



ARE 524
Facilities Maintenance Management
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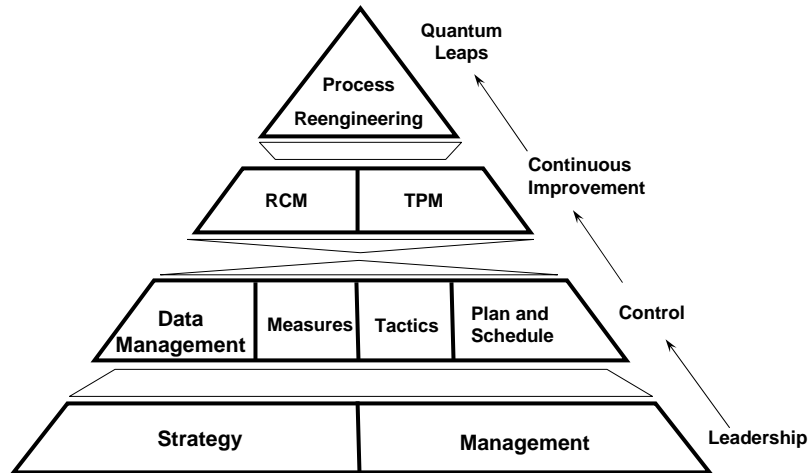
Management information systems for maintenance Section 6

Uptime
Strategies for Excellence in
Maintenance Management

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World Class Maintenance



OUTLINE

- ❖ INTRODUCTION
- ❖ OVERVIEW OF THE CMMS
- ❖ PROJECT MANAGING THE CMMS IMPLEMENTAION
- ❖ JUSTIFYING YOUR CMMS
- ❖ SOME EXAMPLES



INTRODUCTION - 1/4

- ❖ The number and complexity of equipment systems managed by a typical maintenance engineer is awesome
- ❖ When you consider parts and supplies, specialist skills, and the effort required to prevent and repair problems, it is incredible that the plant usually runs .
- ❖ To keep it operating smoothly, you must take a systematic approach to information management.



INTRODUCTION - 2/4

- ❖ The sheer of volume of maintenance information can be staggering.
- ❖ An Airport facility in the far east, for example, with 7,000 equipment systems and a 20,000 SKUs (stock keeping units) in maintenance stores, generates 100,000 work orders each year.
- ❖ At an electrical appliance manufacturing plant with 2,000 pieces of equipment and 30,000 stores SKUs, 150,000 work orders (110,000 of them “urgent”) are filed annually.
- ❖ A public transit fleet generates 250,000 work orders or service requests for 950 vehicles.
- ❖ it controls 25,000 stores SKUs and has 415 tradespeople and a direct maintenance cost of 50,000,000 per year .

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INTRODUCTION - 3/4

- ❖ The number of transactions for these businesses easily exceed 1 million a month.
- ❖ With all that maintenance has to handle, they need all the help available to keep track of who is doing what tasks, on what equipment, with what parts, and at what cost.
- ❖ You should be using an automated information management system .
- ❖ As discussed earlier, data about equipment histories, resource planning, scheduling for preventive and corrective maintenance, and the warranty and legal conformance routines must be documented and controlled .

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INTRODUCTION - 4/4

- ❖ Most businesses today have some sort of computerized maintenance management system (CMMS) .
- ❖ Some have developed them in-house, but most have chosen one of the hundreds of commercially available packages.
- ❖ If you or CMMS is more than three years old, it might benefit your company to take another look at what's available .
- ❖ If you don't yet have the CMMS , this chapter explains what they are all about and how to select and implement one .

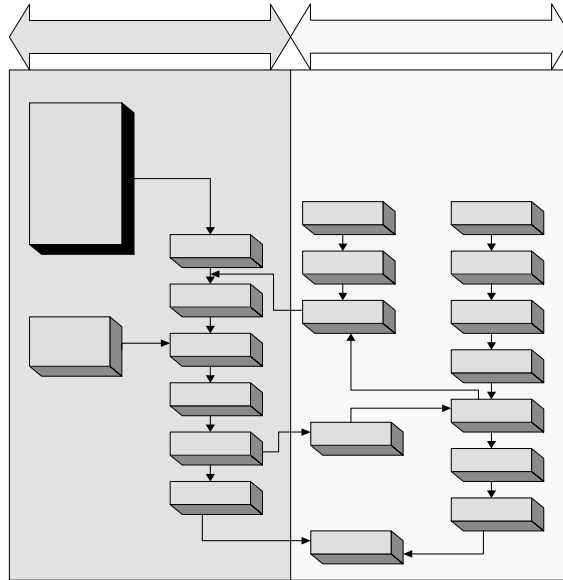


OVERVIEW OF THE CMMS - 1/10

- ❖ In chapter 3, we looked at various ways to enhance maintenance and materials management .
- ❖ Figure 6–1 shows an overview of what a typical CMMS would cover by linking the two processes .
- ❖ The computer program lays out the entire cycle, beginning with the requirements and ending with an analysis of purchasing and inventory control.
- ❖ The complete maintenance plan is addressed , from identifying what needs to be done to analyzing the completed work .



