

ASOCSA 2010-18

The Application of Facilities Maintenance within the public sector: An exploratory study

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ABSTRACT

Purpose: The exploratory study investigates the implementation of maintenance practices with regard to the need, classification, planning, implementation, impact and cost estimating by property practitioners.

Design/methodology/approach: A literature review identified key concepts to be defined in terms of maintenance. Data was gathered through visual inspections and structured interviews with a sample of property practitioners regarding current maintenance practices adopted for their facilities. Outputs were subsequently analysed and interpreted.

Findings: The key finding revealed that maintenance is implemented predominately on a corrective/emergency basis. This in turn has led to inaccurate maintenance estimates being projected by property practitioners resulting in the overrunning of maintenance budgets and premature replacement of building components.

Research limitations/implications: The study was limited to two public sector organisations in the Eastern Cape province, managing facilities covering in excess of 100 000m² of office accommodation, warehousing, clinics, museums, libraries, houses and community halls.

Practical implication: The findings provide a holistic overview of the status of maintenance and the impact of unstructured maintenance on facilities within the public sector.

Originality/Value: The data retrieved from respondents can be compared against best practice as defined in the various literature sources on maintenance. This can inform the shortcomings of current maintenance practices and the requirements to develop a cost effective maintenance strategy. Hence collation of the data analysed can be further developed into a structured Maintenance Management Framework for the public sector.

Key words: Facilities Management, Maintenance, Maintenance Management Framework, Maintenance Cost Estimating.

1. INTRODUCTION

Infrastructure is a means to an end (The Department of Public Works, 2006: 9). Maintaining this infrastructure is therefore an essential imperative for the country. Maintenance is thus an essential priority. Chanter and Swallow (2007:128) state that maintenance work will be inevitable, as it is in its nature for material to deteriorate over time with usage and exposure to the elements of climate. Moubray (1997:6-7) views maintenance as preserving something which stems from the word 'maintain' which is defined as a cause to continue or keep in an existing state. Best, Valence, Langston (2003:177) state clearly that maintenance is a significant activity. Best et al., (2003:177) continue by stating that an important competency that provides value adding to built facilities is the coordination of operations and maintenance management. Cloete (2002: 40) goes as far as stating that maintenance management guarantees that capital investments are protected and ensures acceptable working environment for users.

Cloete (2001: 14) also adds that it is unfortunate that at times maintenance is accorded little or no merit in addition to this Martin (2006: 199) adds that failure to maintain property often results in large and unbudgeted expenditure occurring. It is therefore imperative for the property practitioner to embrace maintenance as a global concept and to apply it as efficiently and effectively within their working environment. In order to implement good maintenance, the property practitioner will need to understand the various components of a building structure, its functionality and with regard to maintenance the need, classification, planning, implementation, impact and cost estimating. Maintenance can therefore be seen as an important management component to any property practitioner as it forms the corner stone of the life span of any property.

This exploratory study will investigate the implementation of maintenance practices with regard to the need, classification, planning, implementation, impact and cost estimating by property practitioners.

2. FACILITIES MAINTENANCE

2.1 The Need for Building Maintenance

Various authors have presented cases for the need for structured maintenance among these are Martin (2006:199) who states that if routine maintenance is neglected or deferred, defects are aggravated and items that could have been dealt with at a relative low cost can deteriorate and create more costly and serious repairs. In line with this the Department of Public Works (2006: 9) states that the cost of not maintaining infrastructure is no longer affordable to South Africa. They continue by stating that in some sectors it is negating the impact of the infrastructure development undertaken to date and planned for the future. The above statement clearly indicates the importance of maintenance of infrastructure and built facilities, as described by the Department of Public Works (2006: 9) maintenance of infrastructure lends itself towards ensuring an adequate quality of life and supports the economy of the country.

2.2 Classification of Maintenance

Chanter and Swallow (2007: 134) and Cloete (2001: 10-12) state that maintenance can be classified as routine or remedial, or planned and unplanned. Chanter and Swallow (2007: 134) and Cloete (2001: 10-12) refer to the British Standards Institute's definition of planned maintenance which is

described as maintenance organised and carried out with forethought, control and the use of records, to a predetermined plan.

