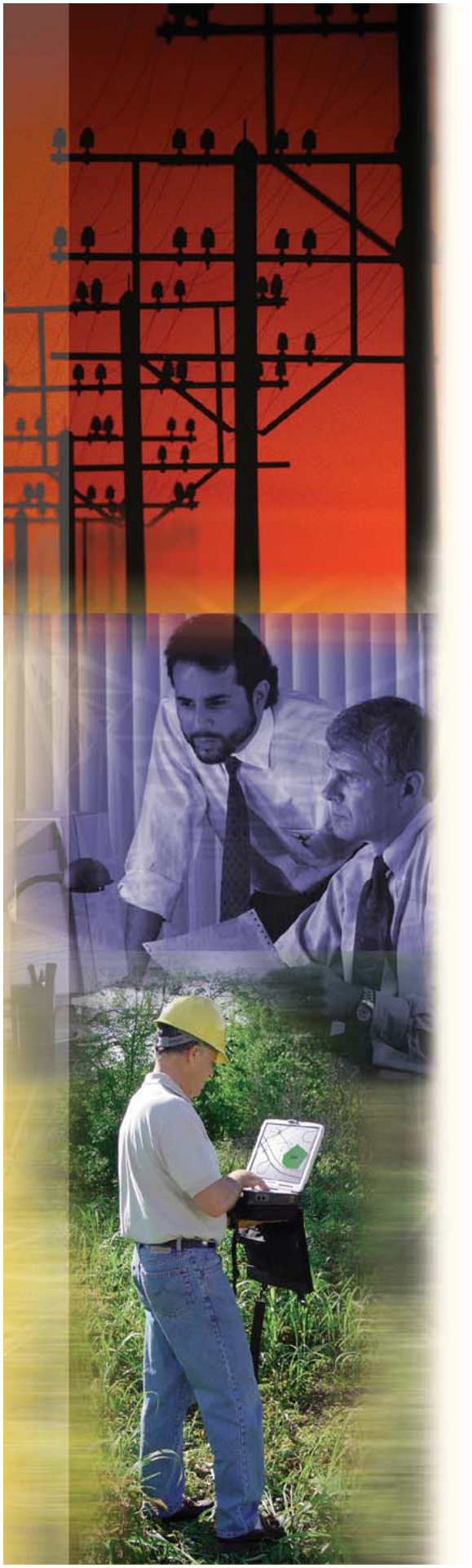

Demand Dramatic Improvement Through Better Asset Utilization and Workforce Unification

By Chuck Drinnan
Executive Consultant, LogicaCMG

Introduction

Utility shareholders and regulators are demanding dramatic business improvements in a corporate environment that limits the utility's options. Today's utilities are smaller, leaner companies facing fixed utility rates, more regulations, and increased insistence on better performance from existing resources and assets. The demands on senior management have increased while the opportunities for quick results through staff reductions and process improvements are limited.

Some utilities are making minimal investments and talking about continued process improvement – doing what they are doing now, but doing it incrementally better. However, incremental changes won't make the substantial improvements that senior management and company shareholders are expecting.

Leading utilities are not settling for incremental improvement. They are seeking dramatic improvements through unification of their assets, systems and data. They are rethinking who they are, what they need, and how they do their work. If they don't, they will be left behind by those who do.

Utility managers are realizing that they are asset owners in asset-intensive companies. As owners, their objectives are to maximize the utilization of their assets. This leads the owners to ask different questions than their predecessors did, seek new performance measures, and require new asset-oriented systems.

This article is divided into two parts:

1. Asset Intensive Companies Are Employing New Systems and Measuring Return on Asset Investment
2. Deploying Unified Work to the Field

Part 1 reviews the questions asset managers are asking and why a new asset registry capability that determines asset life cycle history and accumulated costs is required for business improvement. We will also discuss applying a new investment measurement, Return on Asset Investment (ROAI), to compare potential investments in different assets. ROAI considers the value of the assets in producing revenue.

