

# Ten Pitfalls to Avoid When Selecting a CMMS/EAM

BY DAVID BERGER





## INTRODUCTION

As companies search for ways to get the most out of their existing operating assets, Enterprise Asset Management (CMMS/EAM) software packages are key. However, when it comes to researching, selecting and implementing the right CMMS/EAM, some of the same mistakes have been made for decades and some new ones have emerged. This white paper, written by expert David Berger, explores 10 of the more common mistakes you should avoid if you are looking for a new or replacement CMMS/EAM system. The mistakes are listed in no particular order. Conclusions are supported by a recent survey conducted by *Plant Services* magazine.



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## USER-CENTERED DESIGN

# MISTAKE #1 – YOU ARE FAR TOO FOCUSED ON THE SOFTWARE’S “LOOK AND FEEL.”

Ever since software was invented, there has been considerable effort expended by users to find a CMMS/EAM package with the perfect user interface. This obsession is evidenced by the *Plant Services Reader Survey* results, which ranked “Intuitive User Interface” as the most important criterion of 21 (see Exhibit 1). Many people would explain that any software application that forces the user to move through numerous fields, screen after screen, one tab after another, to access the information needed is just not worth using at all.

**Exhibit 1 - Importance of CMMS/EAM Selection Criteria (based on Dec 08 Plant Services Survey Results)**

On a scale of 1 to 5, where 5 is extremely important and 1 is not at all important, rate the importance of the following criteria to your company when comparing CMMS/EAM packages:

Rank	Criteria	Description	Average Importance
1	Intuitive User Interface	Ensure users can quickly and easily navigate the system, as well as enter, retrieve, and report on data in a user-friendly environment.	4.41
2	Ease of Implementation	Get up and running quickly and easily, with users embracing future-state processes supported by the new CMMS/EAM because of perceived added value to their jobs.	4.32
3	Planning and Scheduling	Distinguish between long-term planning of a maintenance program (e.g., multiple job plans for each asset/component, multiple triggers for PM, asset criticality, condition-based trend analysis), and short-term scheduling (e.g., multiple priorities used in	4.13

[See the full table on p.13](#)

Although there is no question that the user interface is extremely important, there has been significant progress in this area over the years. Most of the major CMMS/EAM software vendors have engaged human factors expertise, either internally or externally, to improve their user-centered design. The most modern software packages have incredible tools to help users tailor the look and feel of screens, and focus workers on actionable tasks that create value and improve productivity. A few packages allow a given company to quickly and easily configure menus, screens, tabs, data entry forms, reports and so on to meet the needs of a given division, department, job function or individual.

Although there is always room to improve, users should not fixate on the user interface as the most significant differentiator among the better CMMS/EAM software packages. Other key factors that do a better job of differentiating modern CMMS/EAM packages are discussed elsewhere in this white paper.

## VENDOR PARTNERSHIP

### **MISTAKE #2 – YOU ARE PURCHASING SOFTWARE BASED ON FUNCTIONAL FIT ONLY.**

As CMMS/EAM software increases in scope and complexity, selection is becoming increasingly based on the relationship with the vendor rather than simply the software tool it sells. This is because partnering with the right vendor can facilitate the implementation of more long-lasting improvements. As can be seen from Exhibit 1, the user community ranks “Ease of Implementation” as a close second in terms of importance. Ease of implementation can be defined as not only how quickly the software can be installed, but more importantly, the length of time and degree of difficulty in achieving your goals and performance targets.

Perhaps users are finally recognizing after decades of CMMS/EAM implementation that the probability of success goes up dramatically when the vendor provides both proper support as well as good software. Try to find a vendor that is in it for the long haul, and for the right reasons – not because their software is so difficult to implement, use, reconfigure and, ultimately, meet business objectives.

Today, many CMMS/EAM vendors have incredible resources that can be brought to bear. Look for a vendor partner whose resources best fit your specific needs, now and over the long run. Some of the supporting services that vendors offer are as follows:

- assessment of organizational readiness and gap analysis to understand what changes will be necessary for a successful implementation,
- process design expertise to map your software configuration to optimized business processes,
- guidance about industry best practices,
- assistance in setting up key performance indicators (KPIs) to ensure users are focused on the right things, and
- facilitation of data analysis and decision-making to ensure expected savings and benefits are achieved.

