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FACILITIES MANAGEMENT IN A MULTI-CAMPUS SETTING: A CASE STUDY OF THE UNIVERSITY OF THE WITWATERSRAND.

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A research report submitted to the Faculty of Engineering and Built Environment, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Science in Engineering.

Johannesburg, 2011.

Declaration

I declare that this research report is my own work. It is being submitted for the degree of Master of Science in Engineering to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other university.

(Signature of Candidate)

----------day of----------2011

Acknowledgements

I am sincerely thankful to God almighty for a dream come true.

Many thanks to my supervisor and mentor Dr. Anne Fitchett for guiding me through this research, providing extensive technical support, resolving logistic bottle-necks encountered during the research and rigorous academic critiques.

The participation in this research by prominent figures in the University such as the Deputy Vice-Chancellor (Finance and Operation), the Dean, Faculty of Engineering and Built Environment, the Head of School of Civil and Environmental Engineering, gave credibility to the work and facilitated access to vital information. I am indeed very grateful to Profs P. Fitzerald; B. Lacquet; M. Gohnert and other Heads of Schools in the Faculty of Engineering and Built Environment. I am convinced, also, that you will identify with the implementation of the recommendations made.

I am grateful to Prof. S. Tyoden and Arc (Mrs) H. Auta, University of Jos, for granting me the privilege to undertake this study. I am very grateful for the financial support from the University of the Witwatersrand through the postgraduate merit award; it went a long way in reducing the burden of this study.

My dear wife, Mrs. Oluwabunmi Ogbeifun, I cannot thank you enough for your support, encouragements and above all, holding the forth for me effectively in the home front. I am thankful to all my family members represented here by one name: Eghosasere, Uyioghosa, Osamudiamen, Osatohanmwen and Omo Omoruyi; you have all been sources of encouragements to me.

I am indebted to my invaluable friends: G. Imade, A.T. Sagay, R. McNeil, B. Asogwa, Alh. Sufi, E. Adeyi, A. Gbode, L. Akinola, T. Opajobi, A. Akande, Evbu, Refiloe, Zukisani, Nathaniel, Olabode, Olatubosun and others too numerous to mention, thank you for your investments and encouragements.

Abstract

In typical higher education institutions the Facilities Management Unit develop, operate and manage the support facilities for teaching and research. Different Facilities Management structures have been experimented with in the University of the Witwatersrand. This University operates from multi-campuses with complex infrastructure in its portfolio and desires to be recognized as one of the top 100 universities of the world, which requires the examination of the structure, operational strategy, and the preparedness of the Facilities Management Unit in the performance of the support functions that would facilitate achieving this goal.

This research focuses on the evaluation of customers' satisfaction at the 'workplace interface'; where the output of the Unit moderates the inputs of the academics in performing the core functions of teaching and research. Adopting the case study method of qualitative research, the data were collected through the administration of semi-structured questionnaires complemented with interviews. The customers express differential level of satisfaction, and the Facilities Management Unit identified some of their constraints. Specific recommendations are made for operating a Facilities Management Unit that will provide effective support facilities for the performance of the core functions of the University and achieve its expressed goal.

Keywords. Facilities Management, teaching and research, workplace interface, customer satisfaction.

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List of Acronyms

ABD: As-built Documents

BMS: Building Maintenance System

CAD: Computer Aided Design

CAFM: Computer-Aided Facilities Management

CC: Campus Control

CCTV: Close Circuit Television

CDP: Campus Development and Planning

CFM: Campus Facilities Management

CI: Component Index

CMMS: Computerised Maintenance Management System

CNS: Computer Network Service

DoH: Department of Health

DVC (F&O): Deputy Vice-Chancellor (Finance and Operation)

DR: Danish Broadcasting Corporation.

EBE: Engineering and Built Environment

EDM: Electronic Distance Measurement

FCI: Facilities Condition Index

FM: Facilities Management

FMAA: Facilities Management Association of Australia

FNB: First National Bank

FOD: Facilities Operation Document

IFMA: International Facility Management Association

GIS: Geographical Information System

HVAC: Heating Ventilation and Air Condition

IT: Information Technology

IWMS: Integrated Workplace Management System

KPI: Key Performance Indicator

LCC: Life Cycle Cost

NEC: New Engineering Contract

SD: Services Department

SET: Senior Executive Team

SLA: Service Level Agreement

TET: Technical Execution Team

TFM: Total Facilities Management

UP: University of Pretoria

UPDC: University Planning and Development Committee

VC: Vice-Chancellor

CHAPTER ONE: INTRODUCTION

1.0 Introduction

Facilities Management as an emerging profession has been described in several ways without firm consensus. The practice has advanced in many of the developed countries but still at its elementary stages in Africa and other developing economies. Efforts are still being made to construct a boundary for the activities or functions executed through the office of Facilities Management professionals. Reference will be made to three definitions commonly referred to in literature. Atkin and Brooks (2000) see Facilities Management as;

> An integrated approach to operating, maintaining, improving and adapting the building and infrastructure of an organization in order to create an environment that strongly supports the primary objectives of that organization (Atkin and Brooks, 2000:1).

The definition of the American Library of Congress, (1989) provides that:

> Facility management… is the development, co-ordination and control of the non-core specialist services necessary for an organization to successfully achieve its principal objective (U.S. Library of Congress 1989, in Barrett, Ed, 1993:23).

This definition incorporates the element of development as part of the functions of facility management, highlighting that it is part of a constantly changing environment in the core activities of an organization. Furthermore, the International Facility Management Association defines it thus:

> Facility management is a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process and technology (www.ifma.org/what_is_fm/index.cfm).

The above definitions suggest that Facilities Management provides a supporting management function to the core business of an organization; concentrates on the area of interface between physical workplace and people; and requires a multi-skill approach to integrate people, place, process and technology in executing its support functions. The function could be as complex as strategic planning to as menial as cleaning services and a range of services in between.

The focus of this research is to examine how the University of the Witwatersrand assesses the contribution of the Facilities Management Unit towards achieving its core objectives of teaching and research.

1.1 Facilities Management.

Facilities Management practice has long been in existence before its formation into professional association. In the formative years, it was viewed as mere 'janitorial' services but through the introduction of modern management methods, has promoted the profession "from the basement to board room" (Becker, 1990; in Lunn and Stephenson, 2000: 314). The practitioners in the field of Facilities Management need, in addition to technical abilities, modern managerial skills in the day to day management of facilities operations. Depending on the setting, the facilities manager would be expected to play a combination of the roles of Routine, Preventive, Tactical, Integrative, Innovative or Strategic Management (Nutt, 1993). The size of an organization and nature of operation determines the organizational structure of a facility management unit. In practice, executing the functions of development, operation and maintenance by different organs of Facilities Management is a common feature in many higher educational institutions. However, in order to enable the Facilities Management Unit to align its operation effectively to achieve the objectives of the institution, the unit should be recognized and incorporated into the strategic management umbrella of the institution and all functions of Facilities Management should be executed and coordinated under one organ (Gabriel, 2004; Jensen, 2008).

1.2 Primary versus Support Activities.

In a typical higher education institution, the Facilities Management Unit is one of several service units that support the core functions of teaching and research. Others include Administration, Human Resources and Finance Divisions. Carder (1997) using the analogy of a supply chain (Porter, 1990), demonstrates that support activities have over-arching effects on the primary activities of any organization. Adapting the analogy presented in **figure 1.1** below to a higher education institution, the support functions provided by Human Resources, Finance and Facilities Management Divisions have direct effects on the institution's core functions of

teaching and research. The provision, operation and maintenance of infrastructure and technological developments are the primary responsibilities of the Facilities Management Unit while the Human Resources and Finance Divisions complement its effort in the procurement of these necessary services. The facilities manager, therefore, is under intense pressure to develop and manage an estate strategy (Housley, 1997) that is aimed at achieving the set objectives of the organization it serves.

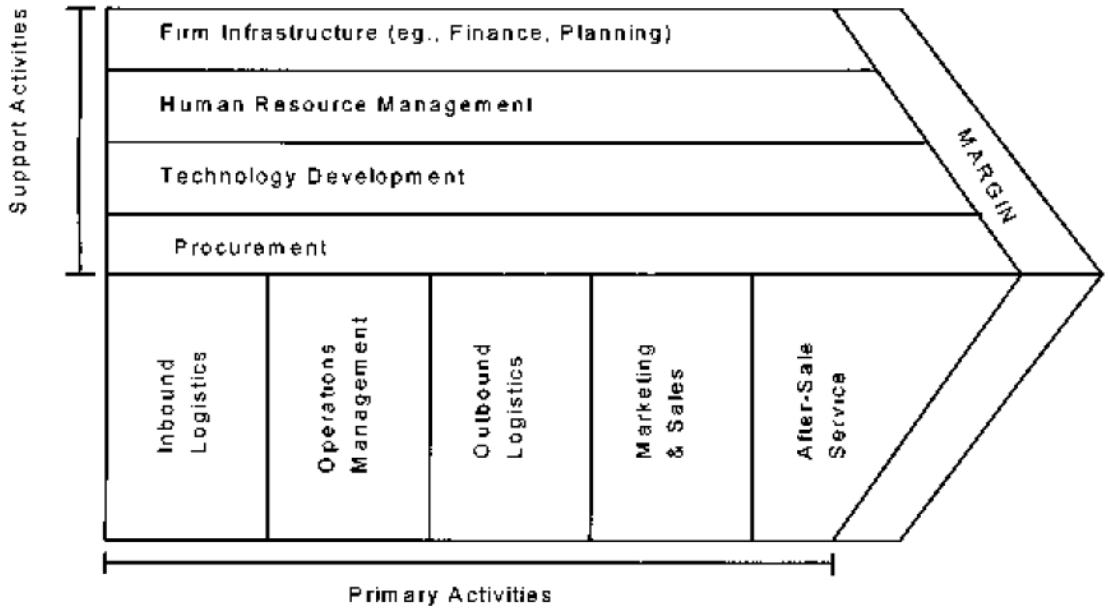


Fig.1.1 Porter's model for support and primary activities (Carder 1997: 86)

1.3 University of the Witwatersrand in the community of universities.

The University of the Witwatersrand is very prominent in the community of universities in South Africa, Africa and the rest of the world but it is yet to be recognized among the most highly rated universities of the world. The ranking exercise of world universities conducted by Times Higher Education Supplement, published by Q S Publication in October 2009 featured the University of Cape Town (the only university in Africa) among the first 200 universities in the world. The University of Cape Town has made steady progress from position 200 in 2007 to 179 in 2008 and 146th position in 2009 (http://www.timeshighereducation.co.uk/..). The criteria used in assessing these universities, in effect, measure the excellence of the university (Taylor and Braddock, 2007) in specific disciplines and in general terms. Practically, the quality of teaching

and research are the fundamental issues generally referred to when discussing the excellence of a university. While excellence of a university attracts both staff and students to particular institution, the standard, quality and functionality of the support facilities "creates suitable, conducive and adequate environment that can support, stimulate and encourage learning, teaching, innovation and research activities" (Lateef, *et al*, 2010:77). The 2022 strategic goals of the University of the Witwatersrand are set out as follows:

- To increase the intake and throughput of quality graduates;
- To increase the percentage of post graduate and research students, attracting the best;
- To be a world-100 university, building on Wits' unique South Africa urban identity;
- To attract, inspire and retain quality academic and support staff. (www.wits.ac.za/...)

