

Keys to success with CMMS

These exhaustive survey results reveal the problems readers have with their CMMS and the system capabilities they find most critical for solving them. Learn from your peers and read what they have to say about CMMS.

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It's common knowledge that a computerized maintenance management system (CMMS) is helpful for organizing and tracking maintenance activities and expenses, and almost essential for gathering the data needed to advance to reliability-centered maintenance. Virtually all but the smallest of facilities are using some form of software-based maintenance recordkeeping.

But systems range widely in cost, capabilities and level of integration with business systems. Does your system do what it should to help keep maintenance costs down and asset values up?

We recently asked subscribers involved with specifying and using maintenance management software a number of questions about their CMMS. Here are the highlights of the survey results and what we understand them to say about the current status, as well as the future of computerized maintenance management.

Which key business issues does the CMMS address?

It's not surprising that the top two business issues the CMMS addresses are improvement of asset performance and availability (Table 1). After all, 56% of respondents stated that there are more than 30 maintenance employees in their organization, implying a relatively asset-intensive environment. Furthermore, about 70% of respondents have a maintenance-related job title such as maintenance manager (40%) or reliability engineer (10%). Maintenance departments have historically focused on assets as the area of greatest improvement potential. (See Asset Manager on p. 21 for more information about asset-based measures.)

Table 1: Most

Important Issues

Ranked No. 3 is "Fostering a culture of productivity and reliability improvement," which, like the top two issues, has an asset focus implied by the term "reliability." However, the issue is worded in the form of a cultural shift, i.e., companies are struggling to move away from the shackles of a firefighting mentality to the relative calm and savings opportunities afforded by a more planned environment. By ranking this issue third, respondents are recognizing that much of the difficulty lies in changing the attitude and behavior of maintenance, engineering and operations personnel at all levels, not just working directly with the assets themselves.

The fourth-place issue, labor productivity, is a favorite of management. It seems people will always be in the spotlight, even when labor costs are a relatively small proportion of the total cost. This is because labor can be either the bane of management's existence or, conversely, save a company millions of dollars by say, solving an expensive problem. The three key measures of labor productivity are:

- Utilization (i.e. percent productive, as opposed to percent non-value-added like wait time).
- Performance (i.e. percent of standard).
- Effectiveness (includes sub-measures such as percent contracted, overtime, training, innovation, etc.).

Issue	Response %	Importance(overall rank)
Improve asset performance	88	1
Foster a culture of productivity and reliability improvement	72	3
Improve labor productivity	79	4
Increase asset availability	76	2
Reduce MRO inventory costs	64	7
Decrease total cost of ownership (TCO)	60	6
Enhance maintenance visibility	59	5
Better capital project cost and risk management	56	8
Integrate asset management with other business processes	54	9

In fifth place is one of the most frustrating issues for some maintenance managers: how to enhance maintenance visibility. Even in asset-intensive industries, some senior management teams have yet to exploit the vast improvement opportunity arising from an asset-management focus. To get top management's attention, maintenance management must develop a comprehensive asset-management strategy in conjunction with Operations and Engineering, and show how meeting reasonable performance targets could bring huge savings. To meet these targets, which are aligned with corporate goals and objectives, senior management must approve key action items; for example, hiring a maintenance planner or purchasing a new CMMS. Joining forces with Operations and Engineering, as well as quantifying the benefits in language that is familiar to top management, enhances the visibility of maintenance.

Although the remaining four issues were not ranked as highly in importance, there wasn't a large gap in terms of the weighted average of respondent ratings. In fact, the last-place business issue, "Integrate asset management with other business processes," had a weighted average importance rating of 2.89 where 1 is most important and 5 is least important. By comparison, the first-place business issue described above had a weighted average importance rating of 2.03, albeit there were more respondents that included it in their top five rankings, as can be seen in Table 1.

What CMMS capabilities are most important?

Each of the top five CMMS capabilities -- preventive maintenance, work scheduling, problem diagnosis and root cause analysis, spare parts management, and key performance indicators -- is discussed below in terms of ranking and emerging trends. (Features are presented in order of the number of mentions in Table 2.) The three lowest-ranked features are also analyzed to provide insight into why at least two of them might soon rise dramatically in importance.

Table 2: Main Features

Feature	Response %	Importance (overall rank)
Preventive maintenance	88	1
Work scheduling	77	2
Problem diagnosis/root cause analysis	70	3
Spare parts	69	4

management		
Maintenance staff productivity management	61	7
Maintenance budget management	60	9
Key performance indicators (KPIs)	50	5
Condition-based maintenance	48	6
Capital project management	37	13
Capital asset planning	32	8
Supplier performance management	30	10
e-Procurement	28	12
Warranty management	27	11

1. Preventive maintenance (PM): This is probably the simplest component of a CMMS, but clearly the most important for many maintenance shops as seen by the survey results. Because of its simplicity, the PM modules of CMMS packages are fairly similar. All of them give you the option of triggering PM work orders based on calendar and meter readings. More sophisticated CMMS packages allow users to trigger PM based on events, or condition readings taken directly from equipment on the shop floor on an online, real-time basis. These readings are compared to the allowable upper and lower control limits and can even spot an alarming trend before downtime occurs (predictive maintenance). Herein lies the power of the PM module to achieve the objective of minimizing downtime.