Your relationship with the CMMS/EAM vendor should not end once the system has been implemented. This is why it is so important to partner with a vendor that is strong financially, especially in the face of tough economic times. The vendor can be extremely helpful in establishing a framework for continuous improvement by assisting with performance assessment and benchmarking, as well as fine-tuning asset management processes and the underlying CMMS/EAM system. Furthermore, as software upgrades are released on a regular basis, typically every 12-18 months, there is ample opportunity to partner with the vendor over the long term.

There also are benefits in partnering with a vendor that has enough depth to provide a suite of business solutions, especially for a large organization. However, be cautious about the tradeoffs between a best-of-breed solution and single-vendor suite, as described below under “Mistake #8.”

## REAL-TIME KNOWLEDGE MANAGEMENT

# MISTAKE #3 – YOU THINK YOUR CMMS/EAM IS JUST A STATIC DATA AND REPORTING SYSTEM.

When CMMS/EAM systems were first implemented many decades ago, they were viewed as an effective means of computerizing existing manual processes. The CMMS/EAM tool amounted to not much more than an electronic data depository. Many companies today make the mistake that nothing much has changed from those early days, i.e., the CMMS/EAM is primarily used for entering and storing data for producing reports on a regular or *ad hoc* basis. However, modern systems offer so much more functionality on a real-time basis. With features such as notification, alarming or alert management, as well as the even more sophisticated workflow engine, your CMMS/EAM system is transformed into a real-time monitoring and control system.

For example, assets can be monitored 24 hours/day, 7 days/week, in terms of any measure, from asset reliability and performance, to compliance, energy consumption and safety. When a key measure for a critical asset equals, rises above or drops below a certain trigger point, then a workflow can be initiated such as automatically issuing a work order, and/or notifying a supervisor via e-mail or cell phone. This functionality forms the basis for predictive maintenance, which can not only help transform day-to-day maintenance fire-fighting into a more planned environment, but can significantly reduce operating costs and risks.

According to Exhibit 2, those surveyed ranked “notification and workflow” as second-worst in terms of how well their current CMMS/EAM package performs. Unfortunately, in my experience, this more likely reflects the users’ lack of knowledge about how to properly utilize this functionality, rather than any major shortcomings in software performance. Notification, alert management, alarming and workflow are powerful and advanced software features that can transform your CMMS/EAM into a real-time and dynamic knowledge-management system that drives simplicity and more value-added action.

Exhibit 2 - Performance of your current CMMS/EAM Software (based on Dec/08 Plant Services Survey Results)			
On a scale of 1 to 5, where 5 is extremely well and 1 is not at all well, rate how well your current CMMS package does with respect to this criteria:			
Rank	Criteria	Description	Avg Vendor Performance
1	Benefits Realization	Plan and budget for productivity gains enabled by the CMMS/EAM implementation, then track results, and drill-down to analyze variances.	3.14
2	Ease of Implementation	Get up and running quickly and easily, with users embracing future-state processes supported by the new CMMS/EAM because of perceived added value to their jobs.	3.13
3	Supply Chain Management	Manage parts, vendors, and contractors with comprehensive features such as ABC analysis, Economic Order Quantity (EOQ), service level management, supplier history analysis, and charging contractor labor and parts usage to work orders for more accurate equ	3.11

See the full table on p.14

The good news is that the criteria labeled “planning and scheduling” ranked #3 overall (see Exhibit 1). This means users generally recognize the importance of a planned environment. Proper planning is a necessary condition for achieving maximum benefit from the notification and workflow functionality. Advanced planning features include the ability to:

- create multiple job plans for each asset/component,
- implement multiple triggers for preventive and condition-based maintenance,
- establish indicators for real-time monitoring of energy consumption and emission levels,
- calculate and record asset criticality, and
- conduct real-time trend analysis for conditions, energy consumption, emission levels, regulatory compliance and so on.

