

Computerized Maintenance Management Systems:
Misconceptions Between Management & Operations

by

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ABSTRACT

Research findings have shown that many computerized maintenance management systems (CMMS) are largely underutilized, often leading to the loss of efficiencies in the organization's maintenance program. A literature review is presented of the available research in CMMS and of operations and management roles in a maintenance program. In addition, research was conducted around CMMS users to identify if any misalignments exist between management and operations. The articles selected for review offer a variety of perspectives, considerations, instructions, and noted failures involved with implementation, day to day use and reporting expectations. Through conducting a survey of both management and operations this paper will show how management and operations conceptions of CMMS vary, even greatly in some areas. The objective of this research is to gain an in-depth perspective from CMMS in all roles and analyze where utilizations vary. This information will then be utilized to understand possible misconceptions between roles, leading to inaccuracies and sub-par outcomes of proposed CMMS implementations.

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CHAPTER 1

INTRODUCTION

A core observation underlying this research involved the apparent misalignment between organization level management and facility management operations departments within the use, value, and application of Computerized Maintenance Management Systems (CMMS). Two historically identified misalignments are insufficient functionality that limits data input and poor implementation, which often leads to inaccurate reporting. Thus, a key objective in this research was to assess how broad these as well as other CMMS issues may be throughout the industry.

PROBLEM STATEMENT

With CMMS' being a relatively new creation, deciding a maintenance manager has typically been an engineer most willing to endure the greatest load of responsibilities. Since then, the position of maintenance manager has grown immensely and has fostered interest in maintenance management, clearing its low esteem image (Pintelon, & Gelders 1992). Until recently, maintenance has been regarded as a "difficult-to-control" part of production. However, this view has slowly changed and maintenance has become the responsibility of a separate department (Pintelon, & Gelders 1992). To continue this growth, action is necessary to improve the effectiveness of a CMMS in meeting the demands of increased workloads and decreased resources (Korka, & Thomas 1997).

While a CMMS is commonly a critical tool to any maintenance program, these programs require a substantial amount of attention and maintenance to maximize full

operational value; potentially more than any other asset under a facility manager's purview. Moreover, an efficient CMMS requires ideal implementation, and a significant amount of ongoing investment. Important requirements for ideal implementation include: having high quality data, accurate asset lists, and scheduling parameters appropriate for business needs.

A common, and significant misconception fostered by management is that investment is initial and not ongoing. When utilizing information produced from a CMMS to guide decision making, common management group misunderstandings are that a CMMS will provide the decision as well as provide a plan of action. Initial investment and resources have also typically been overseen, increasing potential limitations on program results. Successful implementation involves immediately defining success metrics and establishing a team responsible for continuous improvements. This assigned team, or individuals should then incorporate the cycle of plan, do, check, act and repeat. (Hoske 2017). Companies lacking these practices may consume a significant amount of management time compiling, interpreting, and analyzing the data captured within the CMMS. It is estimated that only 30% of the modules of a CMMS are used, and of these, only 30% of functionality, resulting in only a 9% overall utilization (Labib 2004).

RESEARCH OBJECTIVE

The purpose of this research was to attempt conceptualizing how management and facilities operations view and use CMMS programs. Key factors were examined across functionality, productivity, and investment with the goal of identifying how each

organizational element may invest in as well as use a CMMS program. Organizational groups were assessed on both impressions of other groups, and their own with respect to roles and responsibilities within the CMMS. The initial survey question inquires as to what role the respondent holds within the organization, in which a given response did not alter subsequent questions. The selected format allowed both management and operational groups to share thoughts and opinions of both organizational roles. The survey attempted to assess all stages of use for a CMMS program including expectations, implementation, application, and reporting. These were areas of interest to identify if incongruency within one phase would cause disruption and/or lack of ideal results within others.