In order to achieve these goals, the Facilities Management Unit needs to be proactive in the development, operation and maintenance of the infrastructure (buildings, plant, technology, etc) that supports effective teaching and research. Furthermore the Facilities Management Unit, the academics and the university administration require creative collaboration that could foster the needed synergy for the achievement of the set goals of the University and recognition in the community of universities.

1.4 Assessment

In any organization, Facilities Management customers include senior management, the complementary units responsible for the execution of the core functions of the organization and other units providing services or benefiting from the services of the organization. In the context of this research, the customers will be limited to the University administration and the academics. Customers' satisfaction is best measured through realistic evaluation of Facilities Management performance at the workplace interface, where the output of its activities serves as inputs to other units which in turn affects their output in the performance of the core functions of the organization. In a typical workplace interface, the contribution of Facilities Management can be represented in the generic form of 'location, buildings and plant, information technology and transport' (Carder, 1997:84). These generic environments as support facilities and the quality of their functional state are used to evaluate the effect of support services on the core activities of the organization. In the university context, the core functions being teaching and research, the

standard and functional state of support facilities for teaching and research affects the quality of graduates and research outputs of the academic staff weighed against the goals of the university, and the competitive advantages within the community of universities.

1.5 Problem statement

The case study for this research is the University of the Witwatersrand, located in the city centre of Johannesburg. In its growth process through self initiated developments, collaborations, merger and acquisitions, the University operates from multi-campuses with infrastructure of different ages and complexities, similar to older universities in developed and developing countries. The University is prominent in the community of universities in South Africa and in Africa and has made recognizable landmark achievements; its operation is akin to those in the first world and could be a useful model to other African and developing world's universities. Its goal to be recognized as one of the first 100 universities of the world is a challenge that demands strong demonstration and commitment to a deliberate programme of actions to achieve this objective within the target time of 2022. Achieving this goal requires continuous improvement on the quality of its teaching and research outputs, which hinges on the standard, quality and functional state of the support infrastructure and technologies. The development, operation and maintenance of these support facilities are the responsibility of the Facilities Management Unit.

This research is focused on the University of the Witwatersrand because it has infrastructure of different ages and complexities in its portfolio, operating from multi-campuses, in a developing country and desires to be one of the top 100 universities in the world before 2022. The research seeks to examine the management structure and strategies being used by the Facilities Management Unit for the development, operation and management of the support infrastructure in its multi-campus that will enable the University to achieve its goal for 2022. The research also assesses the customers' satisfaction of the performance of these support services and their effect on the performance of the core function of teaching and research.

1.6 Research Questions.

The focus of this research and the questions it seeks to find answers to are:

1. What are the management strategies being employed by the Facilities Management Unit for its operation in the multi-campus setting of the University of the Witwatersrand?
2. What are the strategies in place for the development, operation and maintenance of the support facilities and technologies to achieve the objective of being one of the first 100 universities of the world?
3. How do the academics and administrators rate the contribution of Facilities Management Unit in performing the core functions of the University?
4. What are the constraints or hindrances to its operations, in realizing the 'core business objectives' of the University?

1.7 Objectives of the study.

The objectives of this study are:

- To evaluate the Facilities Management system being used in the multi-campuses of the University of the Witwatersrand.
- To evaluate the understanding, preparedness and commitment to achieving the objectives of the University.
- To examine how the University administration and academic staff perceive the contribution of the Facilities Management Unit to the achievement of the core objectives of the University.
- To evaluate the technological tools being used that can be adapted for use in other higher education institutions in developing countries.

1.8 Contribution to knowledge

The contributions of the research to the body of knowledge of Facilities Management practice in institutions of higher education include:

a. Creating awareness that would enlighten and challenge facilities managers to be proactive in the performance of their function. This is because, the standard, quality and functional state of the support structures and technology affects the University being able to execute its core functions and achieve the set objectives.
b. Challenging the University of the Witwatersrand to pay close attention to the staffing, management and funding of their Facilities Management Unit and recognize the unit at strategic management level. This would enable the unit to be proactive and contribute meaningfully to the strategic objectives of the institutions.

   Demonstrating that a functional structure and dynamic leadership style, adequate and progressive capacity building accompanied by basic information technological tools is essential for effective Facilities Management Unit in any multi-campus institution of higher education.
c. Demonstrating the use of case study method of research as a veritable tool for in-depth study of Facilities Management operations.

1.9 Methodology

In order to find answers to the research questions and achieve the objectives of the study, the case study method of qualitative research is used to collect the research data. This is achieved through the combination of desk-top research, administration and analysis of 'semi-structured' questionnaires complemented by interviews, site visits and evaluation of records. The information from the different sources was correlated in the form of an abridged triangulation method, as means of validating the obtained data and information. Interviews are conducted with selected personnel in these groups:

- The central management of Facilities Management Unit;
- The facilities coordinators of the satellite campuses;
- Selected Heads of School and coordinators of laboratories as facilities for teaching and research; and
- Service providers.

The site inspections are to verify:

- The management system in place;

- Method of archiving, retrieval and updating records;
- The use of technological tools.

1.10 Limitations

This research is limited to a single institution, the University of the Witwatersrand, focusing on one of the five Faculties located in two of the many campuses. The emphasis is placed on the management structure, leadership style and the assessment of the customers' satisfaction on the performance of Facilities Management Unit in the execution of the necessary support functions and their effects on the performance of the core functions of teaching and research.

The compelling reasons for choosing this single institution as case study include its objective of being one of the top 100 universities in the world before 2022, viewed against the background of the state of the infrastructure in its portfolio; to examine the preparedness of the Facilities Management Unit as well as the commitment of the University in supporting the Unit to develop, operate and manage the necessary support facilities that will facilitate the achievement of this goal.

1.11 Structure of the project report.

The project report will be divided into six chapters.

Chapter One provides a general introduction to Facilities Management operation highlighting its importance to the achievement of the core functions of teaching and research in higher educational institutions. The chapter further provides information about the dominating objective of the University of the Witwatersrand that should constitute the driving force and commitment of the Facilities Management Unit.

Chapter Two reviews related literature to Facilities Management best practices and focuses on the practice of Facilities Management in higher educational institutions.

Chapter Three examines the research methodologies adopted discussing the merits and limitation of similar tools. The section provides justification for the use of 'triangulation' method in the qualitative survey of the case study.

Chapter Four evaluates the operation of the Facilities Management Unit in the University of the Witwatersrand and reveals that Facilities Management functions are being performed by multiple independent divisions with few horizontal relationships. The triangulation of information reveals the perception of the various stakeholders about the performance of the critical divisions responsible for the development, operation and maintenance of support facilities to teaching ad research.

Chapter Five provides comprehensive information on the findings of the operations of the Facilities Management Unit in the University of the Witwatersrand and the discussion of the operations compared with best practices gleaned from literature.

Chapter Six provides the synthesis of the critical issues discovered during the research in the form of conclusions, proffering recommendations to address observed shortcoming as well as charting the way forward.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

Facilities Management as an emerging profession in the built environment is receiving due attention in research endeavour. Though the practice of Facilities Management is widely embraced in the developed countries, it is still in its infancy in many developing countries. There are numerous works on Facilities Management as a profession, the organizational structure, operational systems, and other related subjects. There are broad based discussions on Facilities Management operations in the industrial sector, hospitality, health and higher education institutions. In the industrial, hospitality and to a lesser extent in the health sectors operating from multi-sites, the performance of Facilities Management Unit has immediate (positive or negative) effects on the particular site and eventually the product(s) of the respective industry as a whole. By contrast, the performance of the Facilities Management Unit in the education industry does not have immediate effects; but its poor performance gradually erodes the credibility of the educational institution over a long period of time if not checked. In the same sense, the development, operation and maintenance of the required support facilities that enable the institution to execute its core functions and achieve its goals require sustained commitment from the Facilities Management Unit, the academics and the administrators of the institution. Therefore, the focus of this section will be on literature that has direct bearing on Facilities Management practice in institutions of higher education and in particular assessing the performance of Facilities Management units in the achievement of the core functions of 'teaching and research'.

Grimshaw (1999) quoting Donald (1994) says that: "…FM holds the ring between an organization, its employees and its physical space" (Grimshaw, 1999:2). This ring is what Carder (1997) refers to as "the interface between an organization's core business and its physical working environment" (Carder, 1997: 84), and the facilities manager, he referred to as "interface manager" (Carder, 1995 in Carder 1997: 84). The burden of the facilities manager is to develop, operate and maintain standard and functional infrastructure and technology in an environment conducive for the employee to carry out his function in line with the organization's objective. If

the dynamics of the workplace interface are to be fully explored, there is need for in-depth research, strategic planning, responding to the changes in the workplace, taking culture and setting into consideration, and facilities managers need to be proactive (Grimshaw, 1999). The strength of research is that it "must provide tools which help facilities managers to deal with diversity and uncertainty…" (Grimshaw, 1999) peculiar to the respective industry to which the research is targeted. The facilities manager, as a manager of change, needs to form a close and cordial relationship with the main actors in the workplace, develop a feedback mechanism as a means of measuring how effective his support service is in enhancing performance in the core functions of the organization. In practice, the structure and functions of a typical Facilities Management Unit reflect the organization it serves.

