THE SUITABILITY OF SAP ERP TO GENERATE A MAINTENANCE ZERO BASED BUDGET

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ABSTRACT

To determine the ability of SAP ERP to generate a maintenance zero-based budget, a case study was conducted at Company X, using the FY17 maintenance budget (approximately R138M). From the information obtained it was determined that the maintenance module (within SAP ERP) could only accurately allocate 35.3% of the maintenance costs for FY17. Further findings found that by changing the cost centre structure of the maintenance module in SAP ERP one could increase the cost visibility to from 35.3% to 88%. It was therefore concluded that SAP ERP is suitable to generate a maintenance zero-based budget, if setup correctly.

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1. INTRODUCTION

Why is it necessary to budget? Simply put, every organisation only has a limited number of resources to achieve their goals and objectives [1]. Resources include funding in terms of income from operations, capital investment from owners or loans. If the cash on hand is less than expenditures, it becomes difficult to pay the bills of the company, as well as source more funding. Budget planning indicates what management has prioritised by highlighting the allocation of planned expenses in the foreseeable future – as the saying goes ‘failing to plan is planning to fail’. This also accentuates the importance of planning to ensure that the company always has cash on hand [1]. However, in the maintenance field, there have been many findings of inadequate budgetary control. Maintenance budgets are often created simply by using an incremental budgeting method (the previous year’s costs plus inflation), calling into question the detail of, and control over these budgets [2], [3].

Lack of planning can be quite daunting given that maintenance is supposed to provide critical support for heavy and capital intensive industries by keeping the productivity performance of plants and machinery in a reliable and safe operating condition [2], [4]. There are also costly consequences of catastrophic failure if equipment is not maintained to standard [5], [4], [6]. Due to an increase in global competition, technological complexity and ever evolving Health Safety and Environmental (HSE) regulations, maintenance costs are ballooning. For example, BHP, a world leading mining company spends US$3.5 billion annually to maintain more than 3 000 mobile machines (many larger than the average house) across its operations [7]. One can imagine the damage caused (both from a safety and production point of view) when equipment that large and powerful fails. As another example, some airline companies claim that 40-45% of their operating expenditure is maintenance related [1]. It therefore seems logical that maintenance costs should be examined and monitored to ensure sustainability, competitiveness and even safety of the company [2]. Budget planning is one method where costs can be monitored and controlled, because it provides a benchmark against actual expenditure.

The shift of maintenance from being seen as a ‘necessary evil’, to a value adding department that sustain long term profitability has gain momentum, especially in large industrial companies [4], [8]. In fact, there is already a maintenance standard that has been setup to align companies with best maintenance practices - ISO 55000. It is expected to become a business requisite, which obliges companies to be certified before being eligible for insurance and may soon become as important to companies as the ISO 9001 and ISO 14001 standards [9]. The backbone of ISO 55000 is the establishment of leadership roles to ensure sustainable practices are implemented. To get this right there is a focus in evidence based decision making, which provides guidelines for data identification, collection, record keeping and control [10], [9]. For large companies it is therefore vital to have a system of some sort for all this data, as well as a solid understanding of the system [8]. Because of ISO 55000 and the other complexities associated with maintenance, Computerised Maintenance Management (CMM) systems have become standard practice and necessary. CMM systems are able to store and collate all the various maintenance information. However, without analysing this data to improve the process, these systems become nothing other than an expensive and glorified spreadsheet tool [4], [11], [12].

Today, maintenance software, such as CMM systems, are commercially available, either as standalone packages, or as modules in an integrated system. This includes SAP ERP, a well-known Enterprise Resource Planning (ERP) tool [13]. Ideally CMM systems enables data to be utilised from multiple maintenance functions and manage it all through one system. By processing this large volume of data, managers are able to make more analytical decisions and implement the most effective corrective actions, thereby increasing availability and ensuring a safer work environment [5]. Again, looking at BHP - they have stated that by FY2023 (within the next 5 years) they expect to accumulate a total saving of US$1.2 billion in maintenance costs while increasing production by 20%. They plan to do this by using their CMM system and other big data platforms to optimise maintenance [7]. This shows the confidence placed in these systems when managed and implemented correctly.