## DECISION SUPPORT

# MISTAKE #4 – YOU ARE HUNG UP ON THE SLICING AND DICING OF CMMS/EAM DATA.

There is an infinite number of ways to filter, sort and manipulate the reams of data entered into today’s CMMS/EAM software. The better CMMS/EAM packages provide easy-to-use analysis and maintenance optimization tools that support decision-making at all levels, from maintainer to senior management. Users seem to recognize the importance of this functionality, as seen in Exhibit 1 wherein “maintenance optimization” and “analysis tools” are ranked #4 and #5 respectively.

Sophisticated analysis tools geared to each job position provide visibility into your operations for better control of your business. Imagine arriving each day at work and checking your computer screen for a real-time dashboard display of the Key Performance Indicators (KPIs) most relevant to your job (see Exhibit 3).

### EXHIBIT 3 – SAMPLE REAL-TIME PERFORMANCE DASHBOARD



For example, suppose as a maintenance planner, your schedule compliance KPI is “in the red” for a given asset group when you turn on your computer one Monday morning. By drilling down on this measure, you have instant access to the asset history showing a backlog of work orders that were generated over the weekend. In a further drill-down to analyze condition trends, you discover that the condition of the asset group seems to be deteriorating prematurely for a given manufacturer, and is thus triggering PM job tasks earlier than expected. By checking your notifications and alerts on your dashboard, you notice that these work orders were flagged as eligible for warranty coverage, and as regulatory compliance-related.

Thus, one of the most powerful differentiating features to look for in a CMMS/EAM system, especially when coupled with the notification and workflow functionality described above, is the

ability to quickly and easily analyze data, including:

- configurable KPIs,
- dashboards and business intelligence,
- advanced analytics and maintenance optimization tools,
- comprehensive risk-management and compliance tools, and
- advanced warranty-management functionality.

## ENERGY EFFICIENCY AND ENVIRONMENTAL CONTROL

# MISTAKE #5 – YOU BELIEVE “GREEN” FUNCTIONALITY IS TODAY’S “FLAVOR OF THE MONTH.”

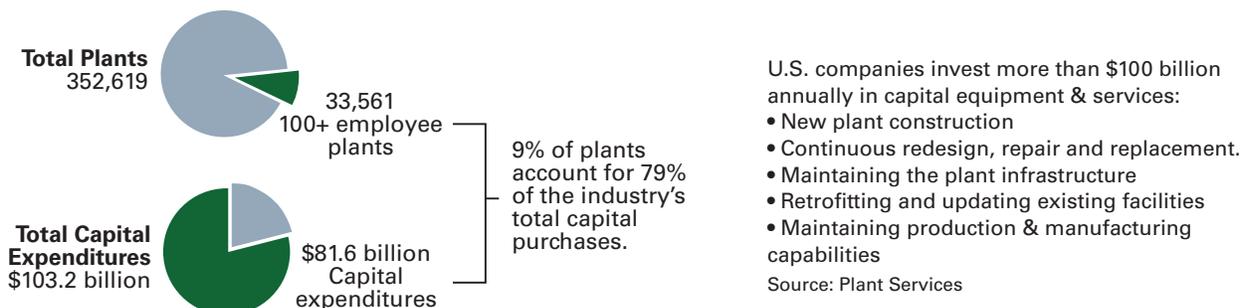
According to a *Plant Services* survey (see Exhibit 4), U.S. companies invest more than \$100 billion annually in capital equipment and services, including new plant construction and retrofits, as well as maintenance, repair and replacement. But those same companies spend more than \$400 billion each year on energy (see Exhibit 5). Given that energy prices are expected to rise over the long term, it is fairly safe to assume that the tracking of energy consumption is more than just a passing fad and flavor of the month. In a study conducted by *Plant Services* magazine, manufacturers felt strongly that energy prices will have the most significant impact on operations in manufacturing plants throughout the United States (see Exhibit 6).