There is yet no consensus on what could be regarded as the ideal organizational structure or delimitation of the functions performed by a typical Facilities Management Unit. Instead most authors agree that the structure and function of Facilities Management Units are dictated by the type of the organization, the relationship between core and support function, methods of execution of development, operation and maintenance services as well as the Facilities Management Unit's recognition by senior management. Customers' satisfaction is central in the assessment of the Facilities Management Unit's performance of its support services and the review of the relevant literature suggested several tools for these assessments.

The synthesis of the literature consulted, especially those works that have direct information on the operations of Facilities Management Unit in the higher education institution, and the gap observed in the literature is provided in section 2.6. This is followed by a discussion on the focus of the present research. Most of the literature cited is fairly generalized, so information about Facilities Management Units in a number of universities was obtained from their respective websites, and therefore has not been subjected to analysis or peer review.

2.1 An overview of Facilities Management

Facilities Management as an emerging profession has been described in several ways. Efforts are still been made to construct a boundary for the activities or functions executed through the

profession of Facilities Management. Reference will be made to some of the definitions commonly referred to in literature. Atkin and Brooks (2000) see Facilities Management as:

> An integrated approach to operating, maintaining, improving and adapting the building and infrastructure of an organization in order to create an environment that strongly supports the primary objectives of that organization (Atkin and Brooks, 2000:1).

The definition of the American Library of Congress provides that:

> Facility management… is the development, co-ordination and control of the non-core specialist services necessary for an organization to successfully achieve its principal objectives (American Library of Congress, 1989; in Mole, 1993; in Barrett, 1993: 23).

The International Facility Management Association, the parent body of the profession defines it thus:

> Facility management is a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process and technology (www.ifma.org/what_is_fm/index.cfm).

Furthermore, Then (1999) opined that:

> 'Facilities management' (FM) has been described as a hybrid management discipline that combines people, property and process management expertise to provide vital services in support of the organization (Then, 1999: 462).

These definitions reveal that Facility Management performs several sub-functions: its main function is to manage the facilities that support the accomplishment of the core function of the organization it is meant to serve. A further analysis of these definitions suggests that Facilities Management provides a supporting management function to the core business of an organization; concentrates on the area of interface between physical workplace and people (Then and Akhlaghi, 1993; Carder, 1997). The boundary defining the function of Facility Management is still fluid.

2.1.1. Functions of Facilities Management unit.

The functions performed by a typical Facilities Management Unit vary, depending on the size, objectives and core activities of the organization it serves. These functions could be as complex as strategic planning to as menial as cleaning services and a range of activities in between.

Price (2003) constructs the boundary thus:

> The facility management (FM) industry can basically be divided into three categories: facility managers, specialist consultants and service providers. Facility managers are responsible for particular facilities either for one organization or on behalf of a number of organizations and function largely at a strategic level. Specialist consultants provide targeted expertise in areas as diverse as architectural, structural, fit-out, services and landscape design, cost management, project management, environmental assessment, due diligence, energy planning and dispute resolution, and function largely at a tactical level. Service providers include cleaning contractors, insurers, furniture suppliers, security, construction, catering, fleet management and a range of other support services, and function largely at an operational level (Price, 2003; in Best *et al*, 2003:49).

The above description of the functions of the facility management could be further expanded into four major divisions with multiple sub-divisions to suit the particular needs of the respective organization. The four generic structures and their sub-functions suggested by Barrett and Baldry (2003) are itemized below:

a. Facility Planning

- Strategic space planning
- Set corporate planning standards and guidelines
- Identify user needs
- Monitor space use
- Define performance measure

b. Real estate and building construction

- New building design and construction management
- Acquisition and disposal of sites and buildings
- Negotiation and management of leases
- Advice on property investment
- Control of capital budget

c. Building Operation and Maintenance

- Run and maintain plant
- Maintain building fabric
- Energy management

- Security
- Monitor performance, supervise cleaning and decoration; waste management and recycling

d. General/office service

- Provide and manage support services
- Office purchasing (stationery and equipment)
- Non-building contract service (catering, travel, etc)
- Housekeeping standards
- Health and safety (Barrett and Baldry, 2003: 48)

The list above is not exhaustive: it shows that the Facilities Management Unit performs different functions to support the core objectives of the particular organization. The development, operation and maintenance of infrastructure and technology are critical support services to the core functions of 'teaching and research' in higher education institutions. These form the major preoccupation of the Facilities Management Unit in any institution of higher education. They could perform these functions at strategic, tactical and operational levels simultaneously through in-house, or combinations of in-house and outsourced service providers.

2.1.2 Organizational structure

Barrett and Baldry (2003) discuss in detail the evolution, structure and practice of Facilities Management under different settings, in the book "Facilities Management: Towards Best Practice". In Chapter 1: Current Good Practice in Facilities Management, it is found that Facilities Management can be structured in any one of five categories or models, namely:

1. **Office manager**: In this model, the Facilities Management function is not a full time assignment but undertaken by someone as part of their general duties. The person charged with this responsibility may not be technically literate or actively involved in the core function of the organization, but could undertake this additional responsibility. The facilities functions, mainly repairs, are executed through external service providers as the need arises. This model is suitable for a small organization.
2. **Single site**: This model depicts organizations in one location but large enough to create a separate unit responsible for the management of its physical assets. The organization may

use a combination of in-house and contracted services in the execution of the Facilities Management functions. A manufacturing plant, independent school and independent retail outlet, are good examples.

3. **Localised site:** This model is suitable for organizations that have facilities in different locations but operate central management control of their core functions from one site-headquarters. This model is suitable for universities or other educational institutions with multi-campuses, banks, hospitality industry, etc. This model encourages partial decentralization of operations that allows a certain level of decision to be made at each site level, with major policy taking place at the central management level.
4. **Multiple sites**: This model, similar to the localized site, is suitable for large organizations that operate across widely separated geographic locations, but perform identical functions in each site. Each site accommodates a functional Facilities Management Office, while the activities are coordinated at strategic levels for effective management. Generally, health service institutions, military barracks, parks and historic sites are good examples. The model operates a structured coordination from national through to local levels.
5. **International.** This model is similar to the previous, except that it operates across different countries. Allowance should be made to accommodate possible difference between the countries involved in terms of language and legislation. (Barrett and Baldry, 2003: 4-7).

The organizational structures discussed above are dynamic, reflecting the growth pattern of the organization. A typical Facilities Management Unit starts from either the Office Manager or the Single Site model and expands to other models. The Single Site structure aptly describes the structure of Facilities Management Units in the formative years of any institution of higher education. Many universities, including the University of the Witwatersrand, commenced operation from a temporary site before moving to their permanent site, which is usually in one location with progressive development. Through the process of expansion, merger and acquisition, many universities operate from multiple sites and by extension adopt the Localised Site structure. The last two structures may not be generally applicable to the university system, although there are examples of universities that operate internationally (e.g. Monash University of Australia).

2.1.3 Development of Facilities Management as a Professional Function.

The development of Facilities Management operations from mere 'janitorial' services to the respected profession promoted "from the basement to board room" (Becker, 1990; in Lunn and Stephenson, 2000: 314) is evident in the description of the various models discussed in section 2.1.2 above. The responsibility in the portfolio of the Facilities Manager increases progressively down the models, with 'office manager' being the least. This progression in responsibility, the need to develop, operate and maintain high quality facilities to support the core functions of the organization, dictates that Facilities Management functions should be coordinated by relevant professionals at strategic, tactical and operational levels. The "localized site" model is the most suitable for universities operating from multiple sites. The structure provides for graded authority, allowing some level of autonomy that facilitates timely decisions on simple issues. This model is suitable for the University of the Witwatersrand that operates from multi-campuses within one City.

The explorative case study of Jensen (2008) traces the origin and constitution of Facilities Management as an integrated corporate function, in his study of the development and growth of the Facilities Management Unit of the Danish Broadcasting Corporation (DR) for 80 years of the corporation's existence. The Facilities Management Unit's growth followed the pattern of growth in the parent body that it served; starting from the "Office Manager" to the "Localised Site" model. In 1949: "The service staff included16 people with nine service related (three office assistants, three messengers, two gatekeepers and one watchman), four building related (three engineers and one stoker) and three car mechanics" (Jensen, 2008:495). The major developments in the Facilities Management Unit of the organization from 1951-1993 are summarized as follows:

a. In 1951, the 'Administration office' was created to coordinate all service and building related functions.
b. Following a major policy change, 1972, the corporation created the 'Building Coordination' unit to be responsible for new buildings development and long-term planning of real estate issues.

When the 'Building Coordination Unit' was created, all building related (capital development) functions were annexed from the 'Administration Office', resulting in two parallel divisions reporting separately to senior management. The intention of this separation was aimed at division of labour that would encourage efficiency in performance, instead it was marred by uneasy calm, rivalry and wide horizontal divide (Jensen, 2008). In an effort to justify performance or excuse the lack of it, each unit developed different strategies aimed at achieving their interpretation of the goals of the organization. Each unit developed a functional vertical structure in an effort to consolidate and establish its level of importance. To a large extent, this resulted in duplication of resources, low performance and high operational cost (Jensen, 2008).

The **fig 2.1** below shows the graphical presentation of the organizational structure; both units in frantic efforts to close their vertical divide in order to meet the core objectives of the corporation, but due to rivalry, competition, and lack of inter-unit relationship their efforts are short circuited by the widening horizontal division. Realizing the disadvantages resulting from the separation, the Facilities Management functions were integrated and performed under one umbrella unit.

