



Noor Farisya Azahar, Md Azree Othuman Mydin

Potential of Computerized Maintenance Management System in Facilities Management

For some time it has been clear that managing buildings or estates has been carried out in the context of what has become known as facilities management. British Institute of Facilities Management defined facilities management is the integration of multi-disciplinary activities within the built environment and the management of their impact upon people and the workplace. Effective facilities management is vital to the success of an organisation by contributing to the delivery of its strategic and operational objectives. Maintenance of buildings should be given serious attention before (stage design), during and after a building is completed. But total involvement in building maintenance is after the building is completed and during its operations. Residents of and property owners require their building to look attractive, durable and have a peaceful indoor environment and efficient. The objective of the maintenance management system is to stream line the vast maintenance information system to improve the productivity of an industrial plant. a good maintenance management system makes equipment and facilities available. This paper will discuss the fundamental steps of maintenance management program and Computerized Maintenance Management System (CMMS)

Keywords: *facilities management, building, computerized maintenance, built environment, CMMS*

1. Introduction

Computerized Maintenance Management System (CMMS) is also known in many terms and names, like Enterprise Asset Management (EAM), Computerized Maintenance Management Information System (CMMIS), Integrated Information Management System (IIMS), etc. However, they represent a system in which the basic functionality is to maintain a computer database of information about an organization's maintenance operations.

Nowadays computerized maintenance management system, (computerized maintenance management system (CMMS) become very popular among building maintenance management teams in daily activities. designed to store information and complete data for each activity, system or equipment such as maintenance of buildings planned or unplanned; work orders; schedule of activities; maintenance history, parts suppliers; purchase orders and financial flows. In addition, the recorded data will be adopted in the monitoring and control of maintenance work; budget planning and financial reporting and maintenance of all information stored in the CMMS it easier to refer back when needed. Figure 1 shows a standard paper workflow.



Figure 1. Standard paper workflow

Ideally a CMMS is a means to achieving world-class maintenance, by offering a platform for decision analysis and thereby acting as a guide to management. CMMS packages are able to provide management with reports and statistics, detailing performance in key areas and highlighting problematic issues [1].

One of the greatest benefits of the CMMS is the elimination of paperwork and manual tracking activities, thus enabling the building staff to become more productive. It should be noted that the functionality of a CMMS lies in its ability to collect and store information in an easily retrievable format [2].

2. Facilities Management

For some time it has been clear that managing buildings or estates has been carried out in the context of what has become known as facilities management. British Institute of Facilities Management defined facilities management as the integration of multi-disciplinary activities within the built environment and the management of their impact upon people and the workplace. Effective facilities management is vital to the success of an organisation by contributing to the delivery of its strategic and operational objectives [3].

International Facility Management Association defined Facilities management as a distinct management function and, as such, involves a well defined and consistent set of responsibilities. Simply stated, it is management of a vital asset – the organization's facilities. Facility management combines proven management with current technical knowledge to provide humane and effective work environments. It is the business practice of planning, providing and managing productive work environments [4].

In the early days practitioners of FM preoccupied themselves not only with issues of definition but also as to whether it represented a profession, discipline or simply a concept. Early views suggest that the following list provides a view of the scope of FM [5]:

- i. cleaning and waste disposal
- ii. energy management
- iii. environmental management
- iv. estates management
- v. equipment and consumable purchasing
- vi. fire safety
- vii. grounds maintenance
- viii. health and safety
- ix. human resources
- x. office management
- xi. property and engineering services maintenance
- xii. relocation, refurbishment, adaptation, new build, etc.
- xiii. Security
- xiv. space management and planning.

The Centre for Facilities Consultancy gives the following as an indication of the scope of their services [6]:

- i. strategic facilities planning
- ii. staffing structure
- iii. accommodation strategy
- iv. customer surveys
- v. space planning, office moves and relocation
- vi. computerised facilities and maintenance systems

- vii. output specifications
- viii. outsourcing exercises
- ix. performance measurement systems
- x. occupancy cost studies
- xi. business continuity plans
- xii. financial systems and cost control
- xiii. change management
- xiv. video conferencing facilities.

The objectives of building maintenance are therefore [7]:

- i. to ensure that the buildings and their associated services are in a safe condition;
- ii. to ensure that the buildings are fit for use;
- iii. to ensure that the condition of the building meets all statutory requirements;
- iv. to carry out the maintenance work necessary to maintain the value of the physical assets of the building stock; and
- v. to carry out the work necessary to maintain the quality of the building.