OVERVIEW OF THE CMMS - 2/10



**Figure 6-1,
The Linked
Maintenance and
Material Process**

MAINTENANCE

Inspection
Predictive
Preventive
CBM
Condition



OVERVIEW OF THE CMMS - 3/10

- ❖ Maintenance and materials processes converge in the plant and equipment configuration and bill of materials, and in the need to report on the analysis conducted .
- ❖ As you can see, you can understand both systems better with this blueprint of how they interact.
- ❖ At the same time, the CNN this simplifies your job of managing information.

Equipment Control

Equipment Configuration

Bill of Materials

Repairable

Reporting



OVERVIEW OF THE CMMS - 4/10

- ❖ A CMMS may run on a mainframe , minicomputer , workstation, microcomputer, or network .
- ❖ Because of their increasing capabilities and ease in networking for multiple users, micros are now the most popular platform for the CMMS software.
- ❖ A typical PC-LAN (network) may have ten or fifteen users and several printers.
- ❖ It may be linked to other systems, particularly accounting , payroll , and inventory , if they are not part of the CMMS.
- ❖ It is usually divided into modules of related functions , which operates the various data management and analysis activities .



OVERVIEW OF THE CMMS - 5/10

- ❖ Following is a brief description of eight of the more common modules and what they do (see figure 6-2).
 - ❖ Equipment identification and bill of materials
 - ❖ Work order management
 - ❖ Planning and scheduling
 - ❖ Preventive maintenance
 - ❖ Inventory control
 - ❖ Equipment history
 - ❖ Labor
 - ❖ Costs and budgets



OVERVIEW OF THE CMMS - 6/10

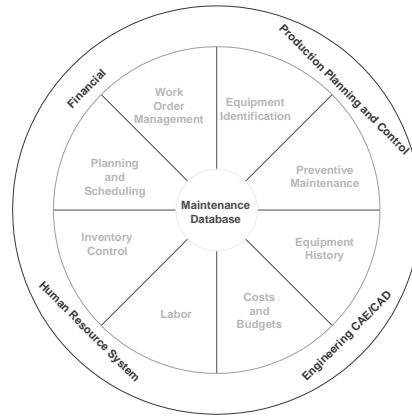


Figure 6-2, Key CMMS Modules



OVERVIEW OF THE CMMS - 7/10

- ❖ ***Equipment identification and bill of materials***
 - ❖ Usually one of its module as used.
 - ❖ All the equipment covered by the CMMS is logged in with “nameplate” data.
 - ❖ Then, the assemblies, components, and parts that make up the equipment are identified and linked according to hierarchy or relationship.

- ❖ ***Work order management***
 - ❖ Manages the process of opening a new work order, estimating its cost, tracking its status, and ranking it according to priority.



OVERVIEW OF THE CMMS - 8/10

- ❖ ***Planning and scheduling***
 - ❖ Develops task times; resources required to do the work ; and schedules for all types of maintenance work, whether preventive or corrective.
- ❖ ***Preventive maintenance***
 - ❖ A critical module that helps establish that PM schedule, describes required tasks and materials, allocates costs, and helps set that schedules.

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OVERVIEW OF THE CMMS - 9/10

- ❖ ***Inventory control***
 - ❖ Available in most packages, it manages the stores inventory.
 - ❖ However, many businesses use their accounting or production control software to do this job, and often on another computer.
 - ❖ Its function is to track inventory on hand and use, costs, and allocation of inventory items used for maintenance.
- ❖ ***Equipment history***
 - ❖ Key functions are to keep histories of overhauls, repairs, costs, labor, downtime, and utilization, and to track failure causes and special events in the equipment life cycle .