Traditionally, utilities have been organized along capital and operations activities in the office and the field. Enabled through the implementation of "best-of-breed" systems, this culture results in organizational silos that prevent employees from operating at their fullest potential. As utilities recognize these silos and seek to remove them, they can operate more effectively as a unified organization.

Part 2 recommends the unification of office and field capability as a method to reduce costs and make the office and the field more effective. Unification requires organizational, cultural, and system changes. By moving more office capability to the field and aggressively removing barriers between the office and the field, utilities can make dramatic productivity improvements.

The relationship between the utility and its contractors is similar in many ways to the relationship between the office and the field. By expanding access to corporate systems to the contractor, in the contractor's office via the Internet, the contractor's role can be expanded, redundant effort eliminated, and the overhead of contracting minimized.

In short, utility organizations can make dramatic improvements by focusing on their existing assets and unifying their workforce. New systems and cultural changes are required to reduce costs and achieve the full potential of the utility workforce. This article discusses both.

PART 1
Unifying Your Assets and Systems

Utilities – Asset Intensive Companies

In a utility that has generation, transmission, distribution, and retail segments the transmission and distribution segments will spend most of their revenues on the extension and maintenance of the utility network – that is, the utility's assets. These regulated business segments (Wires and Pipes) acquire and maintain assets rather than generate or sell energy. As the utility environment continues to change, the managers of these business segments are recognizing that they are managing asset-intensive companies and asset ownership is their core business. Even vertically organized utilities, with all the business segments present in a single company, spend most of their non-energy acquisition budget on their assets.

The top five US electric and gas utilities have over 130 billion dollars of combined property, plant and equipment assets.

As asset owners, the regulated utilities face conflicting issues:

- Demand for profits and ROI
- Retiring institutional knowledge
- Increased reliability requirements
- Performance based rates
- Aging infrastructure
- Reduced capital budgets

Asset Managers Ask Different Questions

Managers who have recognized the importance of asset management are exploring ways to measure return on asset investment, extend the useful life of their assets, and better utilize their existing assets. They are also changing the way they deploy their resources, what they expect of their resources, and how they measure asset impact.

Utility managers, motivated to manage their assets better, ask questions like:

- What is the full life cycle history of an asset?
- What impact does the asset have on delivery of energy and revenue production?
- What expenditures has the utility made on the asset?
- What is the return on asset investment?
- How can the maintenance and inspection budget be allocated to increase asset life while maintaining reliability standards?

Asset Life Cycle Components

To answer these questions, asset managers need data that is captured and organized differently. For each asset, they need to know each life cycle event, its associated costs, and its effect on the asset's reliability and expected life time. With this history,

managers perform an asset-oriented analysis to drive asset based decisions. Asset life cycle history should include:

- Implementation including cost of equipment and installation prorated to the individual asset
- Design parameters – the distinguishing features of the asset and the engineering parameters required for detailed analysis
- Compliance, inspection, and maintenance events including the evaluated status and associated costs
- Asset utilization parameters and events (sometimes called condition factors) – faults, loads, power factors, etc.
- Maintenance procedures performed on the asset and associated costs – refurbishments, treatments, reconfiguration, etc.
- Special environmental conditions (temperature if unusual, salt water conditions, etc.)
- Decommissioning events and associated costs

Since the information is organized by asset, the cost of operations that are performed on several assets should be prorated in a consistent and meaningful manner to the individual asset.

Life Cycle History Drives Cost Reductions

The asset life cycle history provides the raw data that drives an analysis that helps determine:

- The most cost effective manufacturer based on the total cost of ownership for new asset purchases
- Configuration changes and how they affect the expected life of the asset
- Maintenance procedures and budgets that meet compliance requirements, reduce costs, and increase asset useful life times
- Replacement strategies – if the status of the asset indicates it has minimal degradation, should the utility replace the asset as it nears the end of its design lifetime?