Cloete (2001:10-12) further subdivides planned maintenance into two main sub categories being planned preventative maintenance which is work directed to the prevention of failure of a facility in order to ensure continued operation and planned corrective maintenance which is work undertaken after failure has occurred. Cloete (2001: 12) makes reference to Seely (1987: 2) who further sub divides planned preventative maintenance into scheduled and condition based maintenance. The more common practice which is scheduled maintenance is defined in Chanter and Swallow (2007: 134) as preventative maintenance carried out to a predetermined interval of time, number of operations, mileage, etc. Chanter and Swallow (2007: 134) make reference to the British Standards Institutes definition of unplanned maintenance which is described as ad-hoc maintenance carried out to no predetermined plan. Cloete (2001: 10-12) refers to unplanned maintenance as work necessitated by unforeseen breakdowns or damage due to external forces. Suttel (2006) states that ideally, the ratio should be 70% planned preventive maintenance and 30% planned corrective maintenance.

Another classification of maintenance as used in practice by property practitioners is deferred maintenance. Deferred maintenance is the practice of postponing maintenance activities such as repairs on a facility in order to save costs, meet budget funding levels, or realign available budget monies. The failure to perform needed repairs could lead to asset deterioration and ultimately asset impairment. Generally, a policy of continued deferred maintenance may result in higher costs, asset failure, and in some cases, health and safety implications. Table 1 below provides an overview of the classification of maintenance as defined by the (Department of Public Works, 2007).

MAINTENANCE WORK CLASSIFICATION And Sub-Categories		
Category	Sub-Category	Definition
Planned Maintenance	Preventative Service Maintenance	The actions performed to prevent failure by providing systematic inspection and monitoring to detect and prevent incipient deterioration or failure and includes testing to confirm correct operation.
	Condition-based Maintenance	Corrective maintenance work performed, as a result of significant deterioration or failure, to restore an asset to its required condition standard. The work may be programmed as a result of Condition Assessments or as random additions to the program based on priority.
	Statutory Maintenance	Both Preventative Service Maintenance and Condition-based Maintenance may contain elements of Statutory Maintenance which is defined as actions performed to provide the minimum level of maintenance to meet legal and other mandatory requirements contained in Commonwealth and State Regulations, Australian Standards and Codes of Practice.
Unplanned Maintenance	Routine & Breakdown Maintenance Incident Maintenance	Unplanned and reactive maintenance actions performed to restore an asset to operational condition, as a result of an unforeseen failure. Unplanned maintenance actions to restore an asset to an operational or safe condition as a result of property damage resulting from storms, fire, forced entry and vandal damage.
	Incident Maintenance	Unplanned maintenance actions to restore an asset to an operational or safe condition as a result of property damage resulting from storms, fire, forced entry and vandal damage.

Table1: Maintenance classification

Source: Maintenance Management Framework, Department of Public Works, Queensland, Australia.

2.3 The Execution of Maintenance

In executing maintenance Cloete (2001: 30) states that inspection cycles are a basic necessity for planned maintenance. Mc Dulling (2008) underlines the importance of condition based assessments which is defined as predetermined inspections to analyse asset performance and maintenance requirements aligned with this is maintenance cost estimating, maintenance budgeting, managing of maintenance data and building up historical information as presented in Means (1997). Mc Dulling (2008) alludes to an important point of consideration for property practitioners which is prioritising maintenance work. From the above it is apparent that planning is key in executing maintenance. With regard to maintenance planning Buys (1997: 6) describes the planning as a process which sets out realistic action plans to anticipate, regular repair and sustained enhancement in order to prolong economically useful lives of buildings and to ensure the desirability in terms of market value.

Chanter and Swallow (2007: 255) state that of all the consideration relating to the execution of building maintenance the most important strategic issue is that of who actually does the work. Chanter and Swallow (2007: 255- 283) explain the process behind the execution of building maintenance, although based on British conditions, they identify generic concepts to consider these are the decision whether to employ direct labour or outsourced method of performing maintenance, secondly the agreements between client and service providers must be sound and clear, thirdly performance criteria must be established and agreed upon. In executing maintenance the property practitioners needs to understand the basic need of maintenance which is to re-instate physical condition of an asset to a specified standard, and to prevent further deterioration or failure. Means (1997: 402) states that much of the maintenance and repair work with regard to office buildings is predictable and that landlords use a combination of in house staff and outsourced vendors to execute maintenance.

