Analysis of facilities history: a tool for effective Facilities Management

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Abstract

The analysis of the information available in the operational history of each facility in the portfolio of facilities managers provides useful information on the quality and functional state of the facilities; contributes to the education of the end-users, assists in the development of objective forward planning and realistic budget allocated to definite line items to guide senior management for objective decision making. Such analysis identifies what is required to ensure that the facility is available to meet the needs of the customer and highlights the potential risks of sudden breakdown resulting from the neglect of deferred maintenance. Furthermore, detailed facility analysis provides guidance for the management of renovation, modification, change of use, and conservation of heritage facility.

The principle of document analysis was adopted in reviewing the periodic operational report of the facilities Management unit of two Higher Education institutions in South Africa. The findings revealed that though the unit produces regular monthly and annual reports, no analysis of the report is available. Therefore, the programmed renovation exercises are based largely on visual assessments and use of good professional judgement. Recommendations were made on how to conduct asset analysis and use it as tool for developing operational budget, renovation and rehabilitation plans.

Keywords: End-users, Facility analysis, Forward planning, Objective decision making, Operational budget.

1.0 Introduction

Facilities Management (FM) unit in many Higher Education (HE) institutions have made remarkable progress in effective communication with the relevant stakeholders during capital developments but not so well during operation and maintenance. The reasons for the gap include the fact that capital development is intensive requiring the input from different stakeholders at different times from inception to completion of the project; the financial out lay is huge as well as the component parts are complex and require progressive explanation,

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continuous flow of information and education of the stakeholders, so that the resulting edifice will 'fit for purpose' for the costumer (Campbell and Finch, 2004).

However, during operation and maintenance phase, FM unit play more reactive than proactive roles, since the service demands follows an undulating curve of high and low peaks but require a steady flow of increasing financial resources. Research shows that in the life cycle of a typical facility, the ratio of the construction cost to that of operation and maintenance (including capital renewal) is about 1:5 (Lavy, 2008). In HE institutions, the support facilities are meant to enhance the performance of the core functions of teaching and research, facilitate the achievement of the objectives of the institution and promote its image among the community of similar institutions. The standard, quality, aesthetics and functional state of the physical facilities and the environment within and around a HE institution contributes to its being attractive to prospective students and staff (Lateef, *et al*, 2010), and affects the quality of its teaching and research which are the fundamental considerations in the discussion about "excellence in a university" (Taylor and Braddock, 2007, p. 246). Over a period of time, due to wear and tear, the support facilities are subject to different levels of distress that affects their functionality. The onus lie with the FM operatives to inform and educate the costumers on the functional state of the facilities and their availability for the performance of the core function of the institution; this they can do through periodic reports and objective analysis of the information in the operational history of each facility. The analysis of facilities history should progress from the identification of distress recorded against each facility and cost incurred, classify the distress recorded according to the constituent component-sections, determine the frequency of distress, the Component-section Condition Index CSCI (Uzarski and Grussing, 2008), Component Index (CI) and Facility Condition Index (FCI) (Lavy, 2008). These information provides the FM operatives with the appropriate tool for effective communication, education of the customer, forward planning and pro-active solutions to the facilities need of the customers.

This paper is an abridged form of two separate researches into the operation of FM units in two HE institutions in South Africa. They will be referred to in generic terms as institution A and B respectively. In this paper, emphasis will be on the quality content of the periodic reports (for operation and maintenance rather than capital developments) from the FM unit and suggest improvements in the current format so that the documents can serve as a tool for effective communication with costumers.

2.0 Literature review

The introduction of information communication technology (ICT) into FM has made documentation and archiving easier, but that is yet to translate into objective analysis of the information store in the data base of the respective facilities. This section will provide synthesis of literature focusing on documentation of facility's operational history, analysis of the historical information and its use in forward planning, budgeting and the management of change of use.

2.1 Documentation of facilities history.

The historical documents of a typical facility include detailed as-built drawings, manuals, repairs, renovations, and alterations, accumulated in the process of developing and operating the facility. The documentation of authentic facilities history should commence from developing “as-built documents” (ABD). ABD is the documentation of all modification, alteration and changes in the specification in the original ‘as-designed contract drawings’. The final as-built documents made available at the project commissioning and handing over exercise is helpful for the preparation of the “facilities operation documents” (FOD) (Erdener and Gruenwald, 1997). In the event that existing buildings or facilities do not have authentic ‘as-built’ information, it is possible to develop a near exact document by using either manual or digital methods (Gupta, 2005; Murphy *et al*, 2009). The FOD should be comprehensive and dynamic reflecting the progressive situations of the facility which will continuously serve as input for producing new documentation output (Clayton *et al*., 1998).