With the recent explosion in energy prices, price volatility and the impending financial consequences of carbon equivalents, it is no surprise manufacturers feel this way.

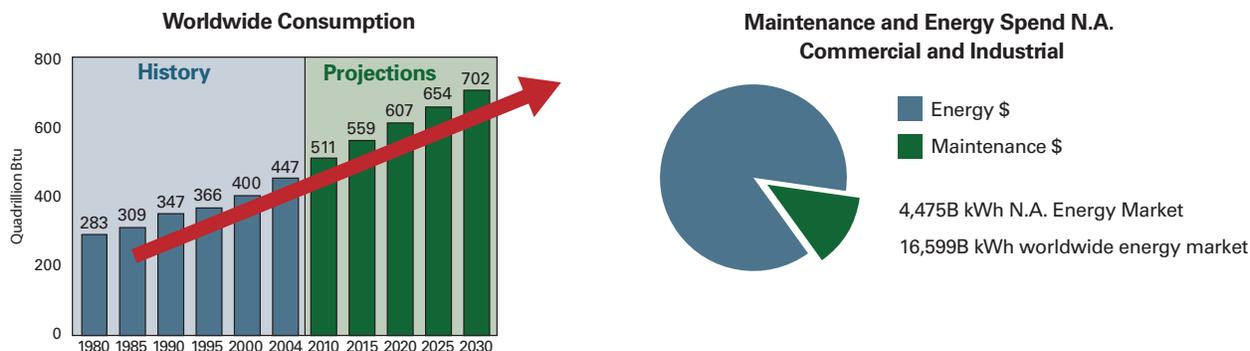
Manufacturers that can manage and control their use of energy will create a competitive edge. A CMMS/EAM should allow companies to implement sustainability best practices such as:

- measuring energy use at the asset level,
- understanding the carbon footprint of assets, products, product lines, etc., and the ability to compare or benchmark performance across like assets, and
- incorporating energy efficiency into asset life-cycle practices, i.e., applying maintenance practices to specific underperforming assets that restore energy efficiency to its designed performance characteristics.

### EXHIBIT 4 – U.S. INDUSTRIAL ANNUAL CAPITAL EXPENDITURES EXCEED \$100 BILLION

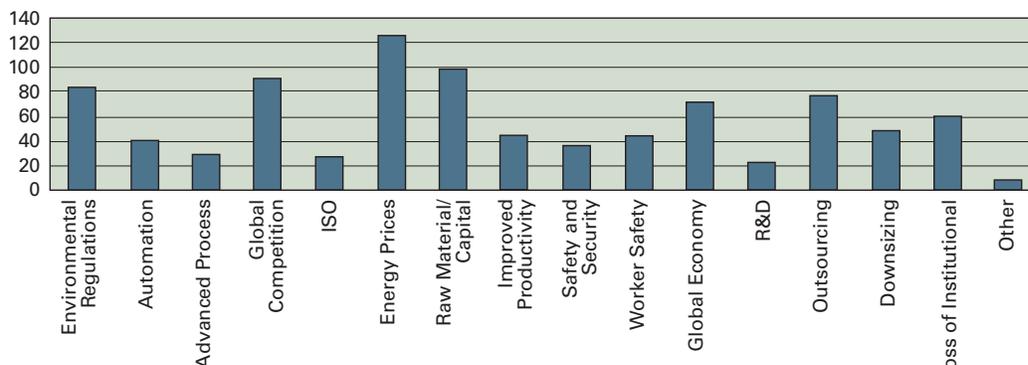


### EXHIBIT 5 – INDUSTRIAL ANNUAL ENERGY EXPENDITURES ARE \$400 BILLION



## EXHIBIT 6 – IMPACT OF CURRENT TRENDS

**What current trends do you think will have the most impact on operations in U.S. manufacturing plants? (check all that apply)**



SOURCE: PLANT SERVICES

For this reason, it is critical for you to select a CMMS/EAM system that has comprehensive functionality to track energy consumption, emissions and other green measures to gain insight into the real costs of operating your assets. Perhaps users have not yet realized that this functionality exists on some CMMS/EAM packages, as evidenced by the relatively low importance ranking of #17 out of 21 for the criterion “comprehensive energy tracking” in the survey shown in Exhibit 1. Moreover, according to Exhibit 2, those surveyed ranked “comprehensive energy tracking” as the worst in terms of how well their current CMMS/EAM package performs.

