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The Effect of Computerized Maintenance Management System (CMMS) in Enhancing the Firm Productivity

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Abstract:- This study aims to prove that having computerized maintenance management system (CMMS) within the firm production process will enhance the productivity of the firm and add a valuable step to be followed in order to get the best out of the daily maintenance activities and the firm productivity as a whole.

The study compares data gathered by the use of a questionnaire for different firms in the Kingdom of Bahrain concentrated before and after implementing the CMMS using three variables such as: Machine efficiency, product quality, and labors productivity which are the main essential components in the production process that are directly affecting the firm's productivity. In addition to that, the study aims to provide a certainty that having CMMS involved within firm activities will smooth up the process of the maintenance daily activities and create a clean environment in terms of reducing the build-up pressures caused by the delay in such process, as well as reducing the papers used by the team for the purpose of having records filed, checklists, and material/tools dispatched.

At the end of the study, a statistical analysis is provided using the weighted mean to analyze the numerical data generated from the questionnaire in terms of (Before and After) having CMMS implemented within the firm, and then the data is compared by the use of T-TEST tool that shows the different variables between having CMMS or not. At the end, a recommendation is provided which can be adopted by firms and researchers alike.

Keywords:- *Computerized, Maintenance, CMMS, Productivity.*

I. INTRODUCTION

Until the previous century**,** preventative maintenance activities are not considered to be an important task within a working environment. People from the industry tend to think that as long as the machines are running, there are no reasons for them to check its condition. There was no system or approach which is being applied on those days. Machines only shutdown unexpectedly and this has a huge impact on the time, cost and resources. No contingency plans were set up in order for the operators and the technical teams to follow in case of sudden machine breakdown. Early in the 21th century, most of the organizations started to consider plans to avoid unwanted break time caused by equipment breakdown. Most of the plans are considered to provide spare machines and parts to serve as standby machines to replace the running ones in case of breakdown

Later on, organizations started to consider maintaining some costly parts which have a major impact on the machine and will affect the productivity of the company as a whole. In effect, the preventive maintenance becomes an important task which will lead to a successful operation of the company. This intensive study provides maintenance concepts and procedures that can be implemented in order to improve maintenance activities.

Implementation of a sound maintenance control program is essential to minimize breakdown and maintenance costs. Machine downtime negatively affects work and results to backlog. Accurate implementation of the maintenance program will definitely result to attaining on time deliveries and meeting the quality of products and services in any company.

The maintenance group should be knowledgeable and focused on equipment condition and turn the maintenance effort into a planning and scheduling machine.

Interruptions in performing the maintenance are not caused by laziness or lack of motivation, but rather by lack of adequate planning and scheduling techniques. A properly planned job will have the needed parts, equipment and tools identified, and the availability of these items confirmed prior to scheduling the job.

II. STATEMENT OF THE PROBLEM

The study focused on the effect of Implementing Computerized Maintenance Management System (CMMS) in Enhancing the Productivity of the Firm, and specifically it aimed to answer the related questions.

- What is the status of the firm before the CMMS implementation in terms of Machine Efficiency, Product Non Conformance to specification (Quality) and Labor Productivity.
- What is the status of the firm after the CMMS implementation in terms of, Machine Efficiency, Product

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Non Conformance to specification (Quality) and Labor Productivity

- Is there a significant difference between the firm productivity before and after CMMS implementation ?

A. Research Hypotheses

H01: There is No significant difference between the firm's productivity before implementation the CMMS and after the implementations within a firm.