CHAPTER 2

LITERATURE REVIEW

APPLICATION

Many organizations have a lot of expectations from the day to day use of a CMMS while some just see it as another source of extra work for maintenance staff already struggling to do more with fewer resources. If utilized correctly, new application of a CMMS is an opportunity to increase organizational worth while demonstrating the value of a strong maintenance approach and plan. By documenting every corrective and preventive task as well as emergency repairs in the CMMS, maintenance operations and organizational management can obtain the data necessary to generate reports that result in increases in product quality and reductions in costs (Parker 2003).

Too little training or untimely training impacts organizations' expectations and

generally results in confusion for most entities involved. This confusion or lack of understanding can lead to a lack of confidence in adopting the new CMMS. Eventually, operations groups will expect to be able to add necessary items to a CMMS for proper recording (i.e. new assets, new parts, additional locations etc.). This request will generally be faced with resistance from the organization on all levels that were directly involved in the initial implementation. Management with little involvement will give the greatest resistance because the implementation phase has passed, and the new CMMS should be ready to meet everyone's needs. On the other hand, an involved management will see additional needs and accept that this new investment requires maintenance that is an ongoing practice.

IMPLEMENTATION

Many managers who implemented a CMMS in the 1970's thought little more would be required after the initial installation, including training. While expectations for facilities managers have grown significantly, so have the capabilities of a CMMS. For this resource to be effective requires considerable data and training. Training should be done as close to the actual implementation as possible and required for all affected personnel. In addition to installing the actual CMMS software and required hardware, an implementation should include: 1) Identifying assets in appropriate groups based on the criticalness of the asset; 2) parts identification and inventory control methods; 3) data collection; and 4) database development. In a typical facility, this effort will require considerable personnel for an average of 12 to 24 months (Cato, & Mobley 2001). It is not impossible for management to implement a CMMS. In fact, good maintenance

managers affect real change that produces considerable positive returns on their CMMS investment. A successful CMMS practitioner focuses on the long-term benefits of the CMMS and uses them to demonstrate their contributions to the company (Parker, 2003).

Some managers believe a CMMS just means additional work and feel overwhelmed or doomed from the beginning (Parker, 2003). While determining factors have progressed with the establishment of the maintenance department and specialized maintenance managers, many factors are still overlooked for the standard management priorities of reporting and graphics. Some of these factors include the need for information to aid management and the amount of information available, which continues to increase exponentially (Labib 2004). Other factors, data-life-time is diminishing because of the shop-floor realities and the rapid pace of change. The new initiative is to acquire data about assets, based upon real interactions rather than deduced behavior from historical data (Labib, 2004). Improper or insufficient data initially loaded to the system results in inadequate information available from the system, which also results in a loss of confidence and lack of use poor planning in initial stages result in misdirected resources, increased implementation time, a loss of interest on the part of key personnel, and underfunding of the project (Cato, & Mobely 2001).

Changing perceptions in the maintenance industry altogether could address several problems associated with using a CMMS. They also often neglect proper implementation of day to day applications for this resource, as well as neglect to establish clear guidelines for desired reporting. Ultimately, these downfalls occur due to a lack of communication and resources, which then lead to less than ideal or negative outcomes.

Studies have shown that when it initially comes to implementing a CMMS, management groups have expressed that two functions need to be given a high level of importance. These include maintenance reporting and graphics (Korka, & Thomas 1997). Although the depth of these functions may be minimal, reporting has always been a requirement, but reporting graphics as a high-level factor reflects the importance of aesthetics to management. Generally, a method of selecting a CMMS should depend on the cost of maintenance policy when compared with other criteria, like increasing asset quality, the availability of spares, and the duration time of maintenance (Bevilacqua, & Braglia 2000). Often the project team then cuts corners or takes the minimum steps required in installing a basic CMMS, and management fails to recognize all these factors that include many non-maintenance issues (Cato, & Mobley 2010).