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OVERVIEW OF THE CMMS - 10/10

- ❖ **Labor**
 - ❖ Keeps an inventory of individuals, their skills, the vacation schedules, training histories, availability, and utilization to enable accurate work order and project scheduling and backlog control.
- ❖ **Costs and budgets**
 - ❖ Most packages are able to accumulate projected and actual costs in multiple cost centers for labor , materials, services, and allocated overheads.



PROJECT MANAGING THE CMMS IMPLEMENTATION - 1/8

- ❖ Like other computerized systems, the CMMS, must be user-driven.
- ❖ That is, the driving force behind it must be maintenance – the system must be useful primarily to you.
- ❖ The project champion should be supported by specialists in systems, materials, operations , accounting, and the like.
- ❖ You need a clear set of objectives that you expect from the CMMS to help guide you through the whole process.
- ❖ An example is shown in figure 6-3.



PROJECT MANAGING THE CMMS IMPLEMENTATION - 2/8

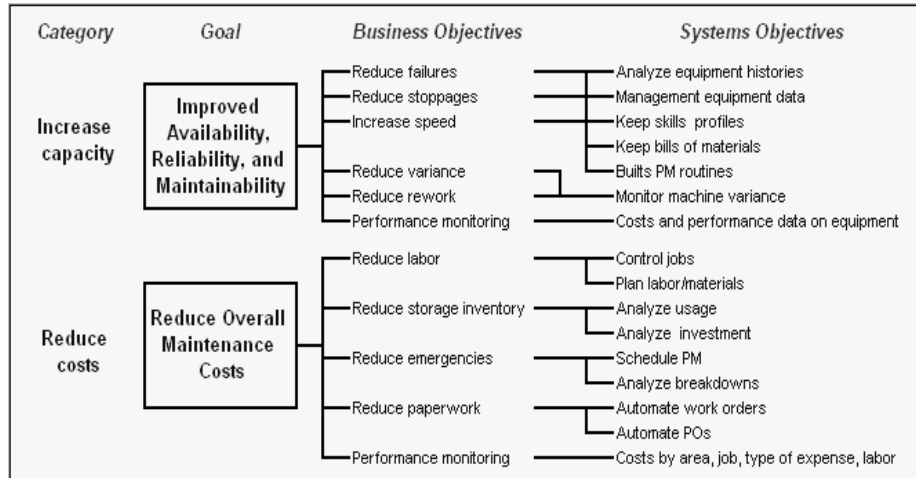


Figure 6-3, CMMS Objectives



PROJECT MANAGING THE CMMS IMPLEMENTATION - 3/8

- ❖ Your success also hinges on knowing how to put your plan into practice.
- ❖ Many large businesses have developed or in purchased systems delivery methodologies, which usually have a fast track for purchased packages.
- ❖ They are made up of a series of steps; the each one must be completed before advancing to the next.
- ❖ An example is described in figure 6-4, which are to lines of the following five phases.
 - ❖ *Requirements analysis*
 - ❖ *Solution definition*
 - ❖ *Design and build*
 - ❖ *Test*
 - ❖ *Transition*



PROJECT MANAGING THE CMMS IMPLEMENTATION - 4/8

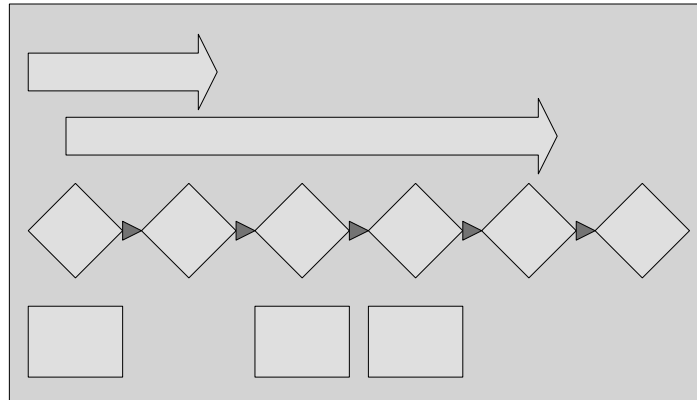


Figure 6-4, CMMS Systems Delivery Methodology



PROJECT MANAGING THE CMMS IMPLEMENTATION - 5 /8

❖ Requirements analysis

- ❖ *The first step in this phase is that your requirements be identified and documented.*
- ❖ *This should involve mapping all the processes, whether automated or manual.*
- ❖ *For example, part of the maintenance work identification process may come from condition -- based monitoring.*
- ❖ *Should this information be input directly into the CMMS up front , or should you allow for manual monitoring and analysis ?*
- ❖ *The result of the analysis could manually trigger a work order in the CMMS.*
- ❖ *Benchmarking and other research into the possibilities will help you decide what's best for your operation.*
- ❖ *The next step is to scout your system , both software (application) and hardware (technology) , from among the many products and vendors on the market.*