2.4 Maintenance Estimating

Means (1997: 231- 232) state that maintenance estimating is the most common type of estimate performed for a property and in addition cost estimates play an important role in evaluating the feasibility or desirability of major modifications or improvements to a property. The process of conducting maintenance estimates begins with understanding all the costs incurred, these must be categorised as direct and indirect cost. The property practitioner must create their own data base of cost, this includes understanding the various cost involved in maintenance such as material cost, labour cost, market related profit percentages charged by contractors. Added to this must be the understanding of productivity, the property practitioner must understand how long maintenance of the various components will take and how often maintenance or repair will be required.

Mc Dulling (2008) has identified key contributors to high maintenance cost, among these are the lack of accurate and reliable information on the current condition and maintenance requirements of an element and inaccurate budgeting or under funding for maintenance work. The Department of Public Works (2007: 3) states that when developing a maintenance budget due consideration must be given to existing assets to be maintained, new assets coming in to the facility, existing assets to be upgraded, refurbished, quality of material and components in a facility and the required level of planned maintenance. In the process of estimating maintenance cost the property practitioner needs to understand the concepts of value engineering versus capital improvement and reserve funds Means (1997: 288) defines value

engineering as being a rational method of making cost-efficient choices between alternatives when upgrading, maintaining, and making system replacements. A capital improvement is normally a short-range plan, usually four to six years, which identifies capital projects and equipment that need to be purchased, in line with this will be a schedule that identifies options for financing the improvements. According to Means (1997: 309) all facilities require some type of capital plan or reserve fund, Components of the facility that are exposed to weather, climate and general wear and tear have a higher degree of need for maintenance and repair than structural elements. Means (1997: 209) continues to add that the perfect reserves set aside funds equal to the rate of attrition of the components and schedule component replacement just prior to the onset of either functional or economic obsolescence.

2.5 Benchmarking and Maintenance Outsourcing

Benchmarking in maintenance is the identification of industry best practices that lead to superior performance, where data from individual facilities are measured against those from other comparable ones. Reichelt (2005: 179) defines benchmarking as the continuous process to measure products, services and practices against the strongest competitor or the company which is considered an industry leader. Dunn (1999:online) adds that benchmarking has become a common practice in all kinds of businesses. Best et al. (2003: 378) states that there is a world trend towards outsourcing specialist non-core services. Outsourcing is changing the way in which organisations restructure and procure services. Means (1997: 39) state that it is important to use a structured approach when evaluating the potential outsourcing of some or all of the facility management and maintenance functions. Atkin and Brooks (2009: 52) state that the decision to outsource has to be made both rationally and objectively. Maintenance outsourcing is an aspect that all property practitioners will be faced with; it plays a key role in ensuring the efficient operation of a facility as non-core functions that do not impact on the organisations competitive advantage can be outsourced. Maintenance outsourcing can be best utilised within facilities management by the property practitioner identifying maintenance activities that can be outsourced.

3. EMPIRICAL STUDY

3.1 Sample overview and survey methodology

The primary source of conducting the research was through the use of structures interviews with property practitioners. This included visual inspections of the facilities and access to maintenance records. The study was limited to two public sector organisations in the Eastern Cape province managing facilities covering in excess of 100 000m² of office accommodation, warehousing, clinics, museums, libraries, houses and community halls. The reason for only selecting public sector organisations is that they are the largest property owners in South Africa and hence play a major role in the preservation and utilisation of infrastructure.

Organisation one:

Organisation: South African Revenue Services (SARS), (Eastern Cape Province)
 Practitioner: Mr Jude Sam
 Position: Regional Facilities Manager
 No of facilities: 11 (38 000 m²)
 Type of facilities: Office accommodation and warehousing

Organisation two:

Organisation: Nelson Mandela Metropolitan Municipality (NMMM), (Eastern Cape Province)
 Practitioner: Mr Patrick Keble
 Position: Director of Facilities Management
 No of facilities: 289 (65 000 m²)
 Type of facilities: Office accommodation, libraries, clinics, museums, houses and community halls.