While not all Operations will embrace change, confidence in a CMMS can drop quickly when Operations are not included in the implementation process. Operations in facility maintenance often feel a high sense of ownership in their facilities and know that the introduction of a CMMS will have an impact on the day to day role of their jobs. Most companies do not have the resources or expertise required to fully implement a CMMS in house, thus a third party is then brought in to implement and install the new CMMS; creating yet another variable for Operations to adapt to. While management may side with the Operations, removing hurdles caused by third party implementation, many in-house personnel do not have a working knowledge of these programs and fail to recognize all the tasks required in directly or indirectly supporting the newly installed system (Cato, & Mobley 2001).

CMMS's often requires thousands of hours and effort, and in most cases, facilities do not have the resources to accomplish a project of this magnitude. As a result, personnel face a lot of strain attempting to implement a CMMS in addition to their regular duties. The resulting conflict becomes meeting production and maintenance goals, as well as implementing a CMMS. This creates an overload for everyone involved, especially for the Operations that are expected to undertake learning the day to day application of a CMMS. Most importantly, for a successful implementation to occur Operations must understand what is expected of them through appropriate training and continued support.

Proper documentation is vital and will only come from proper employee training on terminology, proper asset selection, and inventory management. The distinction between a "bulb," a "light" and a "compact fluorescent" may seem like splitting hairs but can lead to confusion and purchasing errors down the road (Bagadia 2009). The next hurdle to effective employee input in a CMMS is directly related to the thoroughness of the asset lists, locations, inventory management, and time allotment. For example, if Operations are unable to properly record their work on an asset because it has not been listed or is unavailable, this will result in a quick decline in participation from those Operations. While Operations may have disagreed with third party implementation, their expertise are critical in creating thorough asset lists, locations, inventory management, and time allotment. Once implementation is over, management will need to decide the level of clearance each employee will have in changing parameters in the CMMS.

Management's perception after implementation of CMMS will greatly impact the

outcome and adaptation by others in a maintenance organization. A CMMS is a tool that will provide the information required to effectively manage the maintenance function, but it cannot overcome the myriad of other factors that preclude effectiveness (Cato, & Mobley 2001). For example, management's potential lack of decision support could continue to be a primary interrupter in the success of a CMMS program.

A step towards decision support would be to vary frequency of preventative maintenance (PMs) depending on the combination of failure frequency and severity rather than simply based on the manufacturer's instructions. Several companies only use CMMS to input maintenance requests for basic things (i.e. that changing of monthly air filters is most effective when it's simply done for the fact that's it's the next month). The system will produce an instruction to change the air filter on a set date. Many PM's do not reflect shop floor reality, additionally PM's taken from manufactures recommendations may fail to include variances that pertain to individual sites specifically, such as environment, operational trends and vendor reliability (Labib 2004).

REPORTING

While reporting is generally not considered the responsibility of an employee, they often take the brunt for inadequate reports that often result from insufficient information gathering or data collection. Additionally, there are often fundamental management, philosophical, and/or procedural issues that can impede reports delivered by the CMMS that are not related to the Operations or actual system. There is a possibility that Operations could have become agitated throughout a CMMS implementation process and not believe in the new system and even attempt to "buck the

system”.

It's important that reporting deficiencies are addressed during the implementation phase of a new system. If these issues are not dealt with prior to implementation, the blame will be placed on the CMMS for the continuation of your chronic maintenance and reporting problems (Cato, & Mobley 2001).

Another issue companies face are difficulties analyzing equipment performance trends, and subsequently producing reports. This in turn causes companies to spend a large amount of capital in acquisition of off-the-shelf systems for data collection, and their added value to the business is questionable (Labib 2004). Several reasons a CMMS may not meet management's expectations include, management being unaware of the several different maintenance models to begin with, management's lack of confidence in mathematical models due to their complexities and understanding the appropriateness of said systems (Labib 2004). With all these new features management may tend to ignore basic reasons for implementing a CMMS, to reduce costs.