Maintenance of buildings should be given serious attention before (stage design), during and after a building is completed. But total involvement in building maintenance is after the building is completed and during its operations. Residents of and property owners require their building to look attractive, durable and have a peaceful indoor environment and efficient. The objective of the maintenance management system is to stream line the vast maintenance information system to improve the productivity of an industrial plant a good maintenance management system makes equipment and facilities available. The fundamental steps of maintenance management program are shown in Figure 2.



Figure 2. Maintenance management flowchart

3. Background of CMMS

Computer-operated systems began to be used in the 1970s. The first online computerized maintenance systems made an appearance in the late 1970s. Initially these also used main frames in conjunction with an operating system that allowed for the application software (e.g. for maintenance documentation, stores control, etc.) to be operated in parallel – i.e. time sharing. The early operating systems, however, were such that use of these machines was slow and inflexible. The next (probably concurrent) advance was the use of dedicated computers (at this time they were called mini-computers) to run the maintenance application software. The mini-computer operated the work planning function and the mainframe used state-of-the-art databases for maintenance history, spares lists, etc., i.e. for those documentation functions that required storage of large quantities of information [8].

Throughout the 1980s and into the 1990s the PC came to have the processing power and hard disk storage of the mainframe of a decade earlier. Application software had become more portable due to the greater standardization of operating systems. In spite of these advances, up until the mid- 1990s most maintenance documentation systems remained ‘stand-alone’, with at most an electronic linkage between the maintenance and stores software. During this period there were many maintenance documentation packages on the market, for all sizes of company and for use on systems varying from the single PC to the multi-user network.

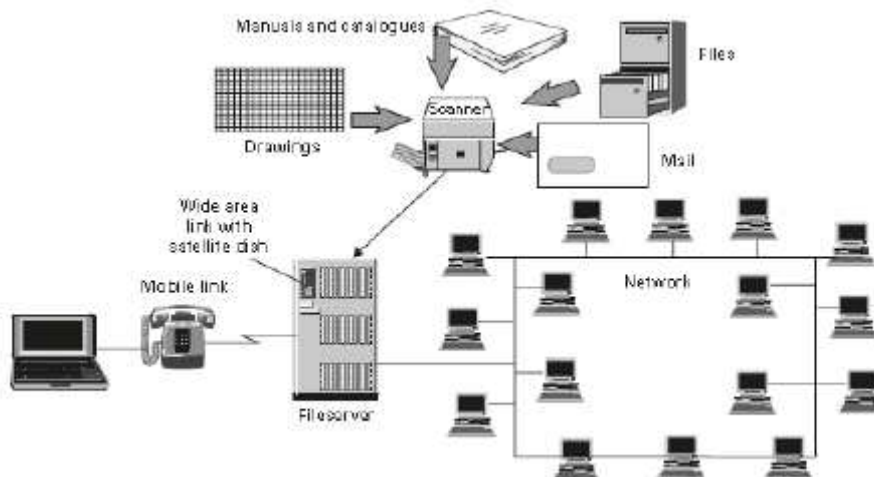


Figure 3. A typical modern hardware configuration

Over the last 10 years the processing power and storage capacity of hardware has continued to increase and its cost to decrease. A typical modern hardware configuration – which includes the use of mobile computers (via digital telephony),

Internet connection and e-mail facilities, is shown in Figure 3. In addition, software improvements and the development of scanners have facilitated the storage and transmission of drawings and pictures, etc. (document imaging). However, the most important introduction over this period has been that of electronic inter-connection of the company software functions (production control, stores control, maintenance control [9]).

4. Capabilities and Benefits of CMMS

CMMS systems automate most of the logistical functions performed by maintenance staff and management. CMMS systems come with many options and have many advantages over manual maintenance tracking systems. Depending on the complexity of the system chosen, typical CMMS functions may include the following [10]:

- i. Work order generation, prioritization, and tracking by equipment/component.
- ii. Historical tracking of all work orders generated which become sortable by equipment, date, person responding, etc.
- iii. Tracking of scheduled and unscheduled maintenance activities.
- iv. Storing of maintenance procedures as well as all warranty information by component.
- v. Storing of all technical documentation or procedures by component
- vi. Real-time reports of ongoing work activity.
- vii. Calendar- or run-time-based preventive maintenance work order generation.
- viii. Complete parts and materials inventory control with automated reorder capability.
- ix. PDA interface to streamline input and work order generation.
- x. Outside service call/dispatch capabilities