With the successful implementation of these systems, management should be able to justify the value gained from maintenance, justify equipment and resource investments, investigate and identify maintenance and HSE (Health, Safety and Environment) issues or trends, focus on the essentials and adapt to the changing organisational strategies [4], [8]. However, despite investments by large companies to implement CMM systems, there are still gaps and problems with collecting and understanding the data, especially when it comes to the maintenance function [14]. One of these problems is accurately accounting of the costs within the maintenance department. This lack of cost visibility often reinforces the negative perceptions associated with the maintenance function as a ‘necessary evil’.
1.1 Problem Statement

For some operations, costs can be managed manually. However, this case study was done for a company with a maintenance budget close to R 140 million and over 2000 maintainable pieces of equipment. This company will hereafter be referred to as Company X. It is clear that for a company of this size, it will become difficult to keep track of the various maintenance activities and costs without a CMM system. Company X uses a CMM system called Work Management, the maintenance module used in the SAP ERP system. Although it is required that all maintenance activities and costs are processed through Work Management, Company X was still unable to account for its complete maintenance expenditure through this system.

Due to the lack of maintenance expenses data, Company X was unable to get a holistic view of all its maintenance activities. It was also not possible to generate a quantifiable means to allocate resources, reduce breakdowns or manage effective expenditure of maintenance costs. The benefits of each strategic decision could therefore not be determined. If a CMM system fails to track maintenance expenditure accurately, then maintenance improvements are based on subjective decision-making. These kinds of decisions prevent continuous improvement and foster a culture of firefighting, as maintenance teams can often not keep up with demand due to the lack of proper planning.

1.2 Objectives

Given all the functionality that already exists in CMM systems, it appears that the necessary data is available to be used to generate a zero-based budget, as described in Section 2.1. Thus, the objective of this case study was to determine the potential of SAP ERP Work Management, to help plan and prioritise future work, as well as its suitability to be used as a tool to produce a maintenance zero-based budget.

1.3 Scope

The rest of this research includes background information on zero-based budgeting and the SAP ERP Work Management. This is followed by a literature survey to evaluate maintenance practices involving the use of CMM systems for budgeting, as well as their challenges and downfalls. Company X’s maintenance data, software and culture was used as a case study to investigate these aspects.

The data from Company X, used in this case study, was reduced due to the size of the maintenance function. Only the execution maintenance costs (corrective, planned and breakdown) for the FY17 figures were analysed. Project costs, maintenance support costs and engineering costs were excluded from the study so that the focus could remain on implementing a zero-based budgeting system for execution maintenance costs.

2. BACKGROUND

2.1 Zero-based budgeting

Zero-based budgeting, strictly speaking means to budget from zero. By wiping the slate clean, all expenditure can be analysed line by line. This is a tedious, costly and time-consuming process which requires specialised skills and often additional external assistance [15], [16]. The benefit of using zero-based budgeting is that it forces one to consider the changes of the operating environment and look for cost effective alternatives, like technological improvements, alternative service providers and Activity Based Costing (ABC) analysis [17]. One company realised an 11% saving in its operating budget within the first four months of a new zero-based budgeting programme [16]. This was due to increased visibility into labour costs, as well as establishing contracts for certain services.

It should be seen as a meticulous process that allows absolute visibility into all costs. This can then be used to identify unnecessary waste within organisations, while forcing a process that prioritises resources, money and effort to achieve set targets [16]. When successful, zero-based budgeting frees up unproductive costs, which can then be redirected to where most important. The process therefore challenges the cultural mind set of cutting costs, from the “do more with less” mentality to the “do the right thing with the right amount” mentality [15].

Despite the interest in zero-based budgeting and the potential benefits, it has not been recognised as a cost-effective option for many organisations. This is because zero-based budgeting is more than a cost cutting exercise. In some cases, even if done correctly, the results will show that the budget may need to be increased. This could be due to a variety of reasons including critical maintenance needs [15], [16]. In fact, zero-based budgeting is mostly used (and successful) in large private companies which have experienced rapid growth while
costs have not been controlled [15]. A full zero-based budgeting exercise is rarely required and improvements can be made without having to analyse every line item of the entire company’s costs [15]. Most companies and agencies only use zero-based budgeting for selected departments or components in their periodic review [15].