Other advanced features offered are multiple PM triggers, schedule flexibility (e.g., seasonality, multiple formats, zoom and simulation), and task shadowing or banding. This latter feature allows you to skip a PM

routine if another is due, such as skipping a weekly routine that coincides with a monthly overhaul.

2. Work scheduling: Table 2 shows the second most important feature of a CMMS to be scheduling work. The most primitive means of scheduling is to print a sorted and filtered report of outstanding work orders. More advanced software compares the work backlog with a listing of available hours sorted and filtered in the same manner.

Some packages will let you drill down on a graph of workload versus available hours to view or edit the detailed work order or resource availability information. Several packages even let the user perform what-if analysis on the schedule by adjusting work order due dates, priorities and resource availability. A few packages have built-in project management software for producing Gantt charts, calculating the critical path and automatically levelling workloads with resource availability. Vendors have found innovative

ways to display a lot of useful information on a single screen, using multiple windows and multiple tabs on each window.

3. Problem diagnosis and root-cause analysis: What was surprising to me was the relatively low ranking respondents gave to this function compared to the No. 1 spot, PM. This is because the CMMS is emerging as an important problem-solving tool for assisting maintenance, operations and engineering in getting the most out of their assets. CMMS vendors have ample opportunity in this area to help users improve the reliability, utilization, performance and operability of their equipment while minimizing the cost of labor, material and other costs to do it.

There has been a steady improvement in features and functions that deal with asset management ever since CMMS software came on the market. Modern CMMS packages have features such as the ability to record reliability-centered maintenance (RCM) data; analysis of data such as problem, cause and action codes to minimize trial-and-error-based corrective maintenance; and use of equipment history from across the enterprise to build a troubleshooting database.

4. Spare parts management: The fourth most critical function of a CMMS, according to respondents, is managing spare parts inventory. CMMS vendors vary widely in terms of the sophistication of this module. Some of the more advanced features include multiple costing methods, ABC and XYZ analysis for classifying your inventory, multi-warehouse tracking, serialized parts tracking, automatic correction of lead times and reorder points, handling consignment, and integration with e-procurement. A key feature available on only a few packages is the ability to perform what-if analysis on service levels, thereby allowing users to fine-tune the balance between service and cost for A-, B- and C-class parts.

5. Key performance indicators (KPIs): Tracking KPIs is viewed as a higher-level feature of a CMMS. Not surprisingly, respondents ranked and scored this feature in the fifth spot, trailing more basic functionality such as PM, work order scheduling and inventory management. Examples of KPIs the CMMS can track include percent planned outage, dollar work backlog by craft, schedule compliance, spare parts inventory turns, and maintenance cost per unit of production.

The more advanced CMMS packages allow users to establish a home page, portal or separate module to customize the presentation of KPIs. Each high-level measure can then be drilled down in detail to determine the root cause of variances. Additionally, measures can be combined to form ratios or indices. This data can then be used across the enterprise for internal benchmarking or comparison to external best practices. Finally, KPIs can be linked to some form of action, such as activating an alarm.

11. Warranty management: It's unfortunate to see this feature so close to the bottom of the priority list. There is much money to be saved by properly managing myriad equipment and component warranties in a typical plant environment. The more sophisticated CMMS packages have come a long way in providing advanced features that simplify the collection and reporting of warranty information; for example, tracking multiple warranties per asset, recording warranty types such as manufacturer or vendor, and favoring non-serialized parts closer to warranty expiration.

12. E-procurement: Since the collapse of the dot-com industry, all things "e" have quickly fallen to the bottom of the priority pile for CMMS vendors and their customers. This is obvious from the relatively poor ranking of e-procurement as shown in Table 2. Some of the CMMS vendors, however, have been quietly sinking R&D money into building the functionality of their software in anticipation of rising user demand for the world of "e-" during the next few years.

In particular, e-commerce, e-procurement and e-marketplace hold promise for users to reduce costs tremendously by automating many of the supply chain functions. Advanced features include standardized electronic catalogs, portals into MRO part supplier web sites, electronic quotations and purchase orders, electronic payment upon receipt of parts, and used equipment sold through an electronic marketplace.