A typical FM unit spends considerable time in the operation and maintenance of the support facilities suitable for the performance of the core functions of the organization, but pays little attention to documentation, reporting, or analysis of the information on the data base of each facility in its portfolio. However, Carder (1995) suggests that FM operatives should present periodic reports in a simple format, so that the customers can relate with the state of the facilities in their portfolio, identify possible constraints to the effective performance of the core function of the organisation and the report should demonstrate prudent financial management. The analysis of facility operational history is an extension of periodic report through a long time period with the objectives of determining the functional state of the whole facility as well as the component parts.

2.2 Analysis of facilities history

The majority of FM units have facilities history stored in their computer or file (Lavy, 2008), for many years, without objective analysis to determine the functional state of the facility or its components. Lavy (2008) demonstrates this by analysing the facility history found in the database for an engineering building of Texas A&M University; the building provides accommodation for “an engineering department and a science department” (Lavy, 2008, p. 307). Though the FM unit is resident in the faculty, they were pre-occupied with reactive response aimed at keeping the facilities functioning, that includes the regular repairs on the “HVAC system that continues to break and leak” (Lavy, 2008, p. 308). The analysis highlighted the negative impacts of the faulty HVAC system on the quality and functional state of the building through the computation of the Facilities Condition Index (FCI) and Component Index (CI).

The FCI is “defined as the ratio of estimated cost of remedying any current deficiencies (CD) in a facility to estimated current replacement value (CRV) of the facility” (Reindorp and Fu, 2011, p. 109). This involves the computation of the total cost of repairs (including capital renewal) and the cost of replacement of the component or the facility. The value of FCI varies from 0 (for brand new facility) to 100 (where each component of the facility should be replaced) (Lavy, 2008; Uzarski and Grussing, 2008). The FCI presents a tool for assessing the quality state of

the facility and the financial implications of maintaining or improving on the quality state of the facility, “to prevent expansion of deferred maintenance backlog (Briselden and Cain, 2001, p.34). Furthermore, the analysis should progress from the macro level of the whole facility to the individual components that make up the facility, by measuring the ‘component-section condition index (CSCI) and the component index (CI). The CSCI can be computed by analyzing the distress information in the data base for each component, observe the frequency and magnitude of distress over time to determine the ability of the component to “perform properly as it degrades from use, exposure, and/or other mechanisms” (Uzarski and Grussing, 2008, p. 150). The CI is computed by dividing the remaining service life of the component by the design life, and the factor ranges from 0 to 100 (Lavy, 2008). A high CI factor is an indication that the component is closer to the end of its design life. While FCI indicates the quality of the whole facility, the CI clearly shows which component is close to or have exceeded its design life. Each component is susceptible to frequent breakdown when it is closer to its design life or experiences sudden collapse, without warning signs, when the component has exceeded its design life (Lavy, 2008; Uzarski and Grussing, 2008). Comprehensive analysis of both operational history and dedicated facilities condition survey are useful tool for effective decision making in regards to forward planning, resource allocation, renovation, rehabilitation and change of use.

2.3 Facilities analysis and management of change of use

The requests for alteration, modification or extension in the form of refurbishment or up-grade of structures are common experiences of FM operators in HE institutions. The exercise will be difficult if the facility does not have authentic ABD and FOD information. Extended analysis of the periodic information in the data base of each facility in the portfolio of the facilities manager provides detailed and objective information on the quality state of the facility, the fabric and component parts. The analysis also provides the financial implications of rehabilitations or executing change of use (Lavy, 2008). The content of specific facility assessment is useful for objective decision making; it helped a suburban university (Hayes, 2006) to know that a historic building they intended to rehabilitate and increase the height could not support another floor and if executed, it would have been at great cost. In another institution, the officials needed to know if a 1960s science building could accommodate a program expansion. The facility assessment and its analysis suggested that, “the best option was to build a new structure” (Hayes, 2006, p. 311). The comprehensive analysis of periodic report or dedicated survey should be communicated to the relevant stakeholders of the institution as a guide for objective and timely “decision making, planning and budgeting, and ultimately shift administrators from a reactive to a proactive standpoint” (Hayes, 2006, p. 312). Furthermore, “whether a campus is urban, suburban or rural, it needs periodic assessment, which puts campus planning into perspective and assists in the development of a multi-year budgeting tool” (Hayes, 2006, p. 310).