B. Conceptual Framework

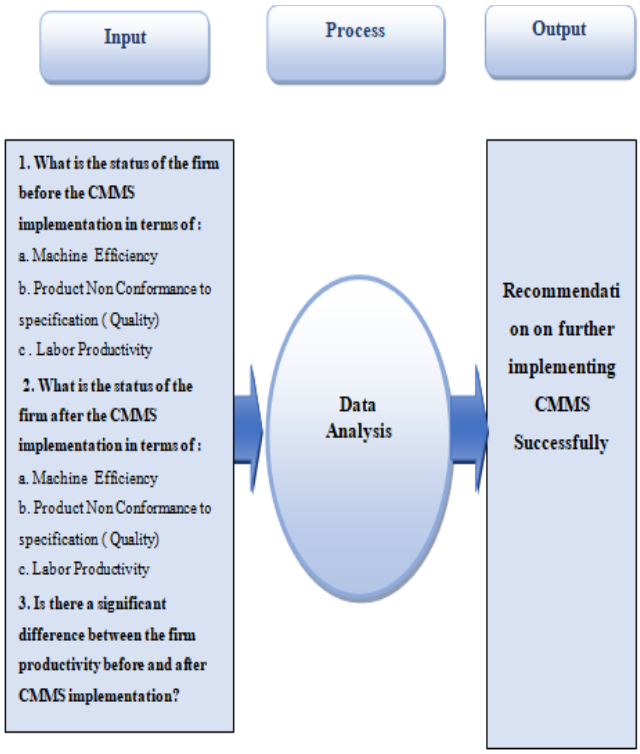

Fig 1

C. Research Design

This paper was descriptive research.Its design to get information related to CMMS from senior level management, middle level management and maintenance staff, on their preference and perspective on the implementation of CMMS before and after implementationeffectively on the(Machine Efficiency, Product Non Conformance to specification - Quality , Labor Productivity).

D. Population and Sampling

Since CMMS has not yet been popular in term of actual implementation in the kingdom, few of well-known companies who had been using CMMS and had implemented it as a part of their system been selected to be under the scope of data gathering source in this research .

The questionnaire been sent to selected people involved in the process within the selected companies.(Sample) Each respondent been asked how they rate the benefits of the applications. Their perception of using CMMS in their daily work and to rate it from1 to 5.

The goal targeted out of the questionnaire is to find out whether or not there is difference in perceived benefits between having CMMS and not, and that would be relayed by answering the question specified in the problem statement.

Most of the prospected respondents were people actually working on the field like senior level management, middle level management, and maintenance departmental staff. in addition to that, information related to the production line being involved/reviewed in the study which been taken from the implementation manuals. Ppopulation are to be considered all people work/Involved in the production field maintenance within the companies located in the kingdom of Bahrain 2018 , asample among these people been selected to be involved in the study , this sample varies from the expert level to the least level. and they are 50 person their position varies between first line management all the way to the implementation team and they been categorized as following:

E. Research Instrument

The main instrument for the data collection in this research was questionnaire and the process been supported by the use of interview as of supplementary to the data collection process.

III. SUMMARY OF FINDINGS

- *On the Status of the Firm before the CMMS Implementation*

For the Machine Efficiency, the overall weighted mean score is 3.01, referring this back to the Likert table, it is found the score indicates that the Machine Efficiency shows **Undecided.**

For the Product Non Conformance to specification (Quality), the overall weighted mean score is 3.12, referring this back to the Likert table, it is found the score indicates that the Product quality shows **Undecided.**

For the Labor Productivity, the overall weighted mean score is 2.84, referring this back to the Likert table, it is found the score indicates that the Labor productivity shows **Undecided**.

- *On the Status of the Firm after the CMMS Implementation*

For the Machine Efficiency, the overall back to the Likert table, it is found the score indicates that the Machine efficiency shows **Strongly Agree.**

For the Product Non Conformance to specification (Quality), the overall weighted mean score is 4.80, referring

this back to the Likert table, it is found the score indicates that the Product quality shows **Strongly Agree.**

For the Labor Productivity, the overall weighted mean score is 4.73, referring this back to the Likert table, it is found the score indicates that the Machine efficiency is showing **Strongly Agree.**

Summary of Weighted Mean		
Variable	Weighted mean Before CMMS	Weighted mean After CMMS
A. Machine Efficiency	3.01	4.75
B. Product Non Conformance to specification (Quality)	3.12	4.80
C. Labor Productivity	2.84	4.73
Overall Weighted Mean	2.99	4.76
Description	Undecided	Strongly Agree

Table 1:- Summary of Weighted Mean

- *On the Statues of the Firm Whether there is a Significant difference between the Firm Productivity before and after CMMS Implementation ?*

T-Test been conducted by inserting both results from the summary of the weighted mean table summarizing the result of the firm's productivity before and after the implementation of CMMSinto online calculator through social science statistics website (https://www.socscistatistics.com) in order to have an accurate statics comparison between both results. The result of the T-test was as showed below:

T-Value	P-Value
-21.05552	0.00003

This indicates that the result is significant at $p < .05$ which means there is a difference between the two inserted results which conclude that there is a different in the firm productivity in term of Machine Efficiency, Product Non Conformance to specification – Quality, and Labor Productivity Before and after implementing the CMMS.

In general, the firm's productivity shows **Strongly Agree** after implementing CMMS and **Undecided** before implementing CMMS, this result shows a big difference in improving the firm's productivity after implementing the CMMS.

- *Hypotheses Testing*

Testing the study hypothesis was done through testing the firm's productivity before and after Implementing Computerized Maintenance Management System (CMMS) within a Firm.