In contrast, there is the relatively high importance ranking of #6 out of 21 for the criteria “health, safety and the environment.” This might be explained by the recognition of users that the CMMS/EAM is important for ensuring regulatory compliance and safety protection of personnel and equipment.

### FLEXIBILITY

## **MISTAKE #6 – YOU ARE FOCUSED SOLELY ON HOW THE CMMS/EAM WILL SATISFY YOUR CURRENT NEEDS.**

Many companies make the mistake of selecting a CMMS/EAM that addresses the short-term needs of primarily the maintenance department. This is not the best approach given the number and degree of changes that most companies go through over a relatively short period of time. CMMS/EAM requirements should cover a minimum of three years out, and span requirements of departments other than maintenance, including operations, engineering, purchasing, finance, IT and other stakeholder groups. There should be specifications that ensure flexibility to make changes to the software as needs of each stakeholder group changes.

One of the key criteria to look for in a CMMS/EAM that ensures flexibility is configurability, which is ranked #7 out of 21 on the *Plant Services* survey (see Exhibit 1). The CMMS/EAM should allow quick and easy configuration at any point in time, to meet the specific needs of any given user among a diverse and ever-changing pool of stakeholders over the longer term. Other features discussed above that support flexibility include a workflow engine for quickly redefining key maintenance processes, and configurable KPIs for easily changing priority measures for analysis and reporting.

## ENTERPRISE THINKING

### **MISTAKE #7 – YOU TEND TO FOCUS ON HOW THE CMMS/EAM BENEFITS YOUR LOCATION, INSTEAD OF WHAT BENEFITS THE ORGANIZATION OVERALL.**

One common mistake that occurs when large, multi-site companies select a CMMS/EAM system(s) is that either corporate resources do not adequately consider the needs of individual sites, or individual sites select software without regard for the needs of the total enterprise. The key is to select a CMMS/EAM package that can accommodate the needs of each plant, as well as the organization overall.

For example, if multiple sites have common suppliers of spare parts, the corporate purchasing department might be able to obtain national accounts and significant discounts for all sites. However, some parts may be cheaper and more accessible to procure locally. In other cases, plants within close proximity of each other may be willing to reduce their inventory on hand if they were given read-only visibility into the inventory levels of the other sites, and a means of tracking parts transferred between them. The CMMS/EAM system should accommodate all combinations that might encourage enterprise-wide thinking.

It is interesting to note that although Exhibit 1 shows “multi-site” was ranked #20 out of 21 criteria in terms of relative importance, Exhibit 2 shows “multi-site” was ranked 4th in terms of how well their current CMMS/EAM package performs. As most survey respondents were from individual sites, it comes as no surprise that they ranked “multi-site” so low in importance. However, this speaks to the critical need to involve stakeholders from both individual sites and corporate, to select software that best accommodates enterprise thinking. In turn, this will maximize benefits for the company overall.

Similarly, Exhibit 1 shows “strategic asset management” was ranked #16 out of 21 criteria. This low importance ranking is perhaps explained in the same way as above, i.e., individual plant personnel attach less importance to enterprise thinking. However, it is extremely limiting for a multi-site organization to ignore the huge benefits associated with enterprise thinking, both to the individual sites and the company overall. Strategic asset-management functionality implies the CMMS/EAM can handle the diverse needs of all levels in your company, from corporate to the shop-floor, along the entire asset life cycle (i.e., design, procurement, installation, maintenance, disposal), and for any asset class (i.e., plant equipment, facilities, fleet, infrastructure or linear assets, and IT). This can translate into millions of dollars in savings for a large, multinational corporation.