CHAPTER 3

RESULTS

Research Methodology Summary

From the literature review a survey was prepared to be distributed to FM leaders and FM Operations groups that have CMMS in place in the organization. The literature review findings were used to craft the survey questions to capture perspectives and experiences. The survey was created to evaluate the opinions of both managers and

operations regarding their interactions with CMMS. Research has shown different priorities and concerns involved with each stage of implementing and fostering a successful CMMS. Research was conducted on several key areas of a CMMS lifecycle; expectations, implementation, application and reporting.

Using a Likert scale (i.e. “strongly disagree”, “disagree”, etc.), this survey was created to: better comprehend perceptions of CMMS users; how those perceptions interact and create the overall productivity for an organization; and differentiate users’ roles and experiences. The results were used to see perspectives regarding CMMS use, and investment.

Data Collection

The survey was shared with several professional groups in the facilities management industry such as the International Facility Management Association (IFMA), and the Association for Facility Engineers (AFE). Other outlets included current and past professional connections. Results were anonymous and demographic questions were not included. Responses totaled 49 during the survey window. Respondents ranged from management at companies with over 10,000 Operations to Operations at companies with a population of less than 50. Management accounted for 59% of the survey respondents and 31% of management worked for an organization with a population over 10,000. Operations accounted for 41% of the population, 55% of the Operations were from an organization with a population over 10,000.

Data Results

The results of the survey confirmed many of the issues and misconceptions between management and Operations throughout every phase of CMMS development. While some information was significant on a statistical basis, not all results were.

Consideration	one-tail t-test (0.1) p-value	Significant	Takeaway
Management has shown continued involvement in improving the CMMS beyond the implementation stage.	0.262	NO	Both are neutral to this notion
Operations can modify data in the CMMS to improve its accuracy and abilities after the implementation phase.	0.023	YES	Management thinks the data can be modified, Operations does not
Inaccurate records in a CMMS are commonly caused by a lack of knowledge from Operations.	0.385	NO	Both slightly agree to this notion
Inaccurate records in a CMMS are commonly caused by a lack of motivation from Operations.	0.030	YES	Management agrees more than operations that a lack of motivation impacts data quality
Management uses the CMMS to the fullest extent of its abilities.	0.287	NO	Both slightly disagree to this notion.
Operations use the CMMS to the fullest extent of its abilities.	0.126	NO	Both slightly disagree to this notion.

Figure 1. Single tailed T-test showing whether results were significant or not.

Nonsignificant results did still align with the overall thesis supporting misconceptions between both management and operational parties.

From the results of the survey, 69% of management agrees that operations can modify data in the CMMS to improve its accuracy and abilities after the implementation phase. While only 40% of operations agree with the same statement.