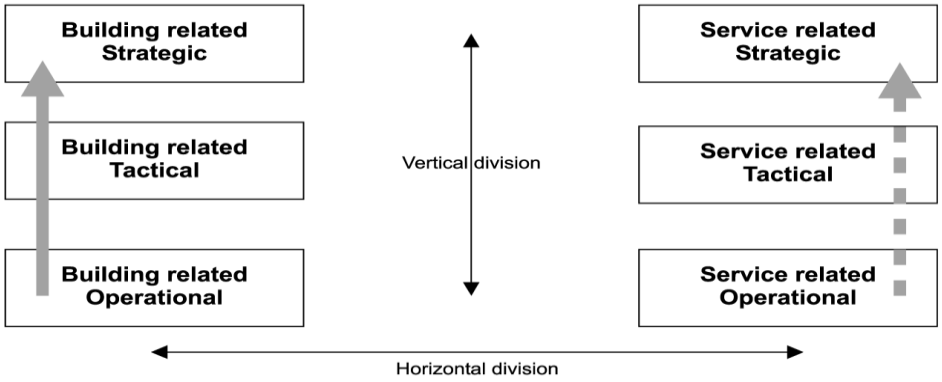


Fig 2.1 Organizational structure of building and service related functions in DR, 1928-1988 (Jensen, 2008:498).

c. In 1993, both the 'Administration office' and 'Building coordination' units were integrated into one organ.

This development facilitated the fostering of close relationships at both vertical and horizontal levels enabling the Facilities Management Unit to act as a 'unit', and proactive in executing its support functions to achieve the core objectives of the corporation. **Fig 2.2** shows the graphical representation of the new structure depicting the vertical and horizontal integration.

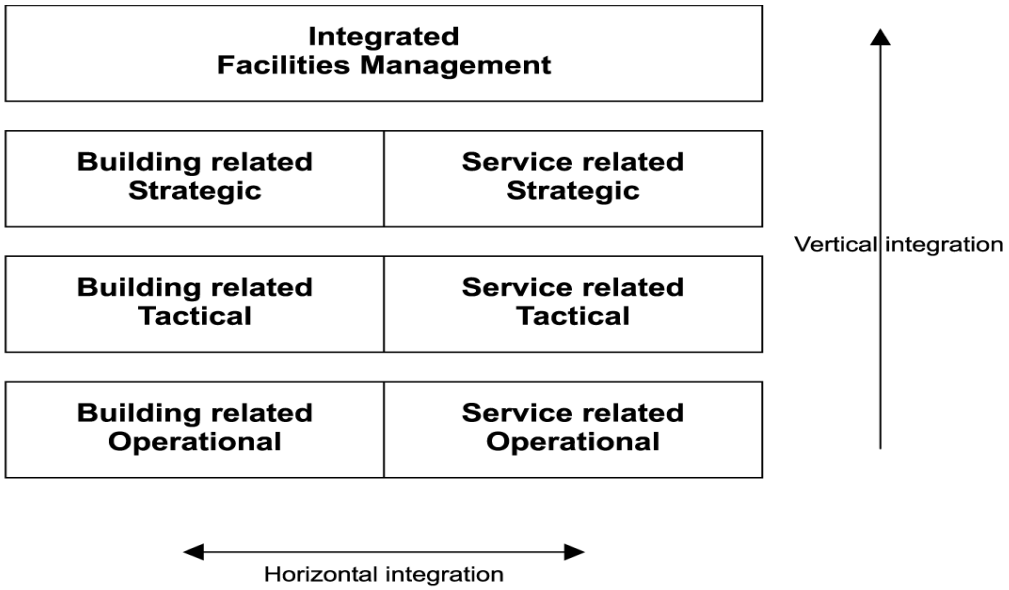


Fig 2.2. **The integrated corporate FM function (Jensen, 2008: 499).**

The closure of the horizontal divide encourages effective use of resources, cross fertilization of ideas, developing holistic strategies to achieve the core objectives of the organization and each constituent sub-unit approach the performance of its duty weighing its effect on the whole unit. In conclusion, Jensen (2008) stated that:

> The development clearly shows the need for a coherent strategic planning of the development of the corporation and corporate facilities. This is important both for the corporation to achieve its objectives and for the FM function to act proactive and professional. This implies that building client function in general should be an integrated part of the FM function (Jensen, 2008: 499).

Generally, separating capital development from operation and maintenance functions is a common experience in many organizations. The reasons could be that of low level of competence of the leadership of operation and maintenance division in which the organization cannot entrust the development of high standard infrastructure into their portfolio. However, performing Facilities Management functions through multiple divisions has constituted the weak link that prevents the unit from adequately providing holistic support services that would enable the organization to effectively achieve its core objectives. The concept of an integrated Facilities Management function is increasingly being considered the best practice of Facilities

Management Units in many industries including universities. Consequently, each organization should pay close attention to the selection of staff to run the Facilities Management Unit.

2.1.4 Staffing a Facilities Management Unit

There are four generic clusters or categories of personnel needed in a Facilities Management Unit, namely; senior management, middle level management staff, technicians and artisans. Opinions have been expressed in literature that Facilities Managers do not necessarily need to possess technical skills but that modern management skills are essential, since their main function is to coordinate and integrate the activities performed by a multi-disciplinary network. The staff structure in any typical Facilities Management Unit reflects the nature of the support services being provided. Tay and Ooi (2001) observe that: "Although the scope of FM straddles between professional and non-professional services, the core competence of a facilities manager in strategic level FM matters while overseeing operational matters" (Tay and Ooi, 2001: 360). In some instances, especially organizations that offer purely operational services such as cleaning, security, mail services, and fleet management, they employ anybody who is able and available to do the job as Facilities Manager, who attends short courses and generally learn on-the-job (Tay and Ooi, 2001).

However, Best *et al* (2003) are of the opinion that the facilities manager could not be anybody with modern management skills but needs to be a certified professional who demonstrates a high level of competence in their areas of expertise. To buttress this point they make references to the professional requirements for practitioners as stipulated by International Facilities Management Association (IFMA) and the Facilities Management Association of Australia (FMAA) which include a demonstration of knowledge, competence and ability in a wide range of technical and management areas in a wide continuum encompassing:

> …everything from computer networking and mechanical engineering to human resources management theory, occupational health and safety legislation, contract negotiation, future financial planning,…subcontract administration, construction management, etc (Best et al, 2003:4).

In this respect, it is similar to Project Management in requiring a combination of technical and managerial competencies. The level of sophistication of infrastructure and technology supporting the core functions of the organization and the huge investments in their development suggest strongly that Facility Managers should be professionals, competent and expert in the management of these support facilities. The quality of the support services has direct impact on the output of the core functions of an organization. Therefore, Facilities Managers in the university setting, from the middle to the senior management level, should possess professional qualifications that could enable them to communicate and relate with academic and senior management staff of the university to be able to translate the strategic objectives of the university into the development, operation and management of facilities for the pursuance of the core functions of teaching and research. Preferably, they should come from the Engineering and Built Environment professions and possess hard and soft skills in project management and law, with well developed interpersonal skills, coupled with competence in finance, real estate and keen interest in the environment (Best et al, 2003).

The operation of a typical Facilities Management Unit is dynamic, depending on the organisation, nature of infrastructure and human capacity. The mode of executing Facilities Management functions could also be referred to as service procurement. Each organisation determines what mode to adopt. The section following will discuss some common procurement systems being used to execute typical Facilities Management functions.

2.2 Service Procurement

Procurement as described by Barrett and Baldry (2003) is the process by which a user employs a separate organization (the supplier), under contract, to perform a function which could have been performed by in-house staff. Literature referring to this process uses different terminologies but the most common is ‘outsourcing’. Many reasons have been advanced for and against outsourcing, however compelling evidence in support of outsourcing abounds. Antidote (1997) argues that:

> The impetus to consider outsourcing support services which are not considered to be core business functions may have originated as a desire to control cost but, increasingly, other

> factors are now seen as just as important. Perceived benefits include the ability to maintain flexibility in response to turbulent market conditions; timely and upgraded service delivery achieved through a combination of improved productivity and access to the latest technology; and, not least, the release of senior management's time to focus strategic thinking on core business issues. (Antidote, 1997: 6).

Four key issues are evident from the postulations above namely:

- Consideration for outsourcing is not restricted to cost control;
- Outsourcing allows for flexible management structures in response to prevailing market situations;
- Outsourcing allows management to buy in specialist services to provide and deliver services with improved technology and shared risk;
- Senior management is freed from tactical thinking to concentrate more of their energies on strategic thinking on core functions, while being available to provide a supervisory function.

In practice, some outsourcing consideration may not initially appear to be cost effective yet management may still proceed with outsourcing based on perceived potential value enhancement (Katsanis, 2003 In Best *et al*, 2003), proper execution, sustaining and promoting the image of the organization (Taylor and Booty, 2009). The practice of outsourcing encourages the prudent use of budgetary allocations, quality services and staffing (Gupta, *et al*, 2005), the development of skills (Taylor and Booty, 2009), specialization (Katsanis, 2003 in Best *et al*, 2003; Davis, 2004; Rycroft, 2006), and performance of multiple functions without increase in overhead cost (Lavy, 2008; Hayes, 2006).