## BEST OF BREED VERSUS SINGLE-VENDOR SUITE

### **MISTAKE #8 – YOU THINK IMPLEMENTING A SINGLE-VENDOR ERP/EAM SOLUTION TRANSLATES INTO THE MOST “FULLY INTEGRATED” SOLUTION.**

There is a common misconception that a single ERP software solution that has a CMMS/EAM module is superior to best-of-breed CMMS/EAM software that is integrated to the corporate ERP package. This may be the case if there are many best-of-breed CMMS/EAM software packages that must be integrated and supported, however, if the corporation selects a single, best-fit, enterprise-wide, best-of-breed CMMS/EAM system that integrates well with the corporate ERP suite, you are

likely to enjoy the best of both worlds.

The key is to select a best-of-breed CMMS/EAM software package that has strong “open systems” functionality. Exhibit 1 shows “open systems” was ranked #9 of 21 criteria in terms of importance. However, Exhibit 2 shows “open systems” was ranked third worst in terms of how well their current CMMS/EAM package performs. This shows the importance of finding a CMMS/EAM vendor that can demonstrate open systems capability – the ability to integrate seamlessly with many other vendors’ software applications and add-ons – to provide greater value and flexibility when configuring your CMMS/EAM to fit your needs.

Effective decision-making may require access to information and processes outside of the core CMMS/EAM functionality, such as

- aligning maintenance and production schedules,
- integrating labor data entry for both asset history and payroll purposes,
- integrating with applications specific to mobile devices,
- handling chargebacks for third-party billing and
- accounting properly for large capital projects involving maintenance.

Some companies have discovered that certain best-of-breed CMMS/EAM software packages are easier to integrate than the suite solutions because they are more open and flexible. After all, by definition, best-of-breed CMMS/EAM vendors have always had to integrate with corporate and other systems.

#### LOWER TOTAL COST OF OWNERSHIP

## **MISTAKE #9 – YOU THINK IT IS ALWAYS BETTER TO OWN AND CONTROL YOUR HARDWARE, SOFTWARE AND SUPPORT SERVICES.**

When purchasing a CMMS/EAM system, do not make the mistake of assuming the most economical approach is to buy the software outright and run it on your own premises. One of the latest alternatives that might be more cost-effective and/or preferable from a cash-flow perspective is called “SaaS” or “Software as a Service.” Although there are many variations on the theme, SaaS provides you with the flexibility to pay a monthly subscription rate, per named user, that covers hosting, training, consulting and other start-up costs.

One caveat if you’re thinking about SaaS: Make sure you know who is providing the service. Some CMMS/EAM vendors offer this only through third-party relationships that might not be viable in the long term. This is a risk, especially with mission-critical data.

Although Exhibit 1 shows “payment cash flow flexibility” ranked least important out of 21 criteria, this is probably because survey respondents were from technical areas such as maintenance, engineering, and operations, as opposed to finance. Regardless, a typical mistake in selecting a CMMS/EAM system is ignoring other payment and deployment options that might lower the total cost of ownership (TCO).

Another factor affecting TCO that is equally misunderstood by most technical users is the importance of a web-architected solution. As seen in Exhibit 1, “web-architected solution” ranked #19 of 21 criteria in terms of importance. As above, this is most likely because respondents are from technical areas within the plant, as opposed to IT. It is for this reason that stakeholders from IT and Finance should be part of the selection committee to ensure options are evaluated in terms of total cost of ownership, including:

- licenses,
- implementation,
- training,
- upgrades,
- ongoing maintenance and support and
- hardware.

Web-architected solutions tend to lower these costs and facilitate ongoing system enhancements.

## **BENEFITS REALIZATION**

# **MISTAKE #10 – YOU CELEBRATE THE DAY THE CMMS/EAM SYSTEM GOES LIVE.**

When would you consider the CMMS/EAM system successfully implemented? Most companies would argue that the system is implemented after a successful go-live, when it is up and running with minimal interruptions, and the system has stabilized. However, this is flawed in that the basis for selecting and implementing a CMMS/EAM system was presumably to realize benefits, not simply install a system.