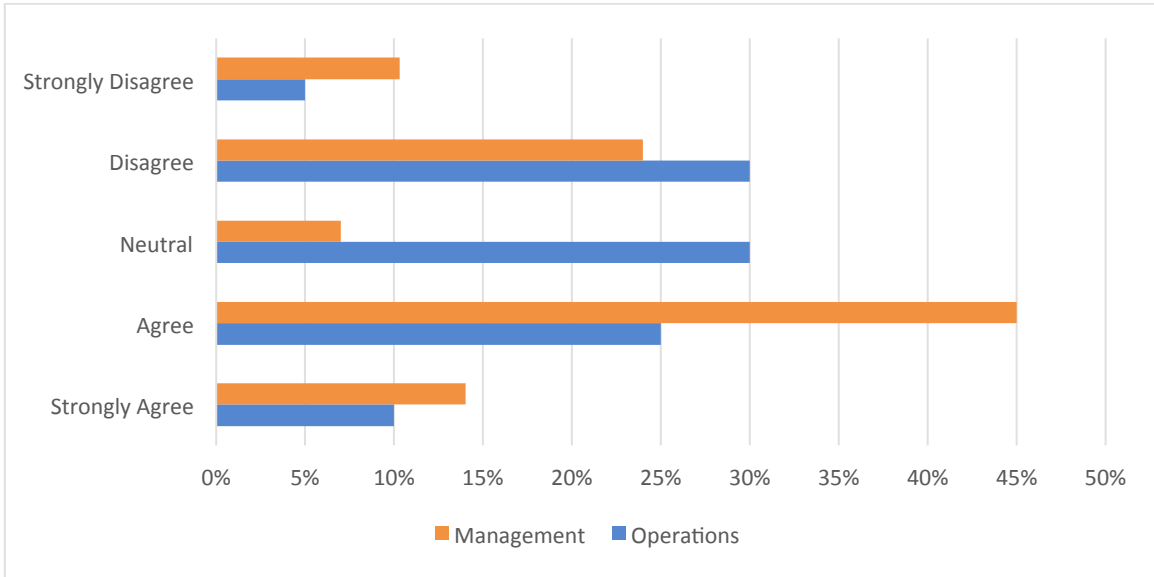


Figure 2. Management has shown continued involvement in improving the CMMS beyond the implementation stage.

This data shows that there is a misconception between management and Operations when it comes to having the authority after implementation phase to modify critical components of a CMMS. Additional misconceptions about managements continued investment after implementation. According to research 59% of managers agreed that management continued to improve the CMMS after the implementation

phase, while only 35% of Operations agreed with the same statement.

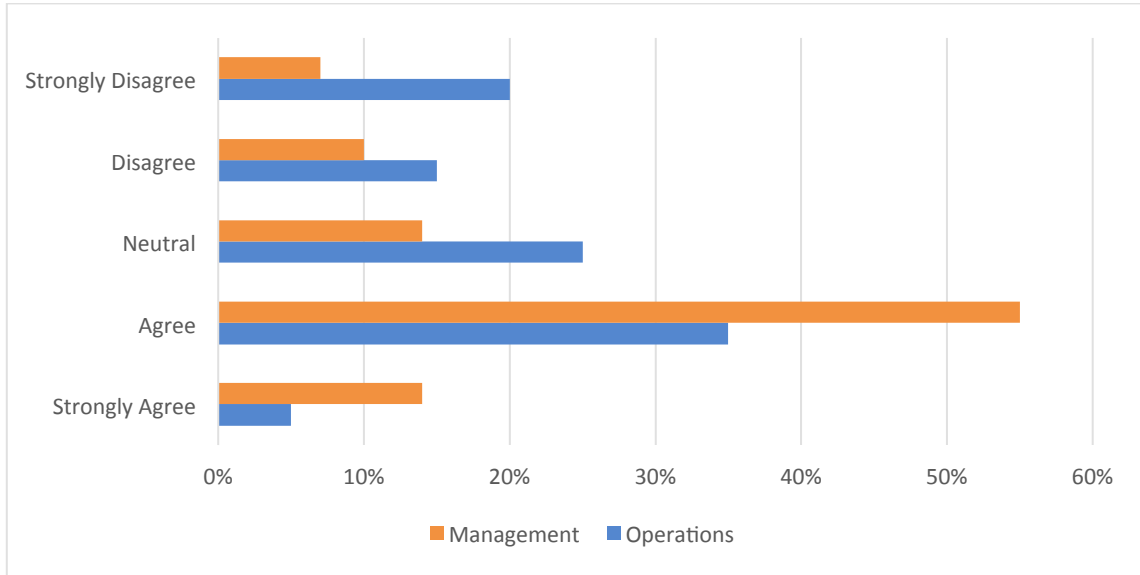


Figure 3. Operations can modify data in the CMMS to improve its accuracy and abilities after the implementation phase.