Measuring Return on Asset Investment

Return on Investment (ROI) is a popular financial measurement used to determine whether an investment should be made and which of several investment alternatives offers the most financial benefit. ROI compares major projects such as acquisition of a new system, the extension of a gas main, or the implementation of a pole life extension effort. ROI is based on best guess estimates of future productivity, value appreciation, etc. Uncertainty is often part of the consideration and is compensated for by the managers who perform the assessment.

Return on Asset Investment (ROAI) is a different measure that helps evaluate the relative importance of different asset investments. While ROI is typically a measure of the value of a complete project, ROAI is used to compare asset alternatives within the context of a larger project.

A Maintenance Example Using ROAI

For example, suppose your company has decided, based on an ROI analysis, to invest in increased maintenance. As a regional manager you want to apply that investment to provide the most ROI by determining the most effective maintenance (or replacement) strategy for each district. You want to determine a more reasoned strategy than giving each division an equal share of the budget. ROAI provides a consistent, objective way to compare the long-term impact of various operations on the assets in each division. Suppose investing in the maintenance of a particular type of facility reduces the probability of failure for ten years and also extends the facility's expected life ten years. Other maintenance procedures for different assets offer different advantages. With a limited budget, the problem is to determine an optimal maintenance strategy for all assets in order to maximize the ROAI. The comparison is between doing nothing to an asset against doing specific maintenance to selected assets.

ROAI provides consistent, objective ways to compare the long-term impact of asset operations.

One component of the value of performing the maintenance is the cost avoidance of buying and maintaining a new asset over the additional expected life time minus the cost of implementing the maintenance. However, there is more to computing ROAI.

If the asset is critical to a sub-transmission line located near the substation, it is more valuable than the same asset controlling the energy provided to the local dry cleaners. It may be the same type of facility but the impact of a potential failure is dependent on the use of the facility in the network. The impact is also a function of the level of redundancy in network paths and the time required to repair the asset or reconfigure the network. Thus the manager should consider the reduced probability of asset failure and the cost avoidance of the failure if the asset is better maintained within the context of the network.

Some utilities offer different grades of service at different rates. The value of the asset can also consider the revenue of the downstream customers prorated to the asset.

Not surprisingly, the general result of the complete ROAI analysis is that the most expensive facilities and those that are responsible for more downstream load (or downstream revenue) will be maintained first. However, once these facilities are maintained and the probability of failure for these facilities is reduced, other facilities with less impact will offer further ROAI and they can be scheduled for maintenance. The strength of the ROAI calculations is to determine various tradeoffs for the expenditure of a finite pool of dollars, based on a technical analysis rather than time-based maintenance that treats each asset as having equal importance.

RCM

Reliability Centered Maintenance, as proposed by EPRI and implemented in some utilities, considers the impact of the reliability of the network in determining when assets should be maintained and what procedure should be used. It has proven effective for substations and generating stations as well as distribution.

This example is a variation on Reliability Centered Maintenance or RCM. The difference is that instead of using reliability as a measure of the value of a maintenance strategy, the ROAI investment uses evaluated cost avoidance.