Barrett and Baldry (2003: 151) show that senior management are freed from the day-to-day management of implementation processes, but are actively connected through the operation manager who provides supervision oversight and report at the strategic/tactical interface, as shown in **fig 2.3.**

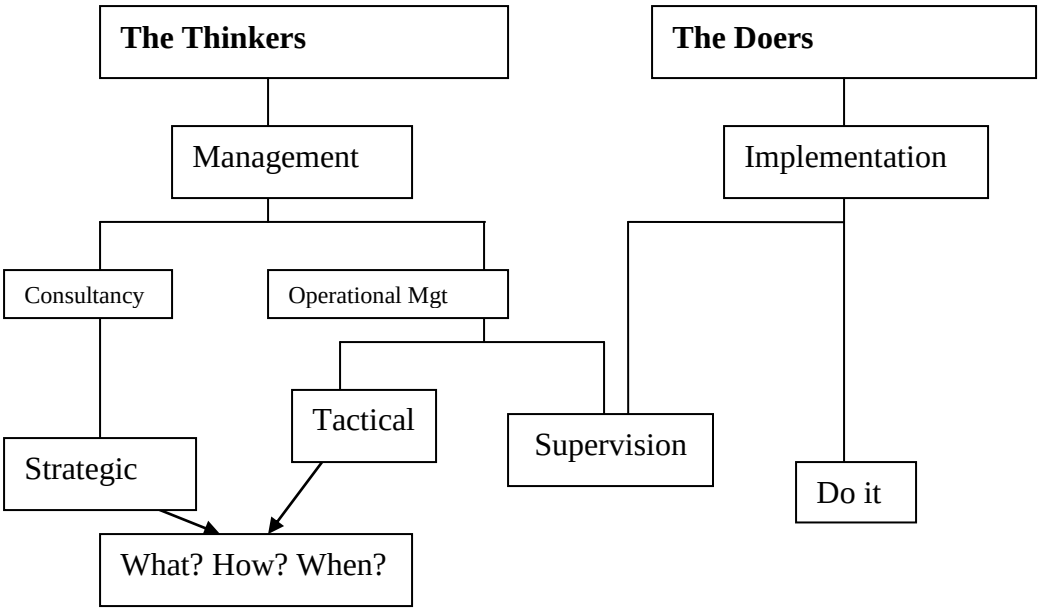


Fig 2.3 Model of Facilities Management (After Barrett and Baldry, 2003: 151).

Outsourcing does not solve all management and operational problems of an organization. However, the benefits of outsourcing hinge on committed and competent internal management as well as skilled service providers that can provide quality service to the client (Hui and Tsang, 2004).

Contrary to the opinions of advocates for outsourcing, the physical resources division of the University of Free State executes most of its routine services through:

> …well established and run workshops, and outside contractors are only involved when specialized work is required…the reason for this is that in-house people have knowledge of the installations that you could not obtain from an outside contractor (Rycroft, 2006:39).

In this process the Facilities Management Unit is contributing to skills development through job security, quality employment, provision of appropriate tools and materials suitable for the task, coupled with a suitable workplace interface that guarantees maximum productivity (Knopp, 2005; Carder, 1997).

Laudable as the case of the University of the Free State may be, it cannot serve as a general rule. Complete outsourcing or complete in-house are two extremes. As with outsourcing, the Facilities

Management Unit requires committed and competent internal leadership in order that the in-house staff is productive and competent. The entire human capacity within the in-house arrangement requires continuous development to improve the competence level and be abreast with changes in techniques and technology in their respective trades. The size of the in-house crew should be kept to a profitable limit to justify that this approach is more cost and competence effective than outsourcing (Elazouni and Shaikh, 2008).

2.2.1 Procurement methods.

Different contractual systems can be adopted by each organization for the execution of infrastructure development or operational functions. The volume of work affects the choice of sourcing methods most convenient and advantageous at any point in time. Some of the common methods include in-house, outsourcing for cost saving and capacity building, out-tasking, and partnership, managing agent, Total Facilities Management and framework contract.

a. In-house.

The service is provided by a dedicated internal resource directly employed by the client organization using the normal terms of contract for employment (Barrett and Baldry, 2003). They design, monitor and control performance of services and activities that support the core function of the organization's business (Hui and Tsang, 2004).

b. Outsourcing for cost saving and capacity building

Generally, the outsourcing method is used where the services and activities are of secondary importance to the core business of the organization. Cost saving is achieved in different ways including 'release of senior management's time to focus strategic thinking on core business issues' (Antidote, 1997).

Outsourcing for the purpose of capacity building could be achieved in one of two ways as follows:

1. Buy technical capacity from specialist companies to enhance the organization's core business, or meet the pressure of peak periods, (Campbell, 1995, Renner and Palmer, 1999);
2. Buy technical capacity through a service agreement that incorporates skills transfer to internal staff during the execution of the contract (Hui and Tsang, 2004). This system is common with the installation of new equipment necessary for the performance of the core function in the business of the organization. For strategic reasons, the service is not outsourced permanently.

c. Out-tasking

Out-tasking is a management process whereby specific tasks are performed by a contractor. This system is used where the task can be well defined or requires a specialized technique or capacity that does not occur frequently (Campbell, 1995). The satisfactory performance of the contractors at each stage helps to foster a collaborative relationship between the client and contractor, which facilitates the development of dynamic record of contractors with satisfactory performance. It is important that each organization maintains a network of certified service providers to meet peak load demands (Hui and Tsang, 2004). The practice of out-tasking is widespread in the USA as shown in IFMA records: "… that the *out-tasking* (hiring individual, specialized vendors to provide one or more FM functions) is more widespread than *outsourcing* (hiring a full-service, single vendor to provide many services bundled together)" (Kleeman, 1994: 24).

Out-tasking is a common practice in many Facilities Management Units in higher education institutions. The comments of the associate director of estate management of a tertiary institution in Hong Kong sum it up:

> ….Out-tasking makes it possible for the maintenance organization to stay lean; cost is an important factor in deciding who will get the award of service contracts or renovation projects…. However, contractor management must be emphasized, and close monitoring of works is necessary. In case the contractor under-performs, it will be handled with reference to the terms and conditions of the legal contract (Hui and Tsang, 2004).

d. Partnership

The term partnership, in this context, is a strategic alliance (Campbell, 1995) formed between the client and the service provider (each organization retaining their unique identity), based on sharing of the responsibility for the delivery and performance of a service. The terms of the relationship also include the sharing of the benefits arising from any efficiency gains and cost savings (Barret and Baldry, 2003).

e. Managing agent.

This system operates where the client desires to retain its in-house resources (contractors/staff) but does not have the capacity to manage them efficiently and effectively. The agent serves as the client's representative and manages the service providers appointed by the client. Some advantages and disadvantages discussed by Atkin and Brooks (2000: 104) are summarized as follows:

Advantages:

- The client can select both the agent and the various service contractors through competitive tendering;
- The appointment of the agent and the service contractors can be done independently;
- In this system, it is easy to isolate poorly performing service contractors;
- This system is flexible, allowing the client to use both in-house staff and contractors to execute its operational functions.

Disadvantages:

- The possibility of gaps in scope definition for the separate contracts;
- The client's risk level varies depending on the calibre of contractors selected;
- The exit of a poorly performing contractor may create a gap in effective service delivery when the replacement contractor is in the learning process;
- Initially, the administration cost to the client will rise as he deals with multiple contractors but such cost could reduce through the efficiency of the managing agent.

f. Total Facilities Management

In this system, the management and operation of the whole range of support services are packaged together and entrusted to a single supplier. According to Barrett and Baldry:

> This approach demands considerable commitment on behalf of the client organization in entrusting the satisfaction of its support services needs to an exclusive supplier for a prolonged period of time. For its part the total facilities management company is required to provide a high level of management expertise based upon a clear understanding of the primary business of the client organization (Barrett and Baldry 2003: 144).

This system of Facilities Management has been in practice in many private high schools and colleges in the USA and many universities are also adopting the system. The success rate of Total Facilities Management in some institutions is not encouraging, which compelled the University of Pennsylvania to scale back its closely watched contract with Trammell Crow for operation and maintenance of campus buildings (Van der Werf, 2000). Bates (1997) is not in support of Total Facilities Management, especially in library services because of high staff turnover, attracting a low quality of employee and poor management of the information needs of the organization. These observations should be taken into consideration when contemplating Total Facilities Management in universities for operation and maintenance services.

Some features of Total Facilities Management as outlined by Atkin and Brooks (2000:111-112) include:

1. The responsibility of managing the client's facilities is transferred to a single organization for a fixed price;
2. This arrangement provides the client with a single purchasing point thus reducing high administrative demands on the client;
3. The client should provide detailed scope description to enable the contractor to manage the services effective and efficiently;
4. The risk level is moderate since the client is dealing with a single organization that also shares in the risk management;
5. The management of sub-contractors is important because high turnover of sub-contractors could affect the quality of performance and service delivery;

6. An open book accounting system should be in place;
7. The client may spend more money to hire a Total Facilities Management system, but make substantial savings in contract management costs by dealing with one organization.

The concept of Total Facilities Management could be seen as a fusion of the 'partnership' and 'managing agent' systems of outsourcing. The success of this approach demands that both the client and the outsourcing organization should have comprehensive information through an asset audit about the facilities to be managed. This system requires a long term relationship before meaningful benefits accrue to both parties.

g. Service level agreement

The progression of Facilities Management structure from the 'office manager' to 'international' structure is similar to the progression in executing its operational functions from out-tasking to outsourcing, partnerships development and culminating in Total Facilities Management. In practice, out-tasking has limited participation of the customer but effective outsourcing encourages active participation of the customer. Executing operational function through the 'out-tasking' system requires a detailed job description using instrument such as the bill of quantities to specify the quantity of work to be executed. On the other hand, the contract instruments for outsourcing relationships are described in general terms specifying minimum acceptable level of performance (Atkin and Brooks, 2000). The two critical instruments in an outsourcing document are the 'service specifications' and 'service level agreement' and these are the "tools for managing the quality, performance and value of service procurement", (Atkin and Brooks, 2000: 74). The following definition provides further clarifications on these two terms:

- A service specification is a document that quantifies the minimum service levels that are acceptable if the customers' requirements are to be met. It provides a benchmark against which the level of service delivered to the customer can be assessed.
- An SLA is a commitment by the service provider (In-house or outsourced) to the customer to deliver an agreed level of service. It should specify rewards and penalties, yet

retain flexibility so that the customer's changing requirements can be taken into account should circumstances change (Atkin and Brooks, 2000: 74).