Assets get replaced and updated and locations can change during remodels in any facility. If management fails to take into consideration that these changes will require updates in the CMMS, data will become inaccurate or not recorded at all. If management allows certain Operations or a specific team to address these changes and updates, data integrity within the CMMS will more likely be consistent. Additionally, management should be more transparent with Operations regarding their continued involvement with the CMMS, such as training for both Operations and management. 50% of Operations agree that inaccurate records in a CMMS are commonly caused by a lack of knowledge from operations.

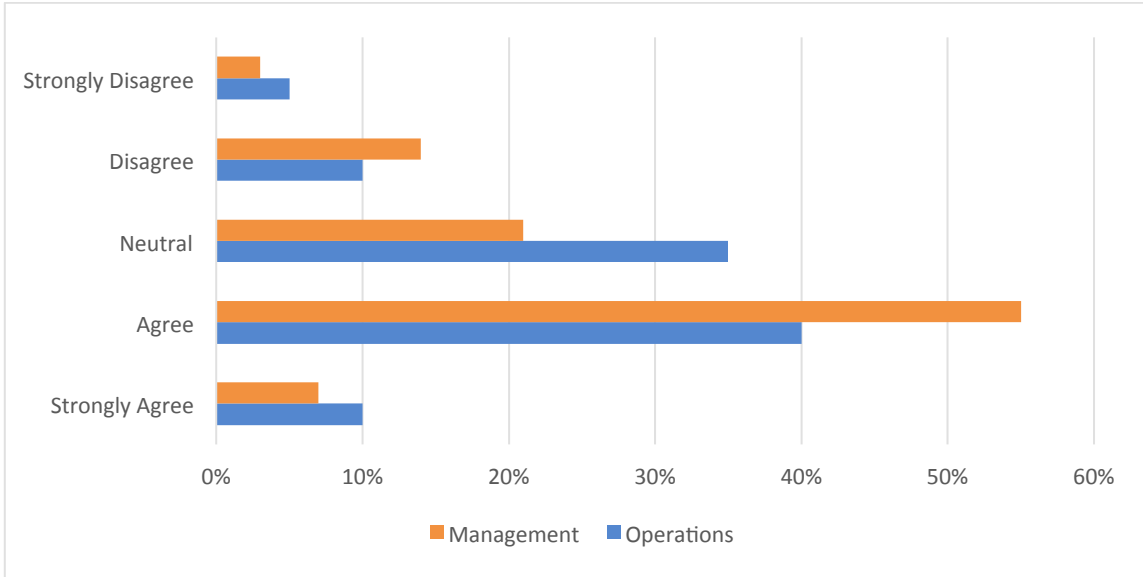


Figure 4. Inaccurate records in a CMMS are commonly caused by a lack of knowledge from Operations.

While 73% of management believes that inaccurate records in a CMMS are commonly caused by a lack of motivation from Operations.