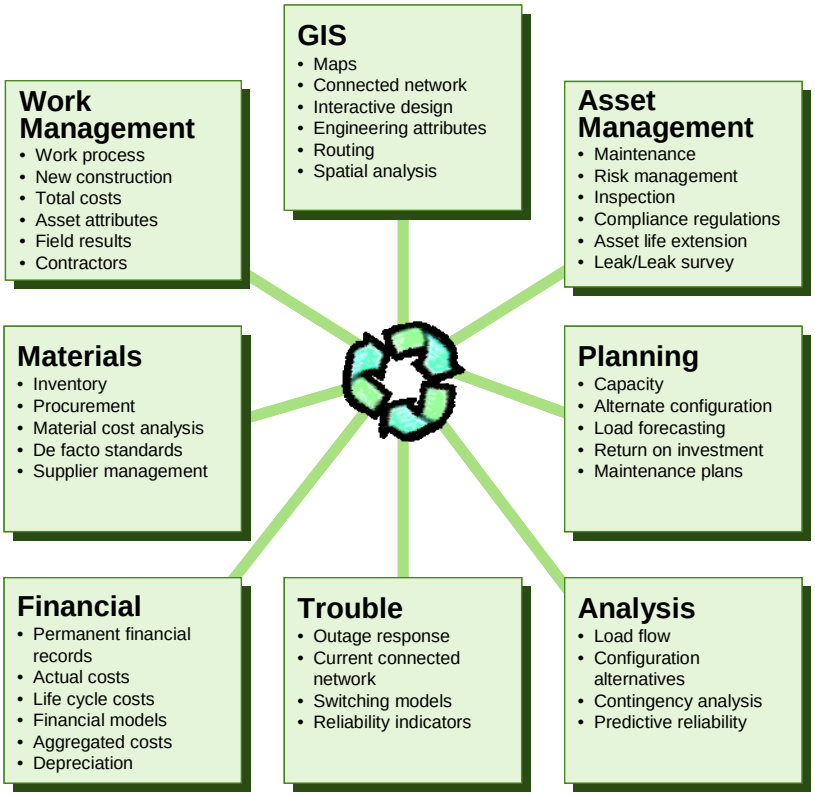

Figure 1: Systems that Manage Assets and their Functions

Asset Oriented Systems

Most utilities have a wide range of systems that were developed to manage specific aspects of the life cycle of their assets. These are mature systems developed over the last twenty years and typically they perform their functions very well (see Figure 1).

However, managers are quickly learning that their specialized systems don't maintain a life cycle history of the assets, can't determine all the costs associated with the asset, and don't have a measure for return on asset investment. The systems don't provide the relative value of the asset in delivering energy or producing revenue.

To retain the required asset information, managers need an asset data repository that provides a definitive record of all the assets and unifies all the activities and information associated with each asset. Without new tools and new data stores, utility managers are forced to manage assets in virtually the same manner as their predecessors did fifteen or more years ago.

New Capability Required – Asset Repository

The data necessary to determine an asset's life cycle history and ROAI is available from the existing asset systems but the systems are scattered throughout the organization, making manual computations impractical. The asset data needs to be organized by asset and aggregated into an Asset Repository.

The Asset Repository stores the following data for each asset:

- Basic asset data including engineering parameters, location, and distinguishing attributes such as manufacturer and serial number
- Current network configuration (if not available via the other systems)
- All life cycle events for each asset
- Complete cost history from procurement to abandonment including maintenance and configuration changes
- Compliance history (inspection, maintenance, or repair); the Repository may also be the system of record to demonstrate compliance
- Revenue billed and collected prorated to the assets
- Load profiles
- Measures of the financial value of the asset

The Asset Repository will include the analysis tools to present life cycle history (events and costs) and ROAI for potential plans, alternate configurations, and system betterment evaluation.

The representative distribution utility system architecture presented in Figure 2 has many different components. These components all capture and maintain data associated with the asset and the work processes. Understandably, the utility doesn't want to add another complicated process, redundant data entry and more system maintenance to implement the Asset Repository.