PROJECT MANAGING THE CMMS IMPLEMENTATION -6 /8

❖ **Solution definition**

- ❖ *This phase expands the mapping started earlier, from the required modules identified earlier to specific functions.*
- ❖ *An example of a functional specification for a CMMS is presented in Appendix B.*
- ❖ *At this point, interfaces with other company systems are defined.*
- ❖ *By now, you will identify your functional requirements and which CMMS systems can meet them.*
- ❖ *Contact suppliers and ask them to submit solutions .*



PROJECT MANAGING THE CMMS IMPLEMENTATION - 7 /8

❖ **Design and built**

- ❖ *Next, customize and cost the package to fit your operation.*
- ❖ *When you have all your requirements designed into the solution, you can finally buy a system and have it installed and commissioned.*
- ❖ *Of course, you'll need to lay out operating procedures for data conversion, installation, and daily use.*
- ❖ *Train your stuff thoroughly to reap the benefits of the system.*



PROJECT MANAGING THE CMMS IMPLEMENTATION - 8 /8

❖ **Test**

- ❖ *Make sure that the users , the maintenance and possibly production people, not the systems department or supplier, test the CMMS in the workplace.*
- ❖ *They are best able to judge whether it is covering the ground in maintenance management, user and technical procedures, backup and recovery, security and volume, and performance testing .*

❖ **Transition**

- ❖ *This final phase is important to get your new system up and running without any major kinks.*
- ❖ *It involves, converting data, installing for the new CMMS and manual procedures, and, most importantly, handing over responsibility to the user management.*

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JUSTIFYING YOUR CMMS - 1/6

- ❖ **A maintenance system will cost \$5,000 to \$250,000 for the software Alone .**
- ❖ **This depends on what It can do and the hardware platform you run it on.**
- ❖ **If you consider the entire cost -- customizing, interfacing with other systems, training, consulting, and communications, and the incremental hardware capacity and such add-ons as printers -- it increases about five times, and this still doesn't count the cost of your own stuff!**
- ❖ **a convincing case of improved maintenance productivity must be made to justify this expense.**

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JUSTIFYING YOUR CMMS - 2/6

- ❖ Maintenance productivity can be defined as output divided by input .
- ❖ Output is measured as equipment availability, operating speed, precision, and reliability.
- ❖ Input is money spent on labor, materials, services, and overhead.
- ❖ What will the CMMS do to improve your productivity?



JUSTIFYING YOUR CMMS - 3/6

- ❖ Failure rate and duration as well as other performances standards depends greatly on a maintenance program that is properly developed, scheduled, and executed.
- ❖ That, in turn, relies on equipment failure histories, records of repairs and overhauls completed, and lists of the correct materials and resources used.
- ❖ Minimizing downtime for inspection, repairs, and overhaul requires scheduling and coordination of labor and parts.



JUSTIFYING YOUR CMMS - 4/6

- ❖ Efficient data management clearly has an impact on maintenance output.
- ❖ Many companies have found that using the information management produces significant results:
 - ❖ Equipment effectiveness (the product of availability, speed, and precision – see chapter 5) jumps from 50% to 85%.
 - ❖ Reliability (mean time between failures) raises 20%.



JUSTIFYING YOUR CMMS - 5/6

- ❖ More efficient use of labor, materials, and outside contractors often means saving of 5% to 15% of total maintenance costs.
- ❖ Sometimes it is difficult to attribute the savings.
- ❖ The CMMS acts as a new framework around which to management.
- ❖ Did the savings actually come from importing data, manipulating information, and generating reports?
- ❖ Or did they arise from developing and implementing a solid PM program because there was a module there that demanded to be used?



JUSTIFYING YOUR CMMS - 6/6

- ❖ It's a moot point.
- ❖ Based on surveys by various software vendors, maintenance periodicals, and consultants working in the field, real benefits are achieved in both increased productivity and direct maintenance costs.
- ❖ One intangible benefits is often improved communication with both operations and materials, and trades.