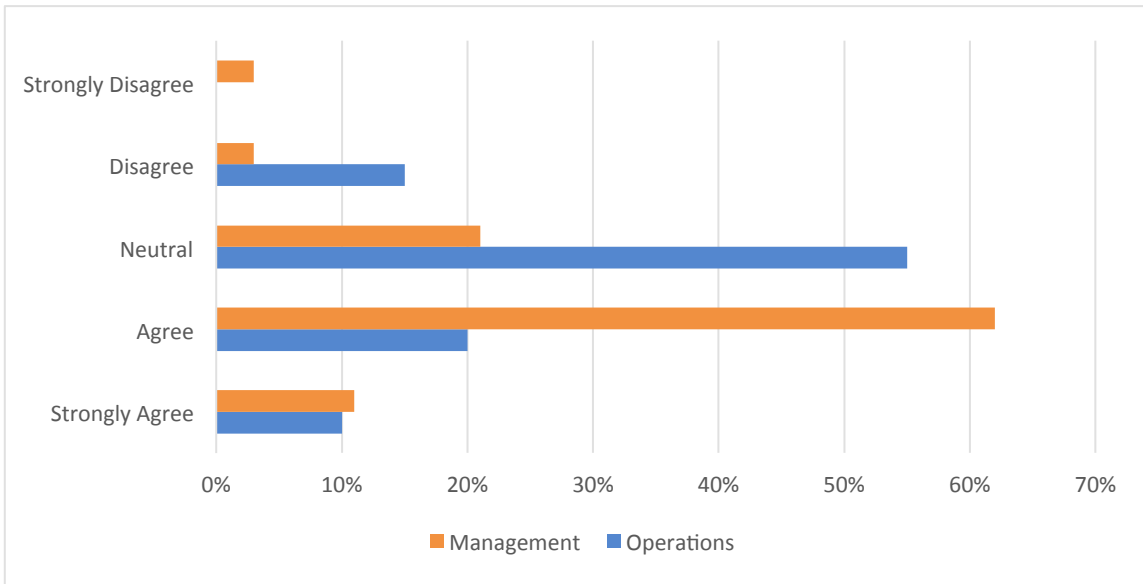


Figure 5. Inaccurate records in a CMMS are commonly caused by a lack of motivation from Operations.

Tables 3 and 4 show that Operations do not feel knowledgeable enough to record accurate records in a CMMS and are willing to openly admit their lack of knowledge. While a majority of management believes Operations are not properly motivated to record accurate records in a CMMS rather than have enough training. Data shows that 55% of management disagrees that management uses the CMMS to the fullest extent of its abilities.

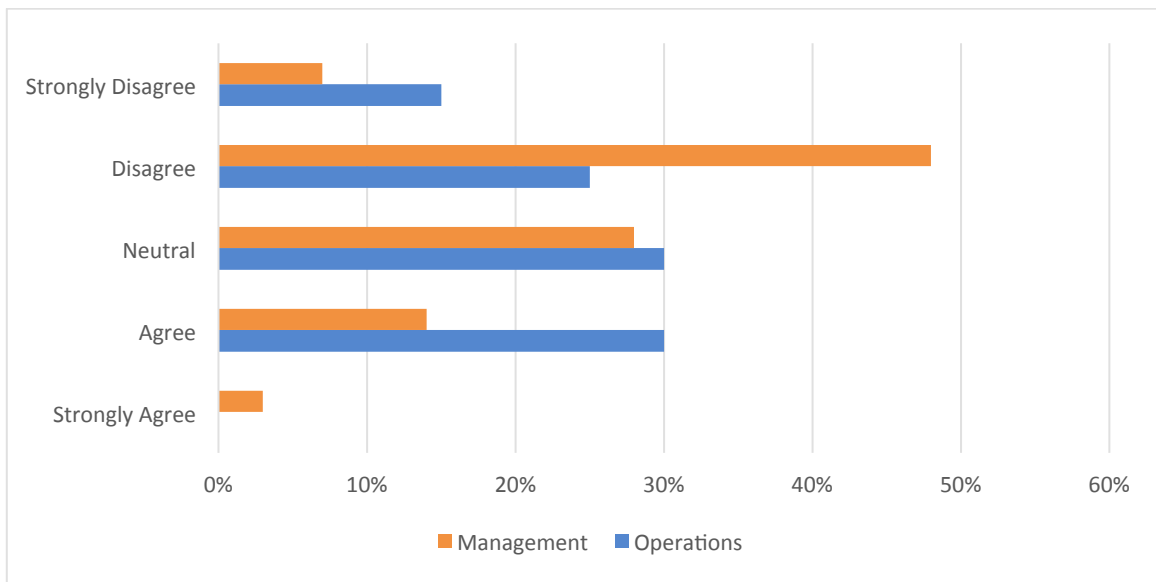


Figure 6. Management uses the CMMS to the fullest extent of its abilities.

Lacking decision support is a significant problem considering maintenance management is a decision-making department. Management needs to be able to decide what is likely most effective while considering the unique needs of the machine, plant and/or organization. This decision-making process can be made more difficult with a CMMS if appropriate and timely data is not recorded. Research shows that 55% of management disagrees that Operations use the CMMS to the fullest extent of its abilities.