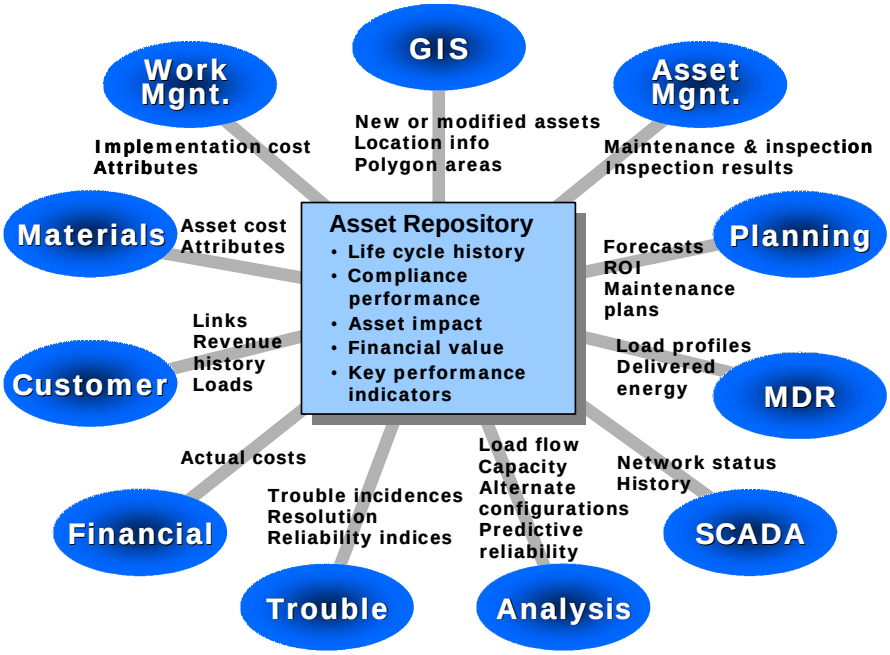

Figure 2: Systems Steward the Data for the Asset Repository

But in today's system architecture, adding another system doesn't have to mean redundant data entry and increased maintenance effort. Modern integration capabilities with service oriented architectures and Enterprise Application Integration (EAI) capabilities allow systems to "steward" data for other systems without any additional user effort.

An Example of EAI in Action

For example, consider a network expansion job. Assuming the work management and GIS systems have been integrated using a graphical design tool (GDT) capability, the work process proceeds non-redundantly. The GIS and the GDT capture the new assets, modify the connected network, and determine location based data. In the process, the GDT automatically designs the job for the work management system using compatible units. The work management system captures the work process, requisitions material, schedules the work, and stores all labor, equipment, and asset costs. As the work is completed and approved, the GIS posts the version of the work in progress to the as-constructed spatial database.

The work management system, integrated with the financial system, captures all the costs of each process step.

During these work finalization processes, the GIS and work management systems issue messages to the enterprise. Systems like the Asset Repository are waiting to receive and process these messages. The message processing inserts the new assets into the Asset Repository, associates the attributes and connectivity from the GIS, prorates the cost to the assets involved, and starts the maintenance and inspection process. All of this takes place transparently to the user through the automatic generation, transmission, and processing of messages.

As described here, this EAI process is called a "loose coupling" because component systems can be modified, upgraded, or replaced without changing the integration capability. If a new system can create and process the messages in a compatible manner the integration continues to work unchanged.

By focusing on the true cost of assets and unifying their systems and data, utilities can improve their reliability and safety records while reducing maintenance and inspection costs, and increasing the expected life time of their assets.

By analyzing asset life cycle information and by maintaining, designing, and implementing assets guided by return on asset investment or ROAI, utilities can get more from their assets for less investment.

FMDR

The Facilities Management Data Repository (FMDR) is a component of LogicaCMG's Asset and Resource Management ARM product suite. FMDR provides an asset repository capability. Implemented in a modern IT architecture, FMDR works cooperatively with existing GIS and work management systems to avoid redundant effort and duplicated process steps. FMDR uses an EAI approach to accumulate information from inspection, maintenance and compliance systems such as the LogicaCMG Compliance Tracking System.

The end result will be a greater capability for the utility to meet shareholder and regulator demands, as well as the service expectations of the utility's customers.

Once a utility has effectively decided what should be done and when it should be done, it needs to consider how, where, and who should do the work.

PART 2
Deploying Unified Work to the Field

Unifying office and field work and effectively deploying the work to the field offers the potential of dramatic business improvements in productivity through better asset utilization and work force unification.

New strategies for unifying the utility's work force and systems in the office and in the field are recommended to reduce organizational silos. Cultural changes are required to achieve the unification and drive productivity improvements. Once the constraining silos have been removed, the utility can achieve long-term cost savings and dramatic business improvements.

Automating the Field – The Last Frontier

Since utilities are asset intensive companies most of their work is done where their assets are located – in the field. However, most of the improvements in processes, procedures, and systems have emphasized the office worker and not the field worker.