SOME EXAMPLES – 1/18

- ❖ There are about 200 CMMS package available commercially in North America, and probably double that number when the rest of the world is included.
- ❖ Although most have similar broad functions, they differ greatly in user – friendliness, efficiency, platform, and operating system.
- ❖ Here is what six examples have to offer:
 - ❖ Chief 2000 by Maintenance Automation Corp.
 - ❖ Maximo Series 3 by PSDI
 - ❖ MPAC by Systems Works, Inc,
 - ❖ OOPS! By Peregrine Systems, Inc.
 - ❖ COMPASS by Bonner & Moore, Inc.
 - ❖ MMS by MARCAM Corporation



SOME EXAMPLES – 2/18

- ❖ **Chief 200 by Maintenance Automation Corp.**
 - ❖ This package is in use at about 300 locations, principally in the facilities, hospital, university, and manufacturing sectors.
 - ❖ The main platform is the PC and PC-LAN, at \$12,000 for the basics, with options available.
 - ❖ It comes with a choice of five languages (English, French, Spanish, German, and Dutch), is menu -- driven, and has a custom report generator with graphics.
 - ❖ The package has all the functions discussed earlier and includes a maintenance procedures library and several purchasing functions.

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SOME EXAMPLES – 3/18

- ❖ **Maximo Series 3 by PSDI**
 - ❖ *Maximo 3* is windows – based, a point and click technology that's user – friendly.
 - ❖ PSDI has about 500 locations, emphasizing manufacturing and facilities .
 - ❖ The platform is also the PC and PC-LAN, at a cost of approximately \$30,000, depending again on options.
 - ❖ The basic package includes functions for managing fleets, as well as procedures library.
 - ❖ *Maximo 3* is also available in five languages .

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SOME EXAMPLES – 4/18

- ❖ **MPAC by the Systems Works, Inc.**
 - ❖ *Unlike the previous two examples, the primary platform for MPAC is the minicomputer, with a significantly higher price.*
 - ❖ *There are over 300 locations, focusing on utilities and process industry .*
 - ❖ *They have a large research and development staff and field technical support staff .*
 - ❖ *The list of available options is extensive , including tool management, warranty administration, accounting, and project planning and scheduling.*

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SOME EXAMPLES – 5/18

- ❖ **OOPS! By Peregrine Systems, Inc.**
 - ❖ *This menu -- driven package is one of the least expensive, at \$3,500, yet rates of quite high on user satisfaction surveys.*
 - ❖ *Operating on a PC at 375 sites, it offers basic modules such as work orders, equipment histories, and stores inventory, but can be expanded with options.*
 - ❖ *Users are mainly in manufacturing and facilities.*

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SOME EXAMPLES – 6/18

- ❖ **COMPASS by Bonner & Moore, Inc.**
 - ❖ *The COMPASS system operates on an IBM – compatible mainframe, and it is expensive – about \$100,000 for the basic software.*
 - ❖ *It has numerous functions and is available in four languages.*
 - ❖ *Of the 150 or so operating sites, most are in the process Industries .*



SOME EXAMPLES – 7/18

- ❖ **MMS by MARCAIM Corporation**
 - ❖ *Installed in over 400 sites, mostly manufacturing, facilities, and processing, this software operates in a client – server environment on windows.*
 - ❖ *It's available in English, Spanish, German, and French.*
 - ❖ *What's a provided is a quite extensive , and is comprehensive for material management functions.*



SOME EXAMPLES – 8/18

- ❖ *Whichever package solution you eventually purchase, it is a good idea to buy the maintenance contract as well.*
- ❖ *First, it ensures that's your software will remain current with the periodic updates issued .*
- ❖ *Second, If you become an active participant in the software company's user conferences, you can influence the direction these updates take.*
- ❖ *The maintenance option is usually about 10% to 15% of the software cost.*
- ❖ *Another plant worth considering :If your industry is strongly represented in the customer listing, updates would likely be geared to your special needs.*



SOME EXAMPLES – 9/18

- ❖ *An interesting case study for CMMS application is also Molson's Brewery in Canada.*
- ❖ *Now the largest in that country, it has plants in every region , coast to coast.*
- ❖ *That brewing industry in Canada consists of many medium and small plants in each of province because, according to provincial law, beer must be made where it is sold.*



SOME EXAMPLES – 10/18

- ❖ *In the early 1980s, each of Molson's plants had their own local maintenance approach.*
- ❖ *They had time-based preventive maintenance programs, corrective maintenance for breakdowns, and overhaul during scheduled shutdowns.*
- ❖ *Systems were ad hoc, both manual and automated.*
- ❖ *In the mid 1980s, the engineering group recognized the potential cost saving and capacity improvement by making three changes in the way in which maintenance was managed.*
- ❖ *Fairest, fix the process; second, automate it; and third, get leverage by doing get the same way in all the plants*