The findings shows a difference between the firm's productivity before and after Implementing the CMMS within a firm in terms of (Machine Efficiency, Product Non Conformance to specification - Quality, Labor Productivity).Therefore, the hypothesis testing rejected the null hypothesis, as there was a positive statistical significant differences in the result as mentioned, The p-value is .00003 and this indicates that the result is significant at $p < .05$

IV. CONCLUSIONS

- *On the Status of the Firm before the CMMS Implementation*

For the machine Efficiency. Based on the findings, it is stated that it cannot be decided whether the machines are efficient.

For the product Non Conformance to specification (Quality). Based on the findings, it is stated that it cannot be decided whether the product is in high quality or not.

For the labor Productivity. Based on the findings,it is stated that it cannot be decided whether the labors are productive or not.

- *On the Status of the Firm after the CMMS Implementation*

For the machine Efficiency. Based on the findings, it is strongly agreed that the machines are efficient and therefore it will lead to: Reducing the down time caused by the breakdowns, Increase the machines efficiency, Increase the machine utilization And having proper tracked records on the machines.

For the product Non Conformance to specification (Quality). Based on the findings, it is strongly agreed that the product is in high quality and therefore it will result to the below :Reducing the number of non-conformities;

Enhance the delivering time to the end users; and

Improved the integration between the required and the produced quantity. Or the Labor Productivity, based on the findings its strongly agreed that the labors are very productive and therefore it will led to:

Increasing the labors motivation because of the number of output has increased as a result of CMMS implementation Enhance the flexibility of releasing materials and tools from the store. Availability of a maintenance standard task database to be used for recurring planned jobs.

- *On the Statues of the Firm withier there is a Significant difference between the Firm Productivity before and after CMMS Implementation ?*

Base on the findings that compared the statuse of the firm before and after the implementation of CMMS . Its agreed that there is a significant difference between the compared result and therefore we counclude that having CMMS implemented within the firm process will positively enhance the firm productivity .

Furthermore, it will led to gaining the reliability among the rivals as a result of a stable standard reliable procedure being implemented within a firm policy.

RECOMMENDATION

- *On the Status of the Firm before the CMMS Implementation*

Based on the conclusions its stated that its can't be decided whether the machines are efficient and reliable. Therefore, there should be a way to enhance the efficiency of the machines.

Based on the conclusions its stated that its can't be decided whether the product is in high quality . Therefore, there should be a way to enhance the product quality.

Based on the conclusions its stated that its can't be decided whether the labors are productive. Therefore, there should be a way to enhance the labor productivity.

- *On the Status of the Firm after the CMMS Implementation:*

Based on the conclusions it's strongly agreed that the machines are efficient and reliable. I, therefore, highly recommend the implementation of CMMS in order to: Reduce the down time caused by the break downs. Increase the machines efficiency increase the machine utilization Having proper tracked records on the machines.

Based on the conclusions, it is strongly agreed that the product is in a high quality. It is highly recommended to implement the CMMS in order to: Reduce the number of non-conformities; Enhance the delivering time to the end users, Improved the integration between the required and the produced quantity.

Based on the conclusions it's strongly agreed that the labours are highly productive. It is highly recommended to implement the CMMS in order to:

Increase the labors' motivation as of the number of output has increased as a result of CMMS implementation; Enhance the flexibility of releasing materials and tools from the store, and Availability of a maintenance standard task database to be used for recurring planned jobs.

- *On the Status of the Firm Whether there is a Significant difference between the Firm Productivity before and after CMMS Implementation ?*

Based on the conclusions, it is positively agreed that there is a significant difference between before and after the implementation of CMMS. Therefore, It is highly recommended to implement CMMS within the firm process which will led to gaining the reliability among the rivals as a result of a stable standard reliable procedures being implemented within a firm policy.

- *For the Firms*

Since the result of the statistics analysis shows the positive effect of having CMMS within the firm process,It is highly recommended for the firms to implement the CMMS in order have issues related to the machines efficiency, product quality and labors' productivity to consider having CMMS onboard which will definitely enhance the process of the mentioned issues and will increase the level of the professionalism that the firm aimed for.

- *For the Researches*

It is recommended for interested researches planning to implement some research subjected to CMMS for the following:

- To look into the available versions of CMMS software and compare among them in term of its suitability to the firm's activities, to come up with a report containing which version is more effective and in which field.
- To conduct a study subjected to a comparison of "Dose CMMS work with both services field maintenance and production field maintenance ", and how does it reflect on both in term of efficiency.

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