2.2 Maintenance background

When using SAP ERP Work Management to analyse maintenance work, it is important to ensure that all the necessary information is captured in the system. This will ensure the availability of data to sufficiently analyse the maintenance expenditure. If a job is completed and the data captured through Work Management, one can determine: the cost of the job, which resources were used, on which equipment maintenance was performed, the components used, the services rendered, the time to completion etc. This provides a cost visibility desired for aspects of zero based budgeting. Once this information has been stored one can easily go back and manipulate the data for the purposes required.

The SAP ERP Work Management system can be set up to capture the relevant maintenance data by giving each piece of maintainable equipment a unique number, known as a function location (see Figure 1.) and the equipment is given to a plant manager and a supervisor to maintain. This is done by linking the plant manager’s cost centre and the supervisor’s work centre (not shown) to the equipment.

![Figure 1: Typical breakdown of the function location structure showing the linkage to a maintenance cost centre.](image)

If any maintenance work is required a notification is created by the work identifier on the required function location. This notification will alert the responsible supervisor to review, plan and execute the requested work. All costs will be allocated to the manager’s cost centre. However, only additional costs over a certain threshold (i.e. external labour, services, spare parts etc.) will flow to the responsible plant manager for approval before work can commence.
Employees are forced to use the system if no work can be allocated without an automatic number generated by the SAP ERP system to issue a permit, referred to as the work order number (see Figure 2). This process was implemented to comply with the Occupational Health and Safety Act of 1993 which states that no work is to be conducted without the permission of one’s supervisor and/or a risk assessment [18]. After the work has been completed, the supervisor will finalise the work details on the system and adjust any costs as necessary. This ensures that the relevant people receive the correct payment for the work they have done. Figure 2 below shows a snapshot of a work order created to purchase and install a communication module for scales. The labour and the material costs are shown, with the work order number required to conduct the work.

All this information is stored in SAP ERP for further analysis. However, if the work is not analysed, maintenance becomes isolated from the rest of the business functions and the benefits of the ERP system are never experienced. Therefore, it is important to have a maintenance support service team that can analyse these costs. In this way maintenance becomes more automated and efficient by integrating all the other business functions, therefore ensuring continuous improvement. Figure 3 was composed to illustrate how analysis of completed maintenance work, with the integration of the other business functions (e.g. Supply, Production and Finance), can lead to the continuous improvement of the maintenance function.
3. LITERATURE REVIEW

3.1 Purpose of CMM Systems

Due to size and complexity of many organisations or companies, it is necessary to ensure that all maintenance departments run through a CMM system. CMM systems no longer need to be justified, but are deemed essentials to achieving world-class maintenance, by offering a platform for objective and quantifiable decision making [11], [3]. If implemented correctly CMM systems are able to monitor any and all transactions, enabling it to identify the source and purpose of all costs and provide a platform on which this data can be analysed for strategic focus and future improvements [3]. This objective data will help management implement and sustain new maintenance techniques and strategies, as it will help them focus on the long-term benefits of the plant instead of giving way to the short-term needs, which often result in a maintenance culture of firefighting [2].

3.2 Maintenance Prioritisation Methods

It has been stated that the best practical mechanism for controlling the overall maintenance effort would be a well-designed maintenance costing system [3]. If the costing system is set up correctly, historical data can be used to build up a budget from scratch (i.e. zero-based budgeting). As an example, a case study conducted on an alumina refinery divided the plant into small sections or process units [3]. All work performed on any of these identified units, as well as downtime hours, were captured and aggregated, using manual job cards. A process flow diagram of the entire plant was plotted and the high cost as well as high downtime areas were easily identified. Resources were dedicated to those areas to ensure that they were receiving the correct maintenance, being operated according to procedure, double checking the maintenance parameters and re-measuring the costs. After going through this process and identifying root causes, the necessary actions could be taken to reduce costs and/or increase availability [3]. This process was then repeated until all high cost or low availability areas had been studied - ensuring continuous improvement. This case study was conducted using manual job cards before the availability of CMM systems. Therefore, if a cost prioritisation process implemented manually brought so much improvement, the benefits of using an electronic capture system like a CMM system, is clear.