3.2 Classification of maintenance

Table 2: Interview questions for classification of maintenance

Question one	Does your organisation have a structured maintenance management framework covering all aspects of your maintenance requirements and implementation.
Question two	How would you categorise the type of maintenance implemented by your organisation, both in terms of classification and percentage allocation.

3.3 Executing maintenance

Table 3: Interview questions for the execution of maintenance

Question one	How often do you conduct inspections/condition monitoring of your facilities to assess the impact of climate, general wear and tear from usage.
Question two	How often is your maintenance planning/policy or procedures reviewed and how do you prioritise maintenance activities.
Question three	Is your maintenance work outsourced or conducted internally and what is the percentage allocation.
Question five	Do you make use of Building Management Software such as Archibus, Genesis etc.
Question five	Is your maintenance activities categorised per building component and which components require more attention and utilise most of the budget. Do you prioritise your buildings according to service provide and the rate of usage.
Question six	How are you addressing any shortcomings in your maintenance strategy based on the maintenance literature provided.
Question seven	How much of the required maintenance is deferred to the next financial year (%)

3.4 Maintenance Estimating

Table 4: Interview questions for maintenance estimating

Question one	Does maintenance budgets receive the necessary attention by top management structures, and are they based on condition assessments of all facilities.
Question two	Do you meet or over exceed your annual maintenance budgets as approved by top management and by what percentage

Question three	Have you created a database or information system to record all maintenance work, their cost in order to build up historical data.
Question four	How often do you conduct value engineering exercises in order to determine repair and replacement cost of the various building components.
Question five	Does your organisation set aside reserve funds for maintenance activities and future replacement cost of the building components.

3.5 Benchmarking and Maintenance Outsourcing

Table 5: Interview questions for maintenance benchmarking and outsourcing.

Question one	Does your organisation institute benchmarking practices by comparing the maintenance requirements of the various facilities you manage
Question two	Do you have standing Service Level Agreements (SLA) with service providers for your maintenance needs both scheduled and planned
Question three	Are or will your SLA's be incentivised or performance based

4. FINDINGS

The study revealed that the following findings regarding maintenance as practiced by the two public sector organisations:

4.1 Classification of maintenance

- No structured Maintenance Management Framework or plan is in place despite both entities having dedicated maintenance departments.
- Maintenance is carried out predominately on a corrective basis. The percentage allocations for both entities are 65% corrective and 35% preventative.
- There are no planned preventative maintenance plans in place.
- Only certain building components such as HVAC and lifts were on a scheduled maintenance programme. These are also components which receive the most priority regarding maintenance budgets and implementation.

4.2 Executing maintenance

- Both organisations have recently implemented annual condition based assessments in order to determine the specific maintenance requirements. However no record exists to suggest that the maintenance requirements identified are implemented.
- Only SARS have implemented a general weekly inspection to determine any minor maintenance requirements. This is an area neglected by the NMMM.
- Maintenance strategies are reviewed annually by both organisations.
- On average 70% of maintenance work implemented is outsourced.
- Both organisations make use of Building Management Software. SARS have implemented a system that is rarely used and the NMMM have implemented a system that does not provide all the functionality required to manage their daily maintenance.
- Most maintenance is related to HVAC components.
- Shortcoming identified in their maintenance strategies are not corrected immediately due to the bureaucratic management systems in place.

- Up to 15% of all identified maintenance is deferred to the next financial year.

4.3 Maintenance estimating

- The property practitioners due to various reasons fail to estimate maintenance related cost accurately resulting in the overrunning of maintenance budgets and premature replacement of building components.
- A further deterrent for both organisations is that maintenance budgets requested annually are on average cut by 35% by senior management.
- No maintenance history is built up for assets resulting in previous maintenance cost not being recorded and used as reference to prepare for maintenance budgets.
- Value engineering exercises are implemented every 3 years.
- No reserve funds are set aside to cater for future replacement costs of building components.