Success must be defined in terms of performance measures and targets, and the CMMS/EAM system can then be used to track progress in achieving them. This is not well understood by most companies, as shown in Exhibit 1 where “benefits realization” is ranked only 8th of 21 criteria in terms of importance.

In conclusion, I would argue that the most important criterion in the selection of a CMMS/EAM vendor and its software solution is the ability to facilitate achievement of target benefits. All other criteria discussed in this white paper must then align and support benefits realization. Your CMMS/EAM vendor is an important partner in ensuring success in the long term.

### Exhibit 1 - Importance of CMMS/EAM Selection Criteria (based on Dec 08 Plant Services Survey Results)

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3	Planning and Scheduling	Distinguish between long-term planning of a maintenance program (e.g., multiple job plans for each asset/component, multiple triggers for PM, asset criticality, condition-based trend analysis), and short-term scheduling (e.g., multiple priorities used in scheduling, graphical schedule, what-if analysis on schedule).	4.13
4	Maintenance Optimization	Provide tools for determining the right mix of failure-based maintenance (i.e., run to fail), use-based maintenance (i.e., preventive maintenance by calendar, meter or event) or condition-based maintenance for each asset, component and/or failure mode.	4.04
5	Analysis Tools	Provide simple analytics like Pareto analysis on high-frequency or high-cost problem and cause codes, and more sophisticated tools such as root cause and trend analysis.	4.02
6	Health, Safety & Environment	Help ensure a safe and healthy work environment with features such as lockout/tagout, safety checklists, safety priority field on the work order, and Material Safety Data Sheets.	4.02
7	Configurability	Provide a system that can be quickly and easily configured at any point in time, to meet just the needs of any given user, from the simplest to most advanced users amongst a diverse and ever-changing pool of stakeholders.	4
8	Benefits Realization	Plan and budget for productivity gains enabled by the CMMS/EAM implementation, then track results, and drill-down to analyze variances.	3.98
9	Open Systems	Integrate seamlessly with many other vendors' software applications and add-ons, providing greater value and flexibility when configuring your CMMS/EAM to fit your needs.	3.91
10	Total Cost of Ownership	Minimize the cost of a given software solution over the long term including licenses, implementation, integration, partner solutions, support, consulting, etc.	3.91
11	Supply Chain Management	Manage parts, vendors, and contractors with comprehensive features such as ABC analysis, Economic Order Quantity (EOQ), service level management, supplier history analysis, and charging contractor labor and parts usage to work orders for more accurate equipment history.	3.89
12	Configurable KPI's	Create dashboards and business intelligence that give visibility into your operations the way you want it.	3.81
13	Notification and Workflow	Automate processes for productivity gain, like alerting a supervisor that maintenance is required due to excessive energy consumption or downtime, or a key warranty is expiring soon.	3.77
14	Industry Specialization	Ensure that the CMMS/EAM vendor understands our business, and that their software solution has features and functions that prove it.	3.75
15	Risk Management & Compliance	Provide sophisticated controls such as error checking capability, multiple approvals, field level security, etc., as well as comprehensive reporting capability for regulatory compliance.	3.67
16	Strategic Asset Management	Handle the diverse needs of all levels in your company, from corporate to the shop-floor, along the entire asset lifecycle (design, procurement, installation, maintenance, disposal), and for any asset class (i.e., plant equipment, facilities, fleet, infrastructure).	3.63
17	Comprehensive Energy Tracking	Track and analyze energy usage for individual assets and overall.	3.57
18	Service Management	Support Maintenance as a business, for internal or external customers, with features such as third-party billing, help desk, and service level agreements.	3.36
19	Web-architected Solution	Drive to a lower total cost of ownership, easier upgrade path, improved access, and greater scalability with a web-architected solution.	3.34
20	Multi-site	Handle multiple lines of business, divisions, physical and logical locations, including multiple language and currency requirements.	3.25
21	Payment Cash Flow Flexibility	Provide options such as full payment up front, site license, Software as a Service (i.e., SaaS or all-inclusive monthly payments), ASP, and lease.	3.05