The field may be the "last frontier" for increased effectiveness and reduced costs. Industry studies have documented that a 30% to 50% improvement in field productivity can be achieved by:

- Implementing comprehensive system capability on mobile devices
- Redesigning business processes to unify field and office work
- Developing and monitoring key performance indicators
- Providing field access to current data

The first steps toward field productivity improvement – such as field map access and downloading work orders – have been available for years. These capabilities offer field workers ease of use benefits and reduce clerical work. However, even greater benefits are achieved when the utility

Organizational Silos
Narrowly Defined Functional Areas
That Inhibit Enterprise Objectives

fully integrates the field into its business processes, accepts field updates, and provides wide system access to the field worker.

Poorly defined business processes have hampered achieving projected system benefits in both office and field operations. The culture of many utilities separates the field and office staff as well as the construction and operations organizations. In fact, within some utilities, there is a tradition of disrespect for the needs of each party. This culture constrains the benefits that can be achieved.

To achieve the next level of utility effectiveness, the utility must shift its cultural focus from the office to the field where the work is performed. Executive support for these changes, including the necessary organizational changes, is required to help ensure their success.

Moving the Office to the Field

Almost all the distribution utility vendors are turning to field applications as a source of new users and increased benefit. However, few field systems are integrated with one another and with other corporate systems. Many vendors are simply moving their desktop functionality to the field without implementing new business processes and integrating field and office functions.

At one time it appeared, in a comical way, that the fully enabled field worker would look like "an outlaw in a cheap western" – a person weighed down with different mobile units, PDAs, and cell phones in different holsters and ready for any situation, whether the application was mapping, dispatch or inspections. But this hasn't happened because mobile units provide enough capacity to support multiple applications, even if the applications aren't integrated. So the question becomes, how can the utility capitalize on the power of the fieldtop and integrated applications to support greater work efficiency?

Mobile Capability Evolution

Mapping was one of the first distribution field applications (customer service turn on / turn offs and outage/dispatch were other early adopters). Since maps are the only field source of network configuration, they are the lifeblood of the field worker. Map access on mobile units has replaced hardcopy map books that were time consuming and expensive to maintain, awkward to use, and always out of date.

Yet dramatic cost reductions have not been achieved. One reason is that the mobile mapping capability serves a narrow purpose – delivering map information. The mobile device is being used as a digital clipboard. The work, defined by office based systems, is downloaded to the mobile device and results entered by the field worker are recorded on the mobile unit (digital clipboard) and uploaded to the office, typically for reentry into the office systems. Some implementations use redlining to record the construction details – a process that replaces the red pen on the paper design with a

Southwest Gas: Breaking New Ground with Office to Field Asset Management

The phenomenal growth of Southwest Gas Corporation, one of the fastest growing natural gas distribution utilities in the United States, has put increasing demands on its workforce and IT solutions. Southwest Gas has controlled its costs and met its increased demands with LogicaCMG's Asset and Resource Management ARM product suite integrated in the office and the field with other corporate systems.

digital pointer recording redlines on a digital map for subsequent re-entry into the office systems by office staff. This approach duplicates the existing process and doesn't provide a unified, highly productive office and field process.

The next evolutionary step for mobile capability came from the asset/work management environment. Work packets defined in the office are downloaded to the mobile units. Some mobile vendors support recording of construction results and upload and automatic entry into the asset/work management systems from the field units. With this capability paper designs and work packets are eliminated, the effort to transcribe construction is reduced, redundant processes are eliminated, and the utility's databases are updated rapidly with accurate data.

However even today, many of the field worker's applications don't have the same look and feel and few of them perform in an integrated fashion with the corporate systems. In some cases, because of the limitations of field devices or communication methods, the field workers are offered "stripped down" applications that reduce the field's productivity as an enterprise contributor. For the utility to achieve real efficiencies business processes and cultural environments must be changed and both field and office systems must be modified to enable the new processes.

A Lesson from the Desktop

All of us have experienced how the value of our desktop systems has increased dramatically as the applications became more integrated and more user friendly. Then these systems became even more valuable when they moved from departmental silos into enterprise wide use. As we learned to "Google", we began to draw on the knowledge of the entire world at our desktop.