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SOME EXAMPLES – 11/18

- ❖ *They develop a systematic approach to work order management, PM development, and maintenance stores management.*
- ❖ *They purchased IBM S36 minicomputers and the ShawWare (MARCAM) maintenance and materials management package.*
- ❖ *After a blitz of implementation, improvements were achieved in the planning and control of maintenance.*
- ❖ *With The usual promotions and engineering staff turnover, the implementation slowed without the full integration of the process and systems being accomplished.*
- ❖ *Further, Morson's underwent a merger with Carling O'Keefe, the third largest brewery in Canada.*
- ❖ *The restructuring was comprehensive, with complete integration and operations.*

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SOME EXAMPLES – 12/18

- ❖ *In the early 1990s, it was difficult to get vendor support of that is S36s and their application programs, and there was a need for upgrading.*
- ❖ *IBM AS400s replaced the less capable S36s, and the manufacturing, financial, and CMMS systems were upgraded as well.*
- ❖ *A network, shown in figure 6-5, was established, linking the largest of the eight regional plants.*
- ❖ *The CMMS configuration of these plants is now:*
 - ❖ *5 AS400 minis*
 - ❖ *120 PC/terminals*
 - ❖ *30 laser printers*
 - ❖ *Networked across all functions and all locations.*



SOME EXAMPLES – 13/18

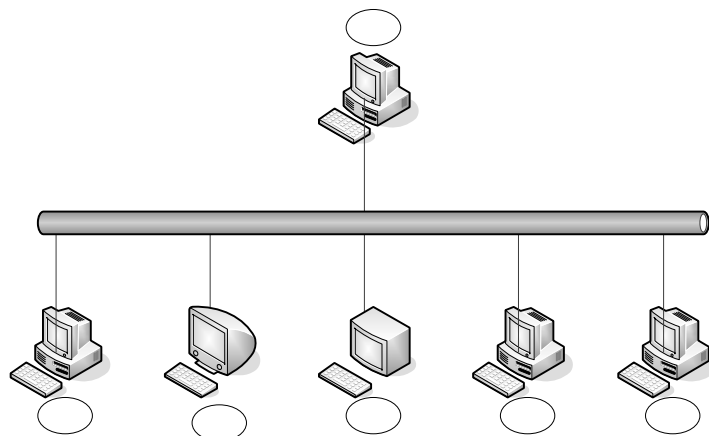


Figure 6-5, Molson Information Technology Network



SOME EXAMPLES – 14/18

- ❖ *The capital cost for the project totaled over \$3.5 million.*
- ❖ *This included software, hardware, networking, consulting, and in – house information technology stuff.*
- ❖ *In addition, three user representatives where assigned fulltime – a champion from maintenance engineering, a storage inventory specialist, and a system application specialist.*
- ❖ *With this investment, Molson’s senior management was looking for quantifiable returns.*



SOME EXAMPLES – 15/18

- ❖ *After the first two years (1993-1994) of implementation, improvement in plant performance and cost reductions have been excellent, near the \$3.5 million capital costs.*
 - ❖ *Equipment effectiveness is up*
 - ❖ *over time is down*
 - ❖ *Maintenance productivity Is up and three largest plants*
 - ❖ *Stores inventory savings with substantial*
 - ❖ *Other savings are being realized in purchasing efficiency, reduced overhauls, and stuff effectiveness.*



SOME EXAMPLES – 16/18

- ❖ *The project champion is confident that the savings will grow as the remaining plants take full advantage of the system capabilities .*
- ❖ *Maintenance costs currently represent about 16% of operating costs across their plants, and their vision is to reduce this to 12% over the next three years – the number achieved by their best plant.*
- ❖ *He believes that the main reasons for this success were supportive management, accountability for results, and a true vendor partnership with the software company*



SOME EXAMPLES – 17/18

- ❖ *Molson's hasn't stopped here.*
- ❖ *They are currently working on an executive information system to make the CMMS even more effective for the area managers.*
- ❖ *Other initiatives include direct integration of condition monitoring and capital project management.*



SOME EXAMPLES – 18/18

- ❖ *With the rapid expansion of microtechnology, functions and features only dreamed about a few years ago are not common.*
- ❖ *Scanning of documents into memory; pen data entry; expert diagnostic systems; total bar code entry; and remote, portable wireless terminals are used in many sectors.*
- ❖ *To keep pace with all that technology has to offer at the best prize, periodically review of the latest CMMS packages.*



Thank You