Table 3: Additional

Features

Feature	Response %	Importance (overall rank)
Electronic document management	81	1
PdM (vibration analysis, lubrication analysis, thermography)	65	2
Shop-floor data collection (SCADA, HMI, TLC)	61	3
Lockout/tagout management	57	4
CAD	49	5

13. Capital project management: This feature, although ranked as least important, serves a grossly underrated purpose. The focus of most CMMS users tends to be on day-to-day asset care, which historically means managing a one-time capital project usually takes a back seat. In some cases, this is because separate software is used, such as project management or specialized capital planning package. In other cases, another department or an external company is responsible for the function.

More advanced CMMS packages have separate capital project tracking modules with features such as detailed project budgeting and variance analysis, long-term capital replacement planning, two-way link to project management software, a link to GIS for inventorying capital infrastructure, and analysis tools such as capital life-cycle analysis.

Tools management	49	13
Graphic parts book	48	6
Mobile technology -- wireless, online, real-time	45	7
ERP applications	35	10
Keys management	29	11
Mobile technology "batch"	28	9
Fuel management	26	14
GIS	25	12
RFID	24	8

Which advanced features are worthwhile?

Table 3 displays the ranking of some additional capabilities of a full-featured CMMS. Electronic document management was given the highest weighted average importance ranking and greatest response percentage by a significant factor. Based on the free-form comments provided by some respondents, the reason for the high ranking appears to be a combination of:

- Increased regulatory requirements (e.g., pharmaceutical and nuclear industries).
- Greater dependence on digitized documentation (e.g., technical and procedures manuals, training videos).
- Less reliance on paper forms and reports (e.g., electronic purchase requisitions and orders).
- Increased security requirements (e.g., audit trail for document changes).
- Greater number of reports available and ways to analyze, format and store them.

More predictably, the second- and third-ranked features were predictive maintenance (PdM) and shop-floor data collection (SFDC) capability. This

speaks to the rising importance of integrating the CMMS with the collection and interpretation of low-level data such as condition-monitoring data and production throughput.

A growing concern about safety appears to support the fourth-place finish of lockout/tagout functionality. CAD is ranked fifth, underlining the importance of integrating electronic drawings of facilities, equipment, components and parts. However, the big surprise and disappointment for me was the relatively low rankings of both wireless and batch mobile technology. Perhaps this is due to the misconception that the technology is new, expensive or complex. This reasoning is seriously flawed. In my view, mobile technology will have the same enormous impact after following much the same product life-cycle as did the microcomputer-based CMMS two decades ago.

Table 4: Success Factors

1. Asset management best practices
2. Knowledge transfer
3. Executive support
4. Change management
5. Shared accountability for results

What factors are most important to CMMS success?

The rankings for CMMS success factors (Table 4) suggest the importance of carefully selecting a CMMS software vendor more as a partner and provider of knowledge, rather than simply a supplier of software. The No. 1 and No. 2 rankings are asset management best practices and knowledge transfer, respectively. This ranking underscores the importance of changing business processes first and foremost in order to be successful -- the software is simply the enabler.

In turn, you need executive support and a change-management program, the third- and fourth-ranked success factors, to ensure there's a substantial change in attitude and behavior throughout the organization. Without it, there will be no change to processes and therefore, limited success. Finally, shared accountability for results, in fifth place, implies there will be no change in attitude or behavior unless every stakeholder has skin in the game.

Given the cause-and-effect relationships of these success factors, I would have expected the CMMS factors to be ranked as follows:

1. Executive support: Success of any major initiative is virtually impossible without it.
2. Shared accountability for results: If a stakeholder has nothing to lose or gain, then why change?
3. Change management: With executive support and shared accountability, a cultural or behavioral shift is possible, given a good change-management program.
4. Knowledge transfer: Once stakeholders are ready for change, processes

improve through internal innovation and external knowledge transfer.

5. Asset-management best practices: There are many ways to source best practices, such as through industry associations, publications, benchmarking, consultants and vendors.

So it disheartens me somewhat that the No. 1 ranking of success factors is best practices. Some of you may remember when CMMS packages first became popular. The many companies that flocked to the software looking for a panacea for their maintenance woes learned the hard way, in some cases through two or three iterations of CMMS packages. In other words, there is no easy street. You can't simply automate without first changing the attitude and behavior of the stakeholders, and the processes for which they are responsible.

I believe history repeats itself with our view of best practices as the new panacea. Best practices should be the result, not the driver of success. In my view, what drives success from your CMMS solution is starting at the top of the organization, motivating the stakeholders to change the culture and their individual behavior by showing what's in it for them, making people accountable for quantifiable results, and using a participatory methodology that combines external knowledge sources with good old-fashioned internal innovation to develop your own best practices. For best results, a continuous program of change must be implemented rather than waiting for the next big bang, such as replacing your CMMS, a change in location or a company restructuring.