4.4 Benchmarking and maintenance outsourcing

- Benchmarking is new to both organisations will implementation only scheduled for 2010 and onwards.
- The NMMM makes use SLA's to procure the service of service providers, however with these are not target of performance driven, nor are they incentivised. SARS do not make use of SLA's, opting for conventional open tenders thus delaying any emergency maintenance requirements.

5. RECOMMENDATIONS

It is recommended that public sector entities;

- Revisit their current maintenance practices and evaluate the merits there of. The literature on maintenance as indicated in the study can be utilised as a basis for developing a revised maintenance management framework.
- Key areas to be reviewed are implementing preventative maintenance strategies, improving their maintenance cost estimating and budgeting processes and building up details records of maintenance history on their facilities.

6. CONCLUSION

It can be concluded that although the practitioners interviewed and there organisations do not fully implement maintenance practices as prescribed in the literature, there is an attempt by them to move from the predominately reactive approach to a proactive approach and align themselves in accordance with the literature presented.

Both interviewees demonstrate that they understand the need, classification, planning, implementation, impact and cost estimating with regard to maintenance.

Although key factors detracting from this are:

- The failure to classify maintenance requirements accordingly.
- Key errors in areas such as estimating maintenance cost and not creating an asset history regarding performance and cost are evident.
- Senior management structures who are seen as hampering progress towards generating a fully fledged maintenance programme as in both studies they influence the budgets in a negative manner affecting both back log and planned maintenance.

The findings above support the need for public sector entities to implement a more structured Maintenance Management Framework both from a cost perspective and the preservation of state assets.

REFERENCE

- Atkin, B., Brooks, A. 2009. *Total Facilities Management*. 3rd ed. Wiley Blackwell.
- Australia. Department of Public Works. 2007. *Maintenance Management Framework. Building Maintenance Budget*. [Online]. Available from: <http://www.build.qld.gov.au/amps/amps04.asp>. [Accessed: 25 April 2009]
- Best, R., Valence, G., Langston, C. 2003. *Workplace Strategies and facilities management, building in value*. Butterworth Heinemann.
- Buys, F. 1997. *The urgency of building maintenance management in South Africa, with specific reference to low cost housing*. Paper presented at the RICS 1997 COBRA conference. [Online]. Available from: www.rics.org/NR/rdonlyres/4363A464-064B-44619C45.../0/urgency_of_building_maintenance_management_19970101.pdf. [Accessed: 14 May 2009]
- Chanter, B., Swallow, P. 2007. *Building Maintenance Management*. 2nd ed. Blackwell Publishing.
- Cloete, C.E. 2001. *Principles of Property Maintenance*. South African Property Education Trust 2nd ed. Business Print Centre, Pretoria.
- Cloete, C.E. 2002. *Introduction to Facilities Management*. South African Property Education Trust. Business Print Centre, Pretoria.
- Dunn, R. 1999. *Basic guide to maintenance benchmarking*. Plant Engineering. [online]. Available from <http://www.plantengineering.com/article/CA119641.html>. [Accessed 30 March 2009].
- Martin, D. 2006. *The A-Z of Facilities and Property Management*. Thorogood.
- Means (RS Means). 1997. *Cost Planning and Estimating for Facilities Maintenance*. R.S Means Company Inc. Reed Construction Data.
- Mc Dulling, J. 2008. *Property Maintenance*. Presentation presented on the Facilities Management Programme. University of the Free State. March 2008. Johannesburg.
- Moubray, J. 1997. *Reliability Centred Maintenance*. 2nd ed. Butterworth Heinemann.
- Reichelt, B. 2005. *Benchmarking in Facilities Management*. University of Applied Sciences. Leipzig, Germany.
- South Africa. Department of Public Works. 2006. *National Infrastructure Maintenance Strategy; In support of ASGISA and government growth objectives*. [Online]. Available from: <http://www.publicworks.gov.za> . [Accessed: 22 April 2009].
- Suttel, R. 2006. *Preventive HVAC Maintenance is a Good Investment*. Buildings. [Online]. Available from: <http://www.buildings.com/ArticleDetails/tabid/3321/ArticleID/3183/Default.aspx>. [Accessed: 28 April 2009]