Though literature supports the importance of analyzing the historical information in the database of each facility in the FM portfolio, for informed decision making process, the common practice is that the majority of FM units do not pay adequate attention to the analysis of facilities history (Lavy, 2008); thus FM units ends up providing reactive instead of proactive services to its customers. This gap can be bridged through objective review of the quality of periodic reports

from typical FM unit and make suggestions for their improvements; which is the focus of this research.

3.0 Research Methodology

The use of case study as qualitative research method is well developed in literature. The case study method of research seeks to "explore and investigate contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships" (Zainal, 2007, p. 1). It is seen and employed as a research strategy useful when holistic, in-depth investigation is needed (Green and Thorogood, 2009; Lateef *et al,* 2010).

The data for the research being reported were collected using the combined instrument of semi-structured questionnaire complemented with interview and detailed review of the quality content of the periodic reports on operation and maintenance, from two FM units of HE institutions and compared with best practice exemplified in literature. The X-ray underscore the importance of comprehensive facility analysis as a tool that enable the FM unit to educate its customers and develop functional forward planning programmes to assist senior management for timely decision making.

4.0 The findings and discussions

Facilities Management (FM) functions require effective management of the relationships between the people, workplace interface, technology and services to ensure harmonious relationship between the service provider (FM) and those responsible for the execution of the core functions of the organization (costumers), in order to facilitate the achievement of the objectives of the organization (Carder, 1995, 1997). In order to achieve improved customers' satisfaction, FM operators need to be proactive, use the soft skill of effective communication in the form of costumer friendly periodic reports and detailed analysis as a tool of information and education of the costumer about the functional state of the facilities available for the performance of the core functions of the organization. The information flow should be seamless throughout the life cycle of the support facilities.

4.1 Project closeout, handing over and end-users' orientation

Capital development exercise, in both institution, follows similar approach in the development process which include the involvement of end-users from the inception of the project, translation of project briefs into the development of project execution documents, incorporating of the end-users into the project execution team (known as Technical Execution Team' (TET)). The active involvement of stakeholders in capital developments follows best practice, where "line function"

departments work closely with project personnel from the earliest part of the project to completion phases (Heywood and Smith, 2006). Representatives of the stakeholders that participated at the planning stage should translate into the execution governance for effective implementation (Pemsel *et al*, 2010). Furthermore, though the reporting structure for capital projects are highly technical, the customers can identify with it somehow because they see the progressions during execution and the FM operatives are readily available to explain the details, where necessary. The same cannot be said of operation and maintenance reports.

4.2 Operation and maintenance report

The FM unit in both institutions produces monthly and annual reports on operation and maintenance activities. The reports are too technical, economical in details, easily understood by those who prepared it and somehow to those at the strategic level of leadership, because the report is presented and explained to them. Otherwise, the reports are not very helpful in educating or communicating with the leaders at the tactical levels. For example, in the annual report for 2012, from institution B, one of the campus director reports:

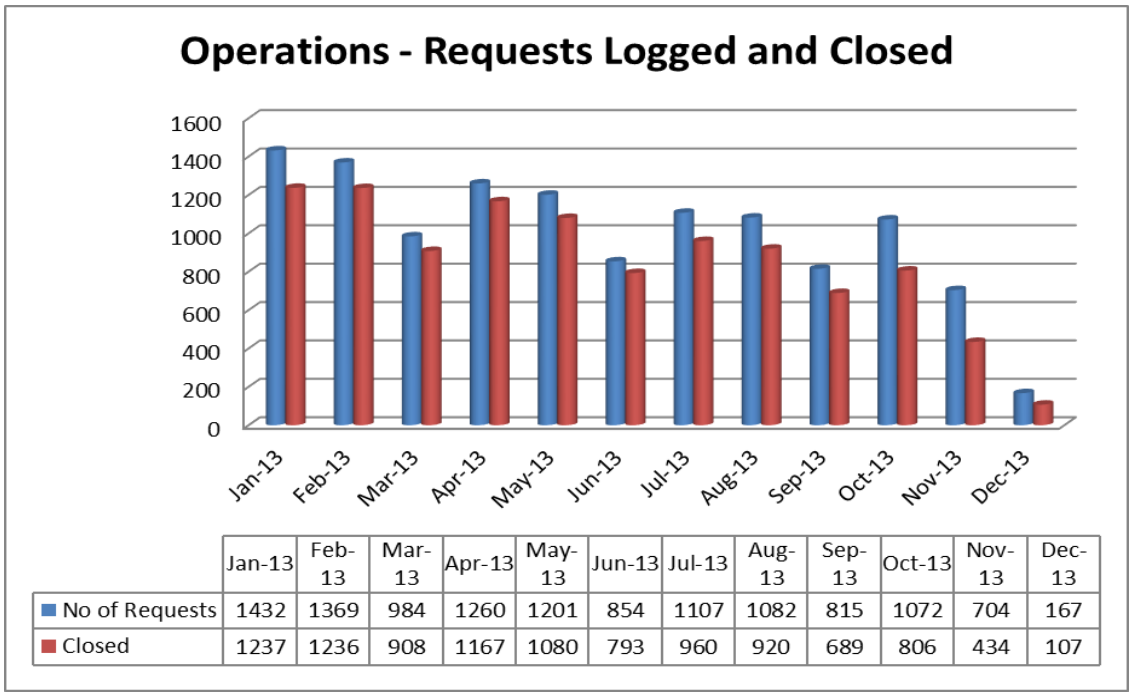
- A large amount of time was spent on day-day maintenance issues, which is indicative of ageing infrastructure. Of the R3.7m spent on maintenance, the larger portion was spent on plumbing and electrical reticulation breaking down.
- Various projects were identified and R12.2m was spent on reviving/replacing ageing infrastructure. (Annual report, 2012, p. 3)

The fact that the above amounts were spent on legitimate projects is not in doubt, but due to limited analysis of operational records, the projects being reported were not specifically identified in the operational plans for the period under review, and the report did not mention the specific location of the projects being reported on; this further inhibits effective communication between the FM unit and its customers (Campbell and Finch, 2004).

The monthly report or its summary provides generic information on the quantity of request lodged with the unit, the quantity resolved and outstanding volume, without classification of distress into the component-sections they represent in the facilities or provide explanatory notes. Institution A provides information on the cost incurred but institution B did not. Tables 1 below represent a typical structure of the monthly report from institution A. While figures 1 and 2 represent the executive summary of the monthly reports from institution B. Unfortunately, these reports are only circulated within the FM units and presented in an executive summary form for discussion at strategic levels of leadership in the respective institutions. The reports from both institutions are usually in large volumes, though institution B presents its executive summary in graphical format.

Table 1 Typical structure of monthly report from institution A

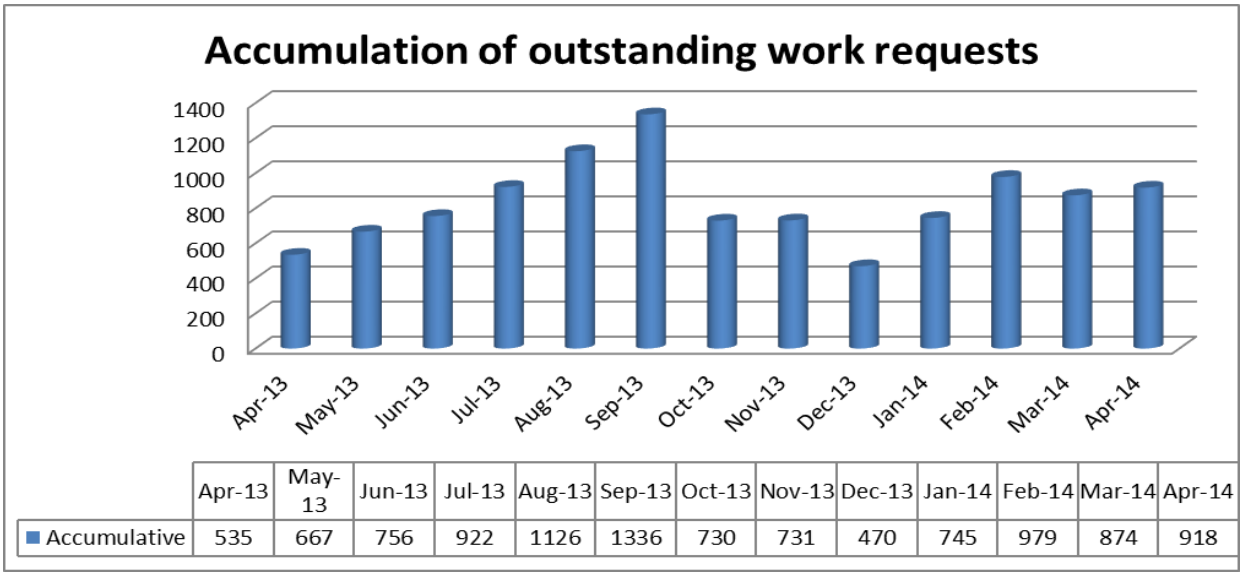
Building code	Assigned work order	Work Description	Date work requested	Service contractor's code	Date work completed	Total cost
127	70792	Remove, investigate and quote on repair of leaking pump. Replace packing with mechanical seal.	2010/03/01	PUMDATA	2010/05/10	R5,462.88
127	70794	Repair noisy pump motor fan.	2010/03/01	MJL	2010/03/29	R538.65
127	70795	Professional service to HVAC. Supply and install 1x 24000 BTU York Mid-wall unit in room GH525.	2010/03/01	PERFECTAIR	2010/04/12	R10.180.20
131	70796	Supply and install 1x18000 BTU York Mid-wall unit in room 236.	2010/03/01	PERFECTAIR	2010/04/12	R9,234.00
446	70797	Repair/replace broken toilet soap dispenser in room 2B34. Urgent	2010/03/01	SUPERCARE	2010/03/18	R0.00