However, it is not feasible to control maintenance from a cost perspective only. If managements’ Key Performance Indicators (KPIs) are incentivised by short term initiatives only, it can fail to look at the long-term factors associated with maintenance [4]. In order to get the maintenance costing system right, one would need high level and long term oriented targets to monitor and analyse the maintenance effort, with lower level Performance Indicators (PIs) needed for shorter time intervals. This would bridge the suggested gap between maintenance strategy and business strategy, while allowing for quicker response time to imminent problems [2].
Another study tried to determine if any useful data could be extracted from multinational mining companies’ CMM systems using the job card text [10]. The conclusion was that, through a rule based cleansing exercise, some companies could produce useful data, while some could not. However, the effort required to manipulate the data into something useful was identified as a major roadblock. It was concluded that a system should first be set in place that can measure data quality, to ensure that only useful and correct data is being captured.

3.3 Maintenance Budgeting Techniques

Various types of budgeting techniques have also been used to try and justify maintenance expenditures and identify areas of focus. The literature shows the following common maintenance budgeting methodologies: asset replacement value budgeting, insured value budgeting, capital cost plus inflation and incremental budgeting [6], [19]. However, because maintenance typically consists of many small and relatively inexpensive purchases or transactions, in comparison to few but large and expensive orders from other company functions, the maintenance budget is normally calculated with incremental increases to the current budget [2], [3]. This method of budgeting is often used because other methods are too time consuming. This results in crude assumptions at best [3]. It gives the impression that management is more worried about the overall maintenance spend than the details of the budget, because the maintenance function is often not linked to any particular business strategy owned by upper management i.e. increase availability, safety or extended equipment life etc. [3].

3.4 Problems Surrounding CMM systems

CMM systems have a tendency to be more financial, accounting and IT orientated, as opposed to ergonomically designed, making them less user friendly to the maintenance personnel [3], [11], [14]. Therefore, many maintenance modules are either ineffective or never fully implemented - even though they contain all the maintenance functionality necessary [3]. These systems are often seen as ‘black holes’ from a maintenance perspective [11]. The users insert all the necessary data, but receive nothing (or next to nothing) in return in terms of decision support, therefore wasting their time and often giving confusing and inconsistent results [3], [5], [11].

There are many other reasons for the failures of CMM systems, or the lack of utilisation of the maintenance modules in CMM systems. The main reason is the underestimation of the time, effort and money required to train the company staff to use it [3], [12]. This suggests that, although CMM systems may be capable of performing all the necessary functions, essential input data may be omitted depending on the staff’s competency, training and motivation, often causing one to question the quality of the data [3], [4], [5], [10].

A quick look at SAP’s website (the biggest leading CMM system worldwide for ERP suppliers) shows that they are confident they can increase asset return by 10%, reduce maintenance inventory by 11% and reduce unplanned downtime by 16% in the mining sector alone - although no academic literature could be found to back this claim [20]. BHP also stated that they are aiming to reduce maintenance costs, by using their CMM system [7].

An article written by a SAP ERP consultant, however, explains that the asset returns are possible but only 10% of companies that implement the SAP ERP system ever reach this stage (see Figure 4) [21]. It is explained that each phase requires additional work. There is also a steep learning curve for system users, due to the extensive functionality of the system to move to the next phase. Due to these challenges, 70% of all organisations do not generate any benefit from the SAP ERP system, as they do not enter Phase 3 and 4, where the benefits of the system lie [21].
Therefore, if the system users are not able to turn the data into knowledge or actionable information to be analysed, then the purpose of the system fails and the CMM system turns into a glorified spreadsheet used to store equipment information \[4\], \[11\], \[12\].