One of the greatest benefits of the CMMS is the elimination of paperwork and manual tracking activities, thus enabling the building staff to become more productive. It should be noted that the functionality of a CMMS lies in its ability to collect and store information in an easily retrievable format. Benefits to implement a CMMS include the following:

- i. Detection of impending problems before a failure occurs resulting in fewer failures and customer complaints.
- ii. Achieving a higher level of planned maintenance activities that enables a more efficient use of staff resources.
- iii. Affecting inventory control enabling better spare parts forecasting to eliminate shortages and minimize existing inventory.
- iv. Maintaining optimal equipment performance that reduces downtime and results in longer equipment life.

5. CMMS Modules

These systems are basically automated databases that enable an organization to track and monitor equipment service requirements and history. The core of a generic CMMS consists of two modules:

- i. Equipment inventory records. Consisting of one record for each device. This record contains information specific to that piece of equipment, such as model, serial number, date of installation, facility, location, and information regarding when it is scheduled for maintenance inspections [11].
- ii. Equipment maintenance and repair records. Contains summary data on each maintenance and repair task that was completed for a given work-order on the equipment [12].

Table 1. Basic Modules in Standard CMMS

| | |
|---------------------------|---|
| Equipment/Asset Data | Information about equipment/assets to be maintained |
| Inventory/Stores Data | Information about parts, spares, and inventory items |
| Employee Data | Information about employees who will charge time to a work order in particular, their hourly rates |
| Work Order Processing | Creating, tracking, charging, and completing work orders |
| Preventive Maintenance | Creating preventive maintenance plans and associating them with equipment/asset records and schedule frequencies |
| Planning | Planning work orders to specify who is to perform the work, materials needed, instructions, and other information |
| Scheduling | Scheduling when jobs are to be performed as well as scheduling labour to perform them |
| Inventory Processing | Issues, returns, replenishment, and cyclical inventory processing of parts and materials |
| Purchase Order Processing | Purchase requests, purchase orders, and receipt of parts and materials |

With any system, there are files, modules, or functions that are required to meet basic maintenance needs. Table 1 shows basic modules in standard CMMS. Some systems offer other features that are not required but certainly add value to the system. These include [13]:

- i. Bills of Materials - The breakdown of an equipment/ asset item into its component parts

- ii. Bar Code Capacity - Bar code printers and readers for part and inventory labeling, equipment/asset labeling, and work order identification
- iii. Graphics Importing - The ability to import drawings, schematics, and other documents into the CMMS from other systems
- iv. Report Writer - A program that allows custom reports to be developed
- v. Modifiable Screens and Reports The ability to change the layout and content of CMMS screens and reports

Each organization must decide, based on its own needs, what the CMMS should do and how it should do it. With the large number of systems available in the marketplace, there is almost a guarantee that one of them will be fight for them [14].

6. Conclusions

With the increase of buildings and infrastructure, the maintenance work equally increased. The more maintenance work increases, the more data and information needs to be recorded. To ensure the maintenance work smoothly, a maintenance management system that systematically and efficiently is required. All data and information must be recorded to carry out maintenance work should be coordinated in a system that is efficient and accessible. The ability of computers to solve various issues and make decisions, no longer be doubted. Most countries are now working to create a generation of IT (Information Technology) began creating a computerized system in government institutions as a first step to achieve that goal. Nowadays computerized maintenance management system, (computerized maintenance management system (CMMS) become very popular among building maintenance management teams in daily activities. designed to store information and complete data for each activity, system or equipment such as maintenance of buildings planned or unplanned; work orders; schedule of activities; maintenance history, parts suppliers; purchase orders and financial flows. In addition, the recorded data will be adopted in the monitoring and control of maintenance work; budget planning and financial reporting and maintenance of all information stored in the CMMS it easier to refer back when needed

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Addresses:

- Building Surveyor. BSc Building Surveying. Noor Farisya Azahar, School of Housing, Building and Planning, Universiti Sains Malaysia, 11800, Penang, Malaysia,
- Senior Lecturer. PhD. Sr Dr Md Azree Othuman Mydin, School of Housing, Building and Planning, Universiti Sains Malaysia, 11800, Penang, Malaysia, azree@usm.my