The modern desktop environment is a seamless environment. However, the field worker often has a hodge-podge of technology: a real time connection for dispatch, docking stations for construction and inspection work, and CDs for mapping.

What if all these field functions were integrated as seamlessly as typical office-based desktop environments? Why not move the office to the field? Why not change the work process so that office and field work are much more transparent? To achieve real performance gains, why not provide access and update capability for most enterprise data to all users, whether in the office or the field? Recognize that the "field" can be many different places – a crew vehicle, a job site, an employee's home, a contractor's office – and make data access possible from all. What if the crew defined new work, requisitioned material, completed the work, and recorded the results from the field without returning to the office – and the effort took a day or two instead of weeks or months?

RTARM
Unifying the Office and the Field

LogicaCMG's new real-time asset and resource management product, RTARM, combines dispatch, inspection, maintenance, construction and mapping capabilities to increase the productivity of field and office work forces.

Unified field and office work doesn't result from new technology alone; it requires cultural changes supported by senior management. As long as office workers are the only ones who can design the job and record as-built data; and as long as the field doesn't appreciate the office requirements or respect office developed designs and corporate records; then work will be performed redundantly in the office and the field and important office system records will remain months behind. Some utilities are actually perpetuating their unproductive behavior by buying additional systems to automate antiquated processes. They are incurring additional costs with little hope of achieving significant benefits.

The corporate culture should change to give greater emphasis and responsibility to the field worker until the distinctions between field and office workers are virtually eliminated. New processes must be defined and implemented so that the whole environment – office to field and field to office – becomes a single business process continuum. When this happens, utilities can reap their expected benefits and experience greater accountability from both office and field personnel. Utilities that adopt this approach can further flatten their organizations.

Harnessing Technological Change

The next generation of office and field systems will implement new system architectures that take advantage of increased communications capabilities. With the revolution called "Wi-Fi" and wireless networks, desktops and fieldtops can connect to corporate systems via the Internet from many locations. Often, wireless "hot spot" connections are either free or relatively inexpensive. As wireless coverage increases, Internet solutions proliferate, and communication costs decrease, utility workers in the field will be able to do everything that they now do in the office.

With new wireless system architectures, systems will be designed to operate seamlessly in both the office and the field. When a wireless connection is unavailable, the system will access data previously downloaded to the field unit. When the connection is re-established the system will automatically upload the work and refresh the field unit without the user taking any actions. This approach requires new system architectures. Enabled by this communications revolution, utilities will be able to achieve real benefits as field and office cultures and their business processes are transformed and the utility's combined work forces focus their efforts on enterprise-wide objectives.

Key Performance Indicators for the Field

Studies have shown that companies that implement performance measures for field activities achieve a much higher level of productivity. Virtually all top quartile companies implement performance metrics that help them substantiate their benefits and identify areas for additional study and subsequent improvement. These metrics – often called key performance indicators – are designed to measure the improvements the utility is striving to achieve. Typical indicators for the field are: completed work orders per day categorized by type, average labor per work order per type, average duration of the work orders and productive direct activity time.

Direct activity time is measured as the percentage of the workday spent working directly on an asset. It doesn't include travel, planning, approvals, record keeping, management, meetings, etc. – only the actual time spent working on the assets.

"Productive" direct activity time is the time that an employee is performing work appropriate for the employee's skill level. Maximizing direct activity time is essential to keeping everyone busy – a good objective; maximizing productive direct activity time is the key to keeping everyone busy doing work they can most cost effectively perform – a better objective.

Work Scheduler*Plus*

Work Scheduler*Plus* is a component of LogicaCMG's ARM product suite. The constraint based scheduling system provides a "least cost schedule" for complex multi-day, multi-crew work. It sets and honors appointments.

Studies demonstrate that when the cultural changes are achieved to make work in the field more effective, a dramatic increase in direct activity percentages results. Many distribution utility companies are performing at less than 20% direct activity time. This means that on average the utility's staffs spend less than two hours a day working directly on an asset and more than 6 hours a day filling out paper work, traveling, recording results, managing others, etc. By way of contrast, field workers for top quartile companies achieve 45% direct activity time.