3.5 Literature review summary

As can be seen, there is a lot of literature on maintenance practices, trying to find ways to improve maintenance while reducing costs \[2\], \[3\], \[6\], \[11\], \[19\]. Costs cannot be controlled if they cannot be monitored and improvements cannot be motivated if there is no reference or benchmark. For these reasons, and others, CMM systems have become a necessity for many companies. The reviewed literature also accentuated why CMM systems fail or fall short of their stated potential. It seems there is a gap in expectations between the software developers and users. This gap puts the two against each other as they both end up blaming the other for the failure of the system.

The majority of the research reviewed looked at the failure of CMM systems due to a lack of skills and knowledge by the user, with little or no proof of the practical success of the system \[3\], \[4\], \[5\], \[10\], \[12\], \[21\]. It would therefore be interesting to see if the software is in fact able to live up to its claimed potential. The reason for this case study was therefore to understand the implemented CMM system and investigate if an improvement in the usage of the CMM system could indeed lead to better cost savings.

Claims from companies like BHP that they are aiming to reduce maintenance costs by using their CMM system, does however show that these systems, if implemented and maintained correctly, may actually be able to provide better benefits than most companies are seeing \[7\], \[21\]. Additionally, there are many new companies coming into the market with add-on solutions, which will supposedly improve the system and allow for more accurate data collection. However, are all these new additions to the system necessary? Perhaps we just need to learn how the system works and use it accordingly.

4. METHOD

Formal and informal interviews were conducted with employees of Company X, as well as a case study approach to explore the potential for data collection from the SAP ERP system. The aim was to understand SAP ERP’s maintenance system (Work Management) and how it links up with SAP ERPs financial system, while using the interviews as a means to guide and assist in fully understanding SAP and exploring its full potential.

The formal interviews were limited to twelve participants - five planners and seven supervisors. The five planners and seven supervisors were chosen because they are considered the functional experts, as they use Work Management to plan and execute the maintenance work on site and because this is all the planners and
supervisors that Company X had on site. Informal interviews were held with one Principle Maintenance Specialist and two financial experts.

The formal interview questions were set out to determine how each of the participants found using the current Work Management system. Questions included: what their daily activities involved, their user limitations and if the system was changed, how would that impact their current use of the system. However, the main reason for these interviews was to determine what sort of impact any changes to the system might have on the direct stakeholders.

The informal interviews were used to ensure a good understanding of how the maintenance and financial function worked and integrated in SAP ERP. From this understanding one could ensure the correct data was extracted from the system. All the maintenance data was extracted for FY17 using the Business Improvement (BI) functionality in SAP, including 18 396 line items generated inside Work Management and 5 463 line items generated outside of Work Management.

The data that was generated through Work Management was used for analysis. This had two purposes - one, to determine any data quality issues and two, to determine if the data can be used as a means to account for costs. This information could help prioritise work based on a variety of factors (highest spend machinery, highest spend per breakdown machinery, highest spend per vendor, etc.) and can be used for benchmarking purposes. The data can then be used, not only to motivate future work and maintenance focus points, but also to reinforce the importance of having absolute cost visibility within the maintenance department.

After analysing the data, discussions were held with the maintenance and financial experts to determine the reasons for non-compliance when using the system and ways to improve the data accuracy of the system. It was then determined that SAP ERP is a suitable tool for generating a maintenance zero-based budget i.e. is it possible to obtain 100% visibility of all maintenance spend by utilising the maintenance module in SAP ERP properly.

5. RESULTS AND DISCUSSION

The total maintenance spend for FY17 was extracted from SAP ERP, totalling R 138.1 million, using the inbuilt BI functionality. The data was imported into MS Excel where it could easily be organised into a variety of ways to help prioritise work and identify data quality, behavioural and/or system issues. This was used to highlight areas that would prevent SAP ERP from being able to generate a zero-based budget. The following finding were observed:

5.1 Observation 1 - Work Management usage

The first observation from the data showed that only 47% of all maintenance expenditures were captured in Work Management (see Figure 5.). This meant that more than half of the FY17 maintenance expenses could not be properly accounted for. The rest of the expenses could only be identified through the amount captured in the General Ledger (GL) account, the vendor and the cost centre amounts were allocated to. This indicated that it was not possible to create a maintenance zero-based budget for the FY17’s maintenance expenditure as the expenses could not be linked to specific equipment. One small finding of the direct maintenance costs was that roughly 2% of these costs were spent on sundries and tools. Therefore, one can only take into account 51% of the direct maintenance costs.
5.2 Observation 2 - Reasons for bypassing Work Management

Further investigation was conducted as to why 53% (R73.2 Million) of the total maintenance budget was not being spent through Work Management. It was found that the CMM system (Work Management) worked exactly like it should. However, the maintenance personnel had found ways to bypass Work Management by spending money directly and not through the processes in place.