	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13
No of Requests	1432	1369	984	1260	1201	854	1107	1082	815	1072	704	167
Closed	1237	1236	908	1167	1080	793	960	920	689	806	434	107

Figure 1 Summary of performance on logged requests for the year 2013 (CTS annual report, 2013, p.14)

The FM unit, in institution B, provide information on the volume of unresolved requests; an indication that these outstanding issues are kept in perspective. However, the report is silent on what the unit is doing with these outstanding requests. Figure 2 shows the year – to – date statistics of outstanding work requests.



	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14
Accumulative	535	667	756	922	1126	1336	730	731	470	745	979	874	918

Figure 2 Summary of outstanding work requests (CTS Annual report, 2013, p.14)

During the course of these researches, the majority of the heads of department complained that they do not receive progress reports from FM unit on the status of execution of their requests. However, if the generic periodic reports were sent to them, they cannot identify the component of the report that reflects the situation in their department. FM operatives should bear in mind that customer satisfaction include, but not limited to 'technical performance' but also "effective communication and management of expectations" (Campbell and Finch, 2004, p. 178). One of the tools of effective communication is detailed and customer friendly periodic reports with appropriate analysis and visual representations (Carder, 1995; Lavy, 2008; Chou, *et al.,* 2010).

4.3 Analysis of operational history

There is no evidence of the analysis of operational history in both institutions. The progression in the analysis of facilities history include identification of distress recorded against each facility and cost incurred, classify the distress recorded according to the constituent component-sections, determine the frequency of distress, the CSCI, CI and FCI. This set of information provides the FM operatives with the appropriate tool for effective communication, education of the customer, forward planning and pro-active solutions to the facilities need of the customers.

To demonstrate the importance of customer friendly periodic report that include analysis of operational history, the requests lodged with the Call Centre from institution A for the School of Civil and Environmental Engineering for the period of January to March 2010 were compiled. The eight page report was reduced into a table format as shown in Table 2. At a glance, the table provides the essential information contained in the eight page report. Figure 3 shows the graphical presentation of the status of execution and components of the facility affected, while Figure 4 shows the financial commitment. However, due to some logistic problems, it was not possible to provide explanatory notes to this report. The notes should provide explanation to terminology, such as Quotation; reasons for uncompleted works; emphasis on recurring requests or deferred maintenance and their implications on the component they represent. The

notes should also indicate the cost implication of executing the outstanding repairs or alternative suggestions for addressing the problem. Despite this shortcoming, the structure of this report elicited the following comments from the Head of the School of Civil and Environmental Engineering: “The layout is easy to determine the state of maintenance and it is easy to read. It also indicates that the FM Unit is concerned about maintenance” (Ogbeifun, 2011, p. 133).

