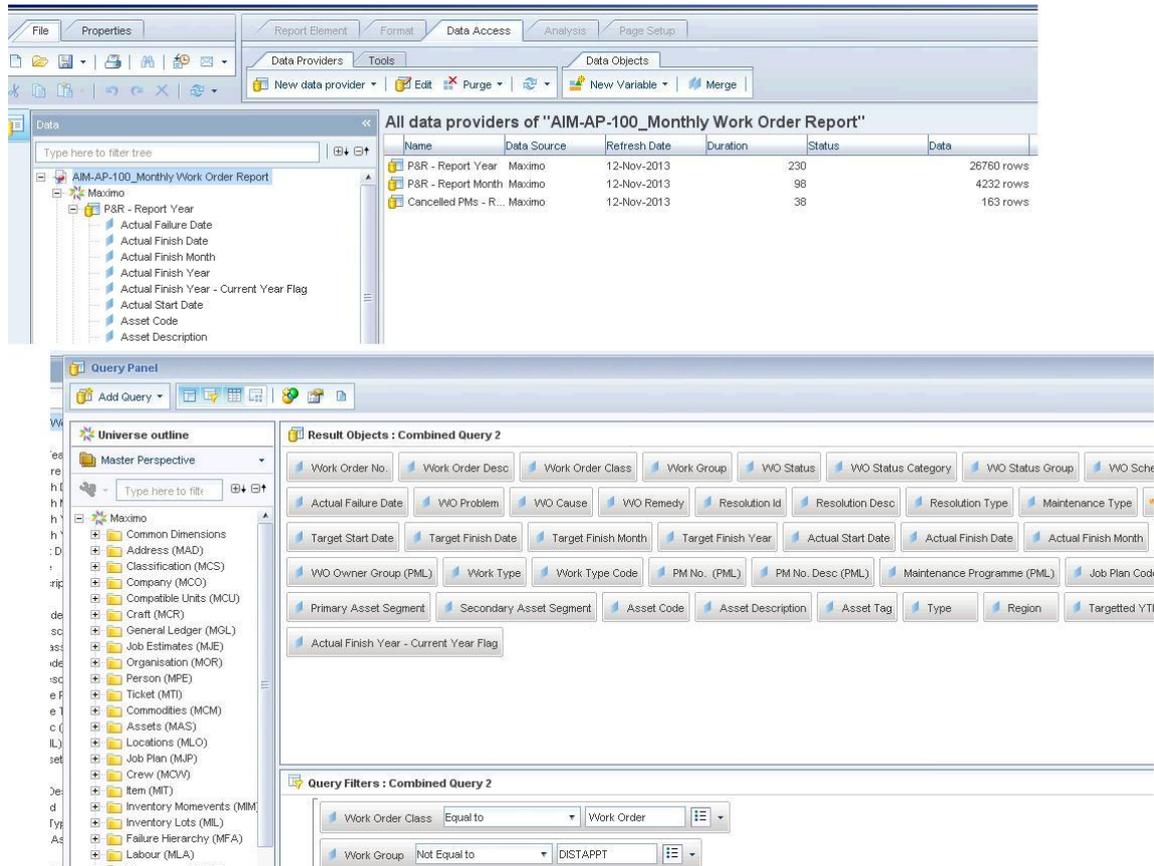


Figure 10. Screenshot showing multiple queries and field selection in Business Objects.

Advantages

- Data can be made available from multiple applications in one report and in one analysis environment.
- Pre-processing of frequently used calculations can be achieved and can save time in reporting.
- A high amount of analytical functionality can be found and used in these systems.

Disadvantages

- Increased administrative burden to manage the data warehouse and reporting suite.
- Additional training and licenses required for users. Can cause a bottleneck if all reporting is funnelled through a dedicated reporting department.