Extending the discussion further, it could be seen that 'service specification' is customer driven, while the 'service level agreement' is service provider driven (Atkin and Brooks, 2000) and the Facilities Management Unit moderates, as client representative guiding the developments towards achieving the goals of the organization. Generally, service specification should "…focus on output and not the procedures that are carried out in delivering those output" (Atkin and Brooks, 2000: 77). The content of the specifications should be developed setting out:

- Internal standards, relating to corporate or departmental policy;
- External standards, covering conformance to statutory requirements, International standards, health and safety legislation, industry standards and manufacturers' recommendations;
- Procedures the service provider has to comply with in order to achieve the required technical standards and
- Quality and performance targets (Atkin and Brooks, 2000:76)

The service specification enables the service provider to develop the *how* to execute the tasks to achieve the specified level of performance and the document need be acceptable to the customer. This '*how*' document commonly referred to as 'service level agreement', "may take a general format, applicable to a number of services or facilities or it may be customer, facility or service specific," (Atkin and Brooks, 2000: 79). A typical service level agreement should reflect the following:

- The minimum level of performance acceptable to the customer, specifying what their tolerance threshold is for rectifying a range of failures or malfunctions;
- The document should identify performance measures in clear terms that should include: quality, performance, delivery time, charges for services and the nature of interaction between service provider and the customer;
- The reporting structure to be completed by both the service provider and the customer in the format provided by the Facilities Management Unit;
- The necessary "Critical Success Factors" and the specific "Key Performance Indicators" that could be used to measure the success of the level of performance; and

- The Critical Success Factors and the Key Performance Indicators should correspond to the goals and objectives that are aligned to the organization's business strategy (Atkin and Brooks, 2000).

The arguments suggesting that the 'service level agreement' should be considered as separate document from the contract agreement (Tulip, 2001) with which the outsourced agent is engaged may be treated as mere semantics. However, from the point of law, the service level agreement specifies the terms and conditions of the substantive contract itself, thus: "…the function of the SLA is to specify the goals of the outsourcing relationship, while the contract is the administrative document which outlines all the practical arrangements necessary to ensure these goals are met," (Taylor and Booty, 2009: 265).

The format for the measurement of performance using the service level agreement as instrument for executing operational functions has three parts: the level of performance expected and its rating, in the execution of each task, as spelt out in the agreement; the level of service provided by the service provider and the rating as well as the assessment of the level of satisfaction by the customer. The differences observed between the assessments of the service provider and the customer forms the basis of initiating and managing necessary corrective measures (Atkin and Brooks, 2000). The quality of service delivery and the customers' satisfaction can be "affected by the quality system that the client organization has in place," (Atkin and Brookes, 2000: 84).

The service specification and the resulting service level agreement should not be assumed as 'cast in stone' but rather dynamic document that allows for continuous improvements as the circumstances of the customer change. The service provider should be involved in updating the content of the service specification and the service level agreement, taking advantage of his experience. Furthermore, formal or informal relationship with similar organizations could help to improve on the updating of these operating documents (Varcoe, 1996; Atkin and Brooks, 2000; Davis, 2004), through the process of benchmarking. When the outsourcing relationship is effectively managed using the instrument of service level agreement, the relationship can progress to that of partnership (Straub, 2007) and Total Facilities Management (Atkin and Brooks, 2000).

The performance assessment of the contractors, using any of the contractual instruments above, in the assigned tasks or cycle by the contract management team and the benefiting department, will guide the organization's decision to:

- Renew the contract with the same contractor;
- Place a new contract with different contractor;
- Revert to in-house resources (Barrett and Baldry, 2003: 157).

Generally, the decision to outsource or execute strategic, tactical or operational Facilities Management function in-house depends on the effect that the support functions have on the core activities of the organization (Campbell, 1995; Hui and Tsang, 2004; Gottfredson and Philips, 2005). In a typical university in a developing economy, it is advisable to progressively develop the outsourcing relationships from 'out-tasking' to 'outsourcing' adapting the instrument of service level agreement before attempting the concept of Total Facilities Management (Atkin and Brooks, 2000).

The emphasis of the next section will be laid on literature dealing with the documentation of facilities history in the form of: as-built documents; facilities operation documents; and preparing budgets and reports from facilities operation records. This section also examines the literature on technological tools available for effective Facilities Management.

2.3 Documentation of facilities history.

A facility's history includes detailed information in the form of drawings, manuals, repairs, renovations, and alterations, accumulated in the process of developing and operating the facility. In the life cycle of a typical facility, different personnel are involved at the design, construction and operation stages. The quality of documentation at each stage will affect the performance and management of the facility. Higher education institutions in many developing countries grow from temporary to permanent sites; develop from make-shift to standard structures, and through the process of acquisition and merger each institution has facilities of different ages with inadequate records of as-built information. This situation is heightened due to poor archiving systems, documentation and information transfer during the transition from one administration or

system to another. Developing an authentic facilities history is an exercise that should commence from the construction stage throughout the life of the facility. It is incumbent upon every operator in each phase of the facility to properly document the operations in the facility for posterity. Commencing the documentation of facilities history through as-built drawings, the Chicago District Guideline describes as-built drawings as:

> …an official record of the project at the time of construction completion. The original 'as-designed' contract drawings and specifications are modified to show all additions, deletions and other changes made during construction. Accurate as-built drawings are very important for project operation and maintenance, and future modifications, particularly for plumbing and electrical systems, which are hidden from view…. (CELRC, 2007).

The guideline provides that all alterations should be recorded using the standard 'mark-up' system to be verified regularly by both the contract officers and the contractor(s). To underscore the importance of the as-built record, the management of Hydro Ottawa Electrical development insisted that "No electrical plant will be energized without the as-built information," (Ottawa, 2009). In practice, a change made in any component during construction usually has a ripple effect on other sections or service providers. Therefore, information about intention to change or changes made should be communicated on time for necessary adjustment by all concerned and the revised drawing produced to guide the contractor accordingly. When these procedures are followed carefully, the final as-built documents made available at the commissioning will be authentic and helpful for the preparation of the "facilities operation documents" (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).

Authentic as-built information is a handy tool for effective facilities operation, useful for training maintenance operatives, helping to locate essential services control points in case of emergency or repairs. It facilitates objective decision making when considering requests for alterations. The requests for alteration, modification or extension in the form of refurbishment or up-grade of structures are common experiences in Facilities Management in institutions of higher education.

Reasons include the need to provide adequate facilities to meet the need of growing numbers of students, keeping pace with technological development and compliance with prevailing legislation and standards (such as health and safety regulation or providing for the physically challenged). The exercise will be difficult if the facility does not have authentic 'as-built' information, more so if the facility has some historical significance (Barrett, 1993) which must comply with relevant conservation legislation (Cullingworth, 1985).

2.3.1 Facilities Operation Documents

The 'as-built' information and the operational records should be used to develop and update the 'Facility Operation Document'. According to Song *et al* (2002): "Designers and contractors who produce the building (as-built) documents often have little awareness of down-stream uses of the information", because the functions, features and fixtures of and in any facility change many times within its life cycle, thus the as-built information will not be adequate for effective operation. The facilities operation document should be comprehensive and dynamic reflecting the progressive situations of the facility which will continuously serve as input to produce new documentation output. In specific terms Clayton *et al* (1998) outlined that:

> Facilities documentation is a resource for planning repairs, shut-downs and other maintenance and operations activities. Drawings of the facility help personnel to identify cut-offs for distribution lines and equipment that will be affected…In cases where equipment is replaced, removed, or…rerouted, facility documentation may act as an input and output of maintenance and operations (Clayton *et al,* 1998: 6-7).

These volumes of information enable the maximal use of available facilities. The database should be available and able to be accessed easily for planning and timely decision making. The document could be used for work request management; equipment and facilities management; inventory control; purchasing and receiving; personnel management; safety and security control; labour productivity and liability tracking (processing and dispute resolutions) (Clayton *et al*, 1998). In this regard, "Before administrators can determine where their renovation and maintenance gaps are, they must have a clear understanding of what they have on their campuses" (Kennedy, 2008: 16). In the face of dwindling resources resulting in reduction in maintenance funding, a comprehensive database can enable institutions to develop long-term

budgeting for maintenance by following set priorities. Corroborating the importance of long term budgeting, Hayes (2006) observes that: "…whether a campus is urban, suburban or rural, it needs a periodic assessment, which puts campus planning into perspective and assists in the development of a multi-year budgeting tool" (Hayes, 2006:310). The content of specific 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.

Authentic and dynamic facilities operation documentation serves as an in-house tool for the facilities manager to manage his day to day operations, forward planning, budgeting and for objective management decisions.

2.3.2 Comprehensive reporting

The quality of reports emanating from the Facilities Management Unit affects the respect the unit earns from the organization it serves. Lavy (2008) demonstrates that facilities managers should progressively build up their report, complementing it with visual representation to enhance understanding and appreciation of their technical report. From the facility's history, Lavy states that he was able to determine the Facility Condition Index with which he developed a ten years forward planning and the financial requirement for three scenarios of facilities conditions, as shown in **fig. 2.4.**

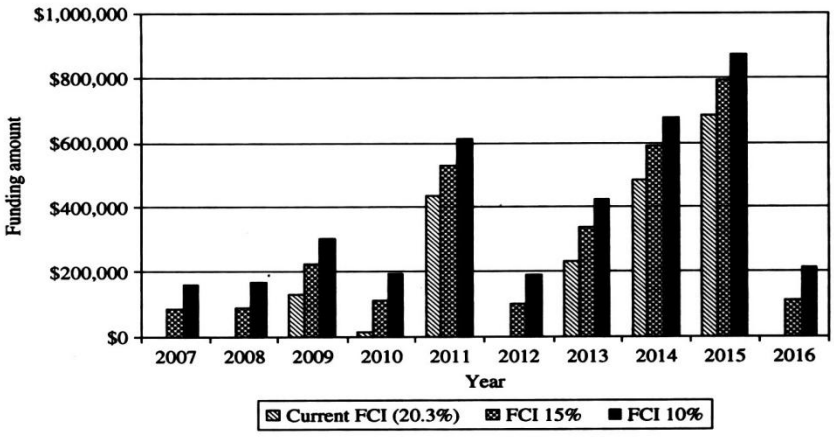


Fig 2.4 Chart for funding required for three different facilities condition indexes. (Lavy, 2008:312)

Adapting the concept of Life Cycle Cost analysis (Lavy, 2008), the Facilities Manager is equipped to inform his client on the relationship between construction cost, maintenance and renewal cost as they affect effective operation of a facility. This could enhance budgetary allocation for facilities operations. From Lavy's report, **fig. 2.5**, it is clear that maintenance cost throughout the life cycle of the facility is four times the cost of construction; 59.8% vs. 17% (Lavy, 2008: 313).