Table 2 Summary of periodic report on work requests

Problem type	JAN	FEB	MAR	Total issued	Total completed	Cost (R)
Electrical	9	5	5	19	18	10,837.80
Plumbing	6	3	3	12	11	15,763.90
Quotation	1	1	2	4	1	136.80
Building		1	1	2	1	695.14
HVAC		1	3	4	3	2,547.90

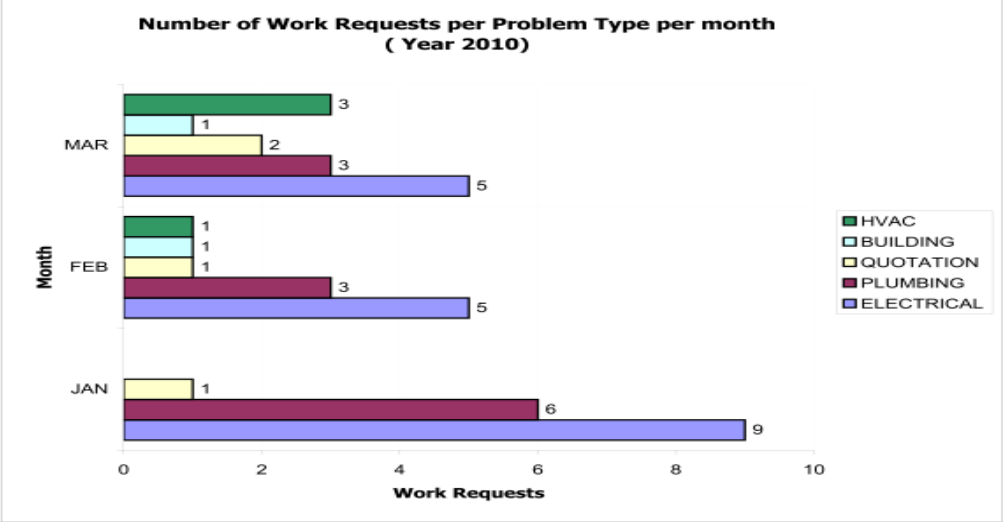


Fig. 3 Graphical presentation of the report.

If the information in the database of the facility for five years or more was available and analysised, it will be possible to identify the frequency of distress recorded against each component-sections of the facility, the cost incurred, and the magnitude of deferred maintenance backlog as well as the current replacement values (CRV). These are the data set required for the computation of the CSCI, CI and FCI that are needed for the interpretation of the quality state of specific facilities in the portfolio of the customer or the facilities of the institution.

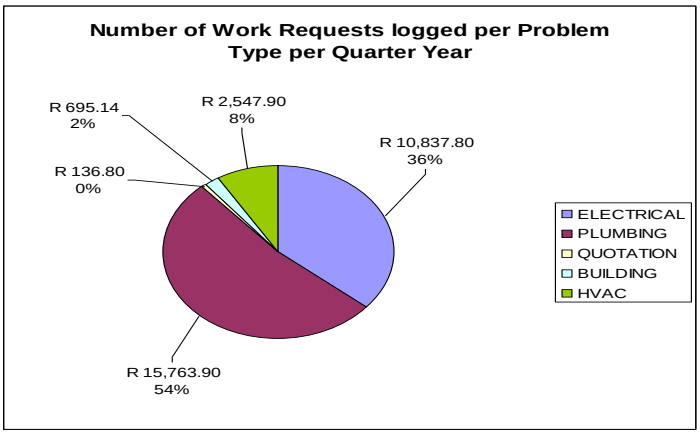


Fig 4 Financial involvements of the work request.

5.0 Conclusion and recommendations

Though the FM unit put in lot of efforts in the development, operation and maintenance of appropriate support facilities for the performance of the core functions of teaching and research, such efforts are not reflected in the periodic assessment of the level of customer satisfaction. This, in part, can be corrected through the development of detailed and costumer friendly periodic report, providing continuous stream of information through asset analysis, functional budget and using the soft skill of effective communication (Carder, 1995; Hayes, 2006; Campbell and Finch, 2004; Lavy 2008). The analysis of the operational history in the data base of each facility enables the FM operatives to determine the quality and functional state of the support facilities of the institution, and the effect on the execution of the core function of teaching and research (Lavy, 2008, Uzarski and Grussing, 2008). The comprehensive and progressive assessment of facilities “provides valuable information about the age and condition of campus infrastructure, identifies the greatest facility needs” (Kennedy, 2005, p. 52), identifies the maintenance gap, backlog of maintenance and renovation (Kennedy, 2008), and “provides holistic understanding of the existing conditions of all buildings and grounds so that a school can plan and budget for campus growth and upgrades” (Hayes, 2006, p. 311).

Therefore, it is recommended that FM operatives should use the soft skill of effective communication which include costumer friendly periodic reports and detailed analysis as tool for information and education of costumer about the state of the facilities in their portfolio.

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