The reasons for the maintenance team bypassing Work Management was determined through interviews. There were two main reasons ascertained. The first was due to employees trying to bypass specific maintenance KPI’s. The second was due to monthly maintenance contracts being set up outside work management. Therefore, the lack of cost visibility (53% of maintenance spend being spent outside of Work Management) was due to behavioural issues and a lack of knowledge of how the system is supposed to work.

The investigation also showed that only some employees could bypass Work Management while others could not. From the interviews it was determined that 27% of all the maintenance cost centres were able to bypass Work Management while the rest could not. The reason for such a small percentage of the cost centres accounting for such a large portion of the budget was because those cost centres serviced the biggest plants within the company.

The reason for the inconsistency was due to the cost centre structure. Cost centres that were able to bypass Work Management were categorised differently within SAP ERP’s Finance system than those who could not. From the interviews it was determined that this difference came about when the company went through multiple changes and there were not enough people who understood the implications of these changes. The finance department therefore set up the cost structures as it suited them, but did not understand the implications it caused the maintenance department. Given that no one understood the maintenance implications these changes went unchallenged.

By changing the structure of those few maintenance cost centres that could bypass Work Management, one could force all maintenance work through the system - ensuring a greater cost visibility. From the twelve maintenance experts interviewed it was determined that ten preferred to work through Work Management and four of them had no idea how to generate orders outside of Work Management.

5.3 Observation 3 - Lack of granularity

To determine the potential of the SAP ERP Work Management system, the 47% of the maintenance budget that was captured in Work Management was analysed to determine the cost visibility. This cost could be analysed in
many different ways to provide a benchmark for any given maintenance strategy. One could look at the costs of breakdown jobs, or focus only on the highest maintenance costs and ensure that the best strategy is in place for the identified equipment, or one could consider the vendors most utilised to determine if a contract should be drawn up to ensure the most competitive prices and best service. There are many different ways to use the data that comes out of Work Management, as it is comprehensive, and what is important will be different for each company depending on their business requirements.

A Pareto cost analysis was used to breakdown the costs for each piece of equipment. This is a vertical bar chart where the costs per resource type are plotted in decreasing order from left to right [22]. Figure 6 illustrates that if Work Management was used correctly the data can be sorted easily to determine which pieces of equipment are the most expensive, therefore helping management prioritise where to focus their time.

![Figure 6: A Pareto cost analysis of total maintenance cost by equipment type.](image)

Figure 7 gives a breakdown of the costs shown in Figure 6. Although Figure 7 only shows the costs of the overall labour, services and materials, the costs can easily be further analysed by resource type (mechanical, electrical or instrumentation), vendor and maintenance criticality (breakdown, planned corrective and planned scheduled) etc. Once management decided where to focus, that specific equipment (or vendor, trade, etc.) could further be analysed to understand the intricacies of that focus area.

![Figure 7: A breakdown of the maintenance cost analysis by equipment type into labour, materials and services costs.](image)
The Pareto analysis was conducted for the entire expenditure captured in Work Management to determine if there were any costs that could not be linked to a specific equipment. Figure 6, and Figure 7, indicated that, unfortunately, the data from Work Management also had further limited cost visibility. In particular, the Area* resource type indicated that 25% of the captured costs have not been allocated to a specific equipment. This reduced the total visible maintenance budget down, from 47%, to 35% (R 48.7 million).