Building system	Construction $US	Construction Per cent	Maintenance $US	Maintenance Per cent	Capital renewal $US	Capital renewal Per cent	Total LCC $US	Total LCC Per cent
Structure	3,784,761	39.9	3,590,128	10.8	0	0.0	7,374,889	13.2
Exterior	997,168	10.5	3,026,843	9.1	626,481	4.8	4,650,492	8.3
Interior	1,491,057	15.7	5,409,035	16.2	3,950,363	30.6	10,850,455	19.5
Services	3,211,548	33.9	21,324,751	63.9	8,342,701	64.6	32,879,000	59.0
Total	9,484,534	100.0	33,350,757	100.0	12,919,545	100.0	55,754,836	100.0
Percentage of total	17.0		59.8		23.2		100.0	

Table III.
LCCs of the four major building systems

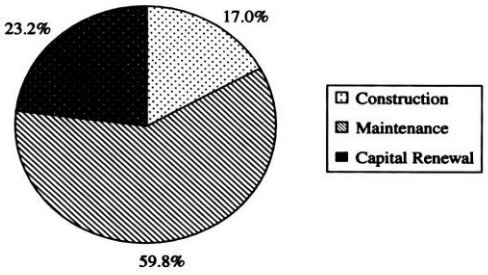


Figure 4.
LCC of the building

Fig 2.5 Statistics and chart of LCC of the building (Lavy, 2008:313)

The periodic reports from the office of the facilities manager should contain concise information about the facilities history, the functional state of the components condition, and the operational and projected plans for managing the facilities. This facilitates objective management decisions in many respects including adequate budgetary allocation.

2.3.3 Information Technology in Facilities Management

There is a steady increase in the volume of literature on the use of information technological tools in Facilities Management. Computerized Maintenance Management System (CMMS) and Computer-Aided Facilities Management (CAFM) are common acronyms used to describe the numerous IT tools for Facilities Management. Though there is a wide variety of a system in the market, the choice of appropriate tool should be guided by the organization's goals and aims of Facilities Management (Rycroft, 2006). The Facilities Manager needs to see these systems as

tools (Smith, 2003; in Best et al 2003) that need to be carefully selected and operated with dedication in order to achieve the desired results (Rycroft, 2007). Facilities Management IT tools are becoming popular, allowing organizations to maximize the value of Facilities Management services and facilitates; "responding to service requests, managing property portfolios, creating the FM strategic plan, searching for information, verifying data, and interacting with other organizational systems" (APQC, 1998:6), "… making them Web-enabled and linking them to other, traditionally separate, management function" (Smith, 2003; in Best et al 2003: 104).

The Facilities Manager can use more than one system to manage the facilities within his portfolio as being practiced in the management of the Vodacom campus in South Africa. The complex is managed using the 'Archibus system, but the building management system is based on Alerton BACtalk equipment. The system is run independently of the Archibus system' (Rycroft, 2007:21).

2.4 Assessment of Facilities Management performance

There are several management tools and areas of concentration while measuring the performance of a Facilities Management Unit in order to determine its contribution to the core business of the organization it serves. Some common management tools being used include, performance measurement (Amaratunga and Baldry, 2002; Amaratunga and Baldry, 2003; Pitt and Tucker, 2008), activity measurement (Ismail, 2010), balance score-card (Walker, 1996; Umashankar and Dutta, 2007; Brown and McDonnell, 1995; Kaplan and Norton, 1992), and benchmarking (Loosemore and Hsin, 2001). These management tools could be used to measure the general performance of the Facilities Management Unit while some are most suitable for assessing customers' satisfaction (Walters, 1999; Loosemore and Hsin, 2001; Tucker and Pitt, 2009; Kaplan and Norton, 1992). Facilities Management customers include senior management and the complementary units responsible for the execution of the core functions of the organization. The customers' satisfaction can be measured through realistic evaluation of Facilities Management performance at the work place interface, where the output of Facilities Management activities serves as input to other units which in turn determine their output in the performance of the core functions of the organization.

Adopting the 'knowledge-base' management tool at the work place interface there is the need to create what Carder (1995) refers to as "informed interface" which requires:

> …taking the tasks of analyst, adviser and educator of the customer, this interface role is increasingly needed between the customer and operational management and delivery services. The interface role will be required to understand and use both business and facilities information, combined to create organization-specific workplace knowledge (Carder, 1995: 8).

A second factor differentiating this method of measurement from others is that, "… the focus for measurement is on effectiveness, not on internal efficiency of the Facilities Management process" (Carder, 1995:9). Senior management of any organization is not interested in elaborate structure or sophisticated technology but functional operation and management of strategic systems (Bourne et al, 2005) at the workplace interface that produce tangible and timely results. The dynamic update of operational and management records as well as joint monitoring of the key performance indicators guarantees that:

> …the FM organization which creates and continuously updates this new performance knowledge will be equipped to provide the role of analyst, adviser and educator… which is increasingly being demanded by the customers. Moreover, FM with this ability will be able to defend their position as operational managers (Carder, 1995: 11).

In the typical workplace interface, the contribution of Facilities Management can be represented in the generic form of 'location, buildings and plant, information technology or transport, people and others' (Carder, 1997:84). The generic environments are used as 'input' factors in Carder's (1997) graphical demonstration of the relationship between the workplace infrastructure system and the core business system **(fig 2.6).**

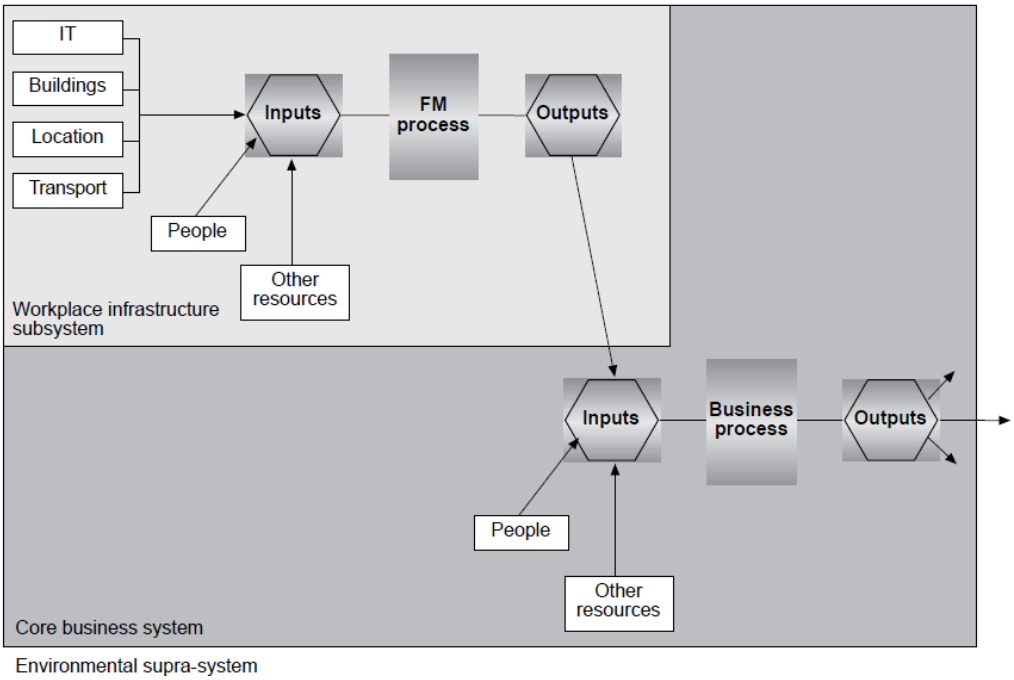


Fig 2.6.Graphical representation of workplace interface (Carder, 1997:87)

The actual services provided by the Facilities Management Unit can be fed into the above model as 'inputs' processed through the Facilities Management structure to obtain the 'outputs'. In the university environment, the 'outputs' from the performance of Facilities Management service serves as 'inputs' for the performance of the core function by other units (lecturers and laboratory staff), to produce the effects they have on the 'business process' (teaching and research) in order to determine the quality of graduates and research outputs of the academic staff weighed against the goals of the university, and thereby competitive advantages within the community of universities. This analogy helps to challenge the facilities manager to see his or her role as crucial to the success of the core objectives of the teaching and research in the university setting and be propelled to develop functional lecture rooms, general and specialized laboratories, workshops, suitable working environment and functional service.

Another tool for measuring performance, known as the 'balance scorecard', has been described as an 'airplane cockpit: it gives managers complex information at a glance' (Kaplan and Norton 1992). It seeks to measure the performance of an organization from four interrelated perspectives by addressing four relevant questions. The perspectives and questions are:

1. Financial Perspective: How do we look to shareholders?
2. Customer Perspective: How do customers see us?

3. Internal Business Perspective: What must we excel at?
4. Innovation and Learning Perspective: Can we continue to improve and create value? (Kaplan and Norton, 1992:72).

The balance scorecard can be used to measure performance in any organization. Applying the balance scorecard for performance measurement in the hospitality industry, Brown and McDonnell (1995) identified the following key implications:

1. The scorecard emphasizes vision, strategy, competitive demands and the need to keep organizations both looking and moving forward - rather than the more traditional focus on control;
2. A properly designed scorecard should help management to understand the many important interrelationships within their organizations, which more traditional measures generally mask or even ignore;
3. The development and implementation of a balanced scorecard require the involvement of a range of senior managers and not just the organization's financial executives (Brown and McDonnell, 1995:9).