Alternative Work Forces

In seeking to make productivity strides, utilities are re-examining who does what work and with what tools. Continuing a trend from the de-regulation era, asset intensive companies are distinguishing asset ownership from asset related service delivery. Service delivery can be divided into:

- Providing capacity, reliable service, and safety
- Performing routine work such as construction and maintenance

For some asset owners, capacity, reliability, and safety efforts are core capabilities for which they retain direct responsibility. Non-core activities such as construction and maintenance may be done by contractors and managed by the asset owners.

Contracting and Outsourcing

Utilities have been contracting their work for years – gas construction, tree trimming, and pole maintenance, for example. However, for some utilities, the paradigm is changing from “contracting" to "outsourcing". With traditional contracting, the contractor does what it is directed to do by the company. With outsourcing, the outsourcing vendor accepts the risks and responsibilities for delivering specific processes and functions, as well as for performing the work. Outsourcing contracts include negotiated service level agreements (SLA's) that specify the outsourcer services, responsibilities, and performance levels to assure quality results.

Each utility is determining its own balance between company employees, contractors, and outsourcers with some utilities contracting everything except the core asset ownership responsibilities while other utilities are pulling most of their work in-house.

Using the Web to Empower Contractors

One of the barriers to effective contracting is the effort required to manage contractors and to record contractor work into the company’s permanent records. This problem is not unlike the organizational silos, discussed earlier in this article, that prevent office and field workers from working effectively.

Most utilities rely on server/desktop systems such as work management, financial systems, and GIS to streamline their in-house work processes. But the utility often restricts contractor access to the systems for security reasons.

ARM Web Portal

LogicaCMG’s ARM Web Portal expands corporate work management access to contractors and developers. Contractors perform more work, more effectively with less effort on the part of the utility.

The barriers to effective contracting can be substantially reduced if the utility treats the contractor more nearly as a partner, increases the share of the work the contractor performs, and provides access to the company’s computer systems through secure portals.

For example, the following procedure increases contractor productivity. Assuming the contractor has a standing service level agreement with the utility, the utility defines the work at a high level and makes it available in the contractor’s office via the Internet through a secure portal. Contractor system access is limited to the contractor’s needs (for example, the contractor can’t view work assigned to others). The contractor accepts the work, does any design, permitting, material requisition, and construction, and then records the detailed construction through the Internet portal via the same systems the utility uses. The contractor’s involvement ends with the submittal of an invoice via the web.

Advantages of this approach include:

- Contractor performs more of the work, presumably at a lower total cost
- As-built records are updated quickly and accurately by the contractor
- Contractor management efforts are reduced
- Redundant paperwork and data entry are eliminated
- Asset posting backlogs are eliminated

Dramatic Improvements

Leading utilities are taking aggressive steps to manage their assets better, find new ways to reduce their costs, and provide better and more reliable service. Recognizing they are asset owners in asset-intensive companies, they are maximizing the effective lives of their assets and controlling total cost of ownership. They are implementing new systems and an asset repository with enterprise access including field workers. These utilities are changing their cultures, unifying their office and field workers, and instituting new business processes to improve performance.

The lines between "office" and "field" are blurring as the utilities recognize that work is the same regardless of where it is performed. Leading utilities are also re-examining such alternatives as contracting and outsourcing and transferring business processes and accountability to third-party entities to reduce costs and increase reliability.

In a tough economic environment where many utilities have taken the easy benefits, utilities are finding new approaches such as these to move to the next level of effectiveness and achieve dramatic business improvements.

About the Author

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LogicaCMG is a global IT solutions company, providing systems integration, consulting, products and services. LogicaCMG's Asset & Resource Management (ARM) product suite includes work management, mobile computing, asset management, compliance tracking, scheduling, and reporting capabilities delivered as a pre-integrated, seamless solution. For additional information visit our web site at www.logicacmg.com/us.

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