**Exhibit 2 - Performance of your current CMMS/EAM Software (based on Dec/08 Plant Services Survey Results)**

On a scale of 1 to 5, where 5 is extremely well and 1 is not at all well, rate how well your current CMMS package does with respect to this criteria:

Rank	Criteria	Description	Avg Vendor Performance
1	Benefits Realization	Plan and budget for productivity gains enabled by the CMMS/EAM implementation, then track results, and drill-down to analyze variances.	3.14
2	Ease of Implementation	Get up and running quickly and easily, with users embracing future-state processes supported by the new CMMS/EAM because of perceived added value to their jobs.	3.13
3	Supply Chain Management	Manage parts, vendors, and contractors with comprehensive features such as ABC analysis, Economic Order Quantity (EOQ), service level management, supplier history analysis, and charging contractor labor and parts usage to work orders for more accurate equipment history.	3.11
4	Multi-site	Handle multiple lines of business, divisions, physical and logical locations, including multiple language and currency requirements.	3.05
5	Payment Cash Flow Flexibility	Provide options such as full payment up front, site license, Software as a Service (i.e., SaaS or all-inclusive monthly payments), ASP, and lease.	2.94
6	Configurability	Provide a system that can be quickly and easily configured at any point in time, to meet just the needs of any given user, from the simplest to most advanced users amongst a diverse and ever-changing pool of stakeholders.	2.93
7	Planning and Scheduling	Distinguish between long-term planning of a maintenance program (e.g., multiple job plans for each asset/component, multiple triggers for PM, asset criticality, condition-based trend analysis), and short-term scheduling (e.g., multiple priorities used in scheduling, graphical schedule, what-if analysis on schedule).	2.93
8	Total Cost of Ownership	Minimize the cost of a given software solution over the long term including licenses, implementation, integration, partner solutions, support, consulting, etc.	2.93
9	Service Management	Support Maintenance as a business, for internal or external customers, with features such as third-party billing, help desk, and service level agreements.	2.87
10	Health, Safety & Environment	Help ensure a safe and healthy work environment with features such as lockout/tagout, safety checklists, safety priority field on the work order, and Material Safety Data Sheets.	2.83
11	Maintenance Optimization	Provide tools for determining the right mix of failure-based maintenance (i.e., run to fail), use-based maintenance (i.e., preventive maintenance by calendar, meter or event) or condition-based maintenance for each asset, component and/or failure mode.	2.8
12	Strategic Asset Management	Handle the diverse needs of all levels in your company, from corporate to the shop-floor, along the entire asset lifecycle (i.e., design, procurement, installation, maintenance, disposal), and for any asset class (i.e., plant equipment, facilities, fleet, infrastructure or linear assets, and IT).	2.76
13	Analysis Tools	Provide simple analytics like Pareto analysis on high-frequency or high-cost problem and cause codes, and more sophisticated tools such as root cause and trend analysis.	2.75
14	Intuitive User Interface	Ensure users can quickly and easily navigate the system, as well as enter, retrieve, and report on data in a user-friendly environment.	2.7
15	Industry Specialization	Ensure that the CMMS/EAM vendor understands our business, and that their software solution has features and functions that prove it.	2.67
16	Configurable KPI's	Create dashboards and business intelligence that give visibility into your operations the way you want it.	2.6
17	Risk Management & Compliance	Provide sophisticated controls such as error checking capability, multiple approvals, field level security, etc., as well as comprehensive reporting capability for regulatory compliance.	2.55
18	Web-architected Solution	Drive to a lower total cost of ownership, easier upgrade path, improved access, and greater scalability with a web-architected solution.	2.48
19	Open Systems	Integrate seamlessly with many other vendors' software applications and add-ons, providing greater value and flexibility when configuring your CMMS/EAM to fit your needs.	2.46
20	Notification and Workflow	Automate processes for productivity gain, like alerting a supervisor that maintenance is required due to excessive energy consumption or downtime, or a key warranty is expiring soon.	2.44
21	Comprehensive Energy Tracking	Track and analyze energy usage for individual assets and overall.	2.2

## ABOUT THE AUTHOR

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