In the same sense, the four perspectives of the balance scorecard can be adapted to measure the performance of Facilities Management in higher education institutions at a strategic level. However, at the operational level, the "Customer Perspective" and its accompanying question: "How do customer see us?" could be used to measure the customers' satisfaction in the provision, operation and management of teaching and research infrastructure. Generally:

> …customers' concerns tend to fall into four categories: time, quality, performance and service, and cost…The combination of performance and service measures how the company's… services contribute to creating value for its customers (Kaplan and Norton 1992:73).

The Facilities Manager should develop creative ways of sampling the customers' satisfaction in terms of his response time, quality of service and the cost incurred. Specifically, in the university setting, he requires soft management skills to develop the needed atmosphere between his academic counterparts for effective management of teaching and research facilities.

2.4.1 Benchmarking

The periodic exercise of ranking the performance of universities against each other local or internationally, in effect, measures the excellence of the university (Taylor and Braddock, 2007) in specific or general terms. Practically, the quality of teaching and research are the fundamental issues generally referred to when discussing the excellence of a university. While excellence of a university attracts both staff and students to a particular institution, the standard, quality and functionality of the support facilities "creates suitable, conducive and adequate environment that can support, stimulate and encourage learning, teaching, innovation and research activities" (Lateef, *et al*, 2010: 77). The concept of 'benchmarking' presents an effective management tool that enables the Facilities Management Unit to continuously measure the performance of the support facilities. Here the Facilities Management Unit measures its performance against similar institutions in order to identify areas of continuous improvement that will enhance the ranking of its university in the community of universities.

Benchmarking has been described in different ways in the literature. Although benchmarking has been widely practiced in the west, it was initially viewed skeptically in the Asia Pacific region (Ho *et al*, 2000), but has become an accepted tool for performance measurement in Facilities Management practice worldwide. Varcoe (1996) citing Watson (1993) defines benchmarking as: "a continuous search for the application of significantly better practices that leads to superior competitive performance" (Varcoe, 1996). Ho *et al* (2000) simply describe benchmarking as a tool that serves both the purposes of helping companies to have an external focus and find industry best practices by constantly comparing their own performance against that of others. In the general usage of the word, benchmark:

> …involves identifying a point of reference (a benchmark) which serves as a standard against which relative performance may be judged. The point of reference may be internal to an organization or external in relation to competitors or 'best practice' (Loosemore and Hsin, 2001).

A more generic definition of benchmarking is that provided by Wauters (2005) citing Williams (2000) as: "a process of comparing a product, service process - indeed, any activity or object - with other samples of a peer group, with a view to identifying 'best buy' or 'best practice' and

targeting oneself to emulate it" (Wauters, 2005: 143). The implications of benchmarking could be summarized thus: a process of constantly comparing own performance against superior performances within a peer group of best practice. To achieve positive results from benchmarking requires commitment and investment from both senior management and operation personnel of the Facilities Management Unit.

A successful benchmarking exercise requires the following components:

- The Facilities Management Unit must understand the goals the organization wishes to achieve within the given time frame, as well as full understanding of what needs improving and by how much (Varcoe, 1996).
- Authentic and dynamic database for computation, analysis and comparison with peer group (Varcoe, 1996; Wauters, 2005).
- A constant reminder that since 'the best do not stand still', improvement should be a continuous process (Varcoe, 1996).
- The selection of peer group members is very critical to the success of the exercise. The peer group must have identical features and the best in the chosen field from anywhere in the world (Varcoe, 1996; Williams, 2000; Wauters, 2005,).
- Select appropriate parameters for the benchmarking exercise (Wauters, 2005).
- The benchmarking exercise must be properly funded (Varcoe, 1996; Loosemore and Hsin, 2001).

Similar to other Facilities Management tools, benchmarking should not be seen as a 'quick-fix' solution (Varcoe, 1996) but an exercise that requires commitments to succeed. The potential factors that would affect the results include level of competence, capacity and capabilities of the operating personnel, quality of data and commitment to their analysis. In South Africa, the forum of Higher Education Facilities Management Association could be used as launch pad to start a vibrant peer group for the progressive development of all higher education institutions in the region. Individual institutions could adopt other peer groups elsewhere to improve and achieve their set goals.

The Facilities Management Unit would need to adopt the 'SMART' principle to remain focused (Varcoe, 1996, McNeeny, 2005). The acronym SMART means:

S= Specific

M= Measurable

A= Attainable

R= Realistic

T= Time frame

This principle encourages the facilities manager to set definite goals, with appropriate milestones, aimed at achieving the objectives set out in the benchmark. These goals could be simply referred to as 'Key Performance Indicators'.

2.4.2 Key performance indicators.

Key Performance Indicators, or performance matrices, are specific standards of performance measures "…used to compare the performance of one benchmarking party against the other…quantify performance and provide a common platform on which comparisons can be made" (Ho *et al*, 2000: 546). They are milestones, significant and measurable, set by organizations adopting the SMART principle. These specific indicators are sensitive to each institution depending on the effect the facility has on achieving the benchmarks and objectives of the organization. Deru and Torcellini (2005) in Lavy *et al* (2010) explain that:

> … relevant, clear, compatible, and authentic performance metrics facilitate the understanding of driving forces of a building's performance, assist designers in creating efficient facilities, and support owners in operating buildings in an efficient manner, as well as help management and decision-makers take necessary steps and track performance (Lavy *et al*, 2010:444).

The literature presents a variety of classifications for the Key Performance Indicators most appropriate for the benchmark and objectives of the subject they are addressing: there is yet no ideal list. Lavy *et al* (2010) demonstrate that several authors have categorized these indicators into four categories, namely customer relations, Facilities Management internal process, learning and growth, and financial implications (Amaratunga and Baldry, 2003). This classification presupposes that the four perspective and related questions in the balance scorecard (Kaplan and Norton 1992) can be adapted as performance indicators. A long list of 172 Key Performance

Indicators developed by Hinks and McNay (1999) are further classified under eight categories thus: business benefits, equipment, space, environment, change, maintenance/services, consultancy and general (Lavy *et al*, 2010:445). Three out of the four categories into which the synthesis of these divergent indicators are classified (Lavy et al 2010) are most relevant to a typical Facilities Management Unit in any university committed to providing suitable support facilities for the execution of the core functions of teaching and research. These categories are:

1. **Financial indicators** which relate to costs and expenditure associated with operation and maintenance, energy, building functions, real estate, plant, etc.
2. **Physical indicators** which are associated with the physical shape and conditions of the facility, buildings, systems and components;
3. **Functional indicators** which are related to the way the facility and the buildings function and which express building appropriateness through space adequacy, parking, etc.

It is worth noting that these three indicators govern the traditional aspects of Facilities Management, while "learning" and "customer focus" are more aligned with recent management philosophy such as Total Quality Management.

The facility's history is useful in developing the details in each of these major indicators. The standards thus developed should be incorporated in all contractual instruments used in executing all operational functions by the Facilities Management Unit. Depending on the level of deferred maintenance and the condition of components and facilities, these standards should be developed in stages and executed in phases (McNeeney, 2005). Comprehensive reports of progress should be communicated to senior management regularly with forward plans for the next phase.

2.5 Facilities Management practice in Universities

Facilities Management being an emerging profession, there is limited literature specifically on the practice of Facilities Management in higher educational institutions. In practice, the organizational structure, operation methods and functions of the Facilities Management Unit in any university is as dynamic as the university it serves but determined by many factors that include: age of infrastructure; size of the university; multi-campuses; response to demand in the increase in student enrolment; and new technologies. Another determinant is the recognition accorded Facilities Management by senior management of the respective universities (Housley,

1997). The structure can be as simple as a three or four layer leadership structure or as complex as a multi-layered structure with both vertical and horizontal relationships. Facilities Management in the educational institution is unique compared to other sectors in many ways but not limited to the following:

- The product of its teaching and research requires long term and dedicated consistency in its development to be able to be competitive;
- The operators of the core functions of teaching and research are able to improvise to make up for the low performance from units, such as the Facilities Management, in order to execute their function; and
- In many educational institutions, the operators of both the core and support functions are yet to embrace the philosophy of mutual collaboration that would facilitate the achievement of the goals or objectives of the institution.

In this section, the Facilities Management Units in two universities where there is literature published in academic journals of Facilities Management operation are first examined; followed by a brief evaluation of other universities based on information obtained from their web sites.

2.5.1 Organization and structure

The Facilities Management Units in different universities are developing dynamic management systems to ensure that there is improved services delivery so that the core objectives of 'teaching and research' are achieved.

a. Texas A&M University, USA.

The research report of Lavy (2008) reveals that the Facilities Management structure in Texas A&M University could be referred to as a 'decentralized' management structure where the day to day operational functions of Facilities Management are localized at the level of the faculties and units and coordinated by the 'office of the Vice President for Facilities' at the University. In his report:

> The organizational structure of the FM department is headed by the dean of the engineering department, who makes the final decision when it comes to large projects and space allocation. Then, the facility and head technician laboratory manager acts as

> the facility manager. Assisted by a secretary, he is responsible for the daily tasks, doing everything necessary to meet the facility's needs. The technician is second in charge, and he is responsible for four other lab technicians, and five student workers. The work is distributed among the lab technicians, while the student workers help them with small tasks. The FM department in this building does not have any strategic planning or tactical planning. At this point, their objective is to maintain the building as well as possible with resources available. (Lavy, 2008: 307)

The advantages of this approach include: the provision of prompt solutions to identified problems; the burden of Facilities Management is distributed across faculties and units; the faculties and units own and bear responsibility for their facilities; it encourages multi-skill allowing laboratory staff to carry out minor repairs; only major or complex requests are referred to the central Facilities Management Unit or an outsourced agent. Though the Facilities Management Unit is able to provide quick response, the lack of strategic or tactical planning (Lavy, 2008) means that they practice reactive maintenance only and the facilities operation is not effectively coordinated by the office of the Vice-President. Lavy observes that although the performance level through the present arrangement seems satisfactory, it could be improved upon by adapting modern Facilities Management tools, such as planned or scheduled maintenance and benchmarking coupled with effective coordination of the respective Facilities Management Units by the office of the Vice-President for facilities.

> Finally, there