Use

A data warehouse feeding a business intelligence application is a key tool for integrated planning within a utility. By using this approach planned maintenance activities can be forecast forward, reactive maintenance measured and projected, capital works activities scheduled and customer driven activities estimated to produce a forward looking integrated activity plan. From this plan manpower requirements can be estimated and any pinch points identified and resolved before they become an issue. This manpower plan can also feed

into the organisation's contract strategy by identifying a need for external resources and informing the organisation of the optimum time to perform activities. The activities plan can also lead into the generation of a materials forecast which can inform the organisations strategy for material procurement and storage. Data stored in the warehouse from different source applications can be combined into single analyses allowing operational and financial performance to be compared and contrasted with other key metrics such the size / value of the network being served, number of customers serviced and internal headcount. A data warehouse is an important strategic piece of infrastructure as it allows the data being sourced and managed in other applications to be used to its full potential.

6. Discussion

It is clear that IT systems exist that are suitable for assisting in enhancing integrated planning within a utility. Within this report several solutions have been introduced for enhancing manpower and materials planning, knowledge sharing and collaboration and dynamic reporting in the context of a utility. As utilities come under increasing pressure from customers and regulators to deliver a high level of service at a low price an increasing focus is being put on IT systems that can help achieve this. Computer mediated solutions for Asset Management, integrated planning and knowledge management are an area that can help drive efficiency by allowing a utility to consistently plan, measure, improve and test its activities and processes.

Many options exist for enhancing integrated planning but a utility does not have to choose one or another. Often a combination of a number of the available applications may present the optimum solution. For example, in the case of reporting, a utility may have a data warehouse in place to capture data from multiple applications with a business intelligence application in place to query the data warehouse and produce analyses and reports combining data from multiple applications. In addition to this business intelligence application users may be able to produce ad-hoc reports themselves through one or more of the individual applications feeding the data warehouse without needing access or training in the business intelligence application. Another example could be where the majority of the needs of a business for manpower and materials planning can be satisfied by an existing off the shelf software solution such as Maximo, however one particular business function may require a piece of bespoke software to be developed for it in addition to the off the shelf solution.

As can be seen in sections 3 to 5, there are advantages and disadvantages to each of the solutions presented in this report. In choosing applications to assist in integrated planning an organisation must be very careful to ensure all requirements have been identified and analysed so that the correct solution can be chosen. Bespoke systems have the advantage of being mapped specifically to the business in question but on the other hand off the shelf systems have the advantage of community shared learning that comes from software that is market driven in a competitive market. Cloud based document sharing solutions have the advantage of being quick to set up and easy to share with third parties however they cannot contend with the power and functionality of a full document management system. Within application reporting solutions can be easy to operate and give users quick results for ad-hoc queries but they cannot replace the power that comes from a dedicated data warehouse and business intelligence application solution.

The scope of the required application to support integrated planning is very important. It has been seen that there are many options and a lot of functionality that can be used by utilities however it is important that the solutions are chosen and implemented with the organisations needs in mind. If an organisation were to invest too much time in collecting and processing more data than it has a need for then this can lead to inefficiencies and increased administrative costs. For example if an organisation implements a new IT system for work management and planning purposes that allows technicians use hand held devices in the field to capture data as they carry out their activities for further analysis in a back office careful attention should be paid to the administrative cost for capturing this additional data. If technicians for that organisation carry out 50,000 activities in a year and capturing data in the field adds 5 minutes of additional work to each activity then assuming an average hourly cost (including overhead) of €50 per technician the cost of collecting this data is approximately €416,000. The organisation must be sure that the benefits of collecting this data outweigh the costs.

Integrated planning in a utility and the systems put in place to manage it must be a strategic decision by the organisation. Due to the nature of systems and processes required to enhance integrated planning, and the

data required to facilitate it, it makes sense that an organisation would introduce these systems as part of a greater Asset Management Strategy where policies, practices and systems are put in place to manage the life cycle of all assets as well as all activities carried out by the business.

7. Conclusions

- There are many options available to a utility when considering an IT solution for enhancing integrated planning.
- Integrated planning systems can have huge advantages for a utility however they should only be integrated as part of a wider organisational strategic decision.
- There are advantages and disadvantages to all of the solutions presented in this report, a utility must carefully weight these up when deciding on a system to implement.
- The scope of any required application for integrated planning should be carefully considered due to the wide variety of applications available to ensure the appropriate level of functionality is achieved.

Appendix 1: References

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