Again, the reasons for job information in Work Management being allocated to an area as opposed to specific equipment are many, and were determined by the interviews. The primary reason was that no one really understood why allocating jobs to the specific equipment was important. The allocation to a specific equipment is done in the work request heading field. This is a free text field (as was seen in Figure 2.). Unless this heading was non-descriptive or unclear, the supervisors did not bother to change it.

Unlike changing the cost centre structures, which force employees to use the Work Management system, it is recommended that continuous monitoring of cost allocation be implemented and supplemented with ongoing training for all supervisors and planners to ensure that the maximum cost visibility can be obtained from the system. One way of doing this would be to set up a KPI which would monitor the cost of jobs that are not allocated to a specific equipment. This value could for example be targeted to be below 5 - 10% on a monthly basis. By doing this, one can then at least be confident that the captured data will be 90 - 95% reliable.

6. CONCLUSION AND RECOMMENDATIONS

The findings of this study reinforced what has been reported in the literature. The primary conclusions are:

- There is a lack of understanding of the CMM system, which resulted in data being incorrectly inserted or captured [4], [11], [12].
- The maintenance cost centre system was not set up correctly, which has resulted in the system being misused [11], [14].
- KPIs have been set up without the supervisors’ agreement, this led to employees finding ways to bypass the system [8].
- There is a lack of supervision and leadership driving the correct use of the system, therefore it has deteriorated from its intended purpose. Even if employees capture all the required data correctly there was no reporting in place. This gave the impression that management was not interested in their efforts and not concerned about continuous improvement [3], [4], [8], [9], [11], [12].
- No maintenance efforts could be justified through the use of the SAP ERP Work Management system as progress cannot be tracked or benchmarked from previous trends [4], [8].

The purpose of this case study was to determine the suitability of the SAP ERP Work Management system to generate a zero-based budget. It was postulated that if all costs could be traced back to a specific type of equipment, then one could claim to be able to generate a zero-based budget.

The results showed that in the FY17, Company X spent R 138.1 million on maintenance, with 53% not captured in the system. The reasons for bypassing Work Management varied, but the primary motive was that certain KPIs could not be tracked and therefore was not reported on. It was also discovered that certain cost centres could bypass the SAP ERP system due to a lack of knowledge and skills when changes in restructuring were implemented.

Of the 47% that was captured within the Work Management system, only 25% was correctly linked to a specific equipment instead of an area. This lack of granularity effectively meant that visibility into the maintenance expenditure was only accountable for 35.25% (R 48.7 million) of total expenditures.

It therefore seemed that the SAP ERP Work Management system was not suitable to generate a zero-based budget as only 35.25% of the maintenance expenditure was accountable to a specific equipment. However, by implementing the recommendations mentioned in the discussion one could increase the maintenance cost visibility from 35.25% to 88%. This can be done by the following recommendations:

- Implementing cost KPI’s and providing training and ongoing supervision to all personnel using the CMM system. This will ensure the majority of the maintenance costs will be visible through the BI functionality in SAP ERP. Should a compliance of 90% be achieved then the cost visibility could increase from 35.25% to 42.3% (90% of the 47% visible costs).
- By restructuring the maintenance cost centres that can bypass the Work Management system, one could force all maintenance work to be completed through the system. This would increase the maintenance cost
visibly by retrieving the 45.9% (90% of the 51% spent outside of Work Management) of costs that have bypassed the Work Management system. This change would increase the maintenance cost visibility from 42.3% to 88.2%.

The benefits of implementing these recommendations are threefold

1) It can be used to provide quantitative data to determine where to focus resources, so as to reduce maintenance costs and production downtime. This can be filtered by work type, equipment type, work trade or vendors;
2) It can then be used as a benchmarking tool to track progress on any strategy that has been implemented; and
3) It will automatically put the company on a path to becoming compliant with ISO 55000 standard, as a greater percentage of the maintenance costs will be able to be monitored and therefore be used to assist in quantitative decision making.

It can therefore be concluded that SAP ERP is a suitable tool that can be used to generate a zero-based budget, provided that it is correctly implemented and maintained.

A final recommendation should be made to repeat the analysis two years from now to determine if the implemented recommendations provided the desired output by improving the system’s ability to account for the majority of the maintenance spend.

7. REFERENCES