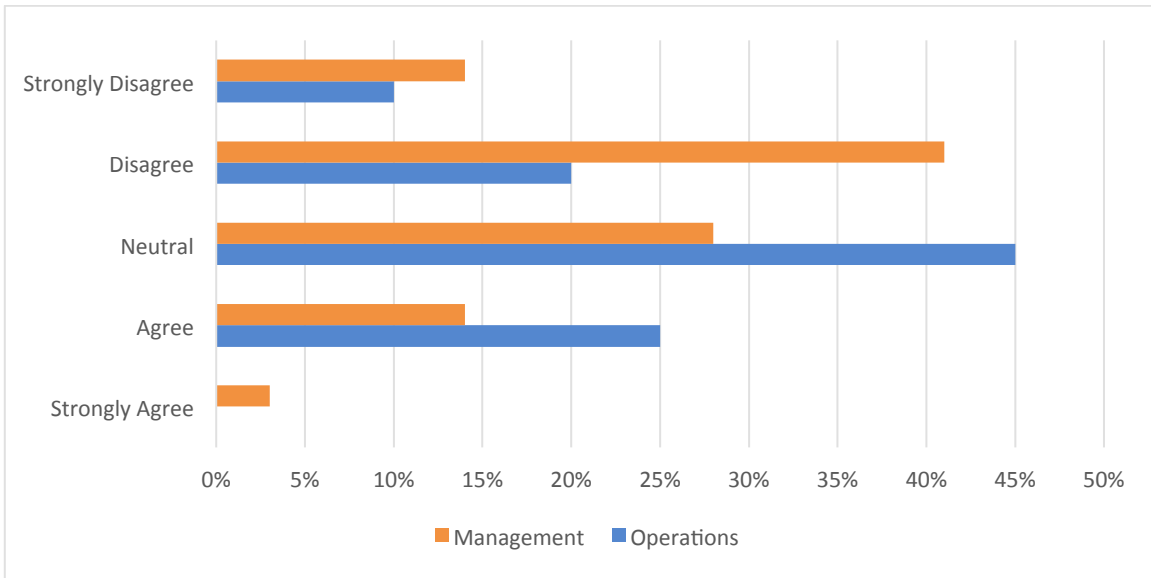


Figure 7. Operations use the CMMS to the fullest extent of its abilities.

CHAPTER 4

CONCLUSION

There are many aspects to successfully operating a CMMS. Although many maintenance managers state that they plan 80% of their maintenance activities, few plan more than 10% and of the 80% of tasks that may be written out, few are effectively planned (Cato, & Mobley 2001). This can be addressed beginning with implementation and a solid plan for both the CMMS itself and what it is expected to deliver.

Management, Operations, and likely third-party installation groups need to have roles, expectations, and established transitions in place that allow for open communication during the implementation process. Overall there needs to be communication and resources in place to ensure the continued maintenance of a CMMS itself. Operations should have their roles explained to them, along with access or a process in place for

making changes to the system. Management will have to keep a clear standard in what information is expected from the CMMS and follow a decision-making process that is applied to the information it produces. Ultimately, to maximize a CMMS' potential benefits for the organization, all individuals and groups involved in all phases of developing and operating a CMMS should be supported through proper training, efficient communication, and accessibility to necessary resources.

Some limitations to the research arose in trying to find Operations or end users of CMMS programs. Sharing links to the survey in management groups was simple considering the number of professional networks there are in the industry. Using this method to reach out to Operations was rather difficult considering the lack of professional groups that were found online. Encouragement was made in the initial requests to management through professional groups to share the survey with their team of Operations. With no input beyond the initial link for the survey, follow up was impossible to encourage employee participation through management respondents. Recommendations for future research would include focusing on different perceptions between both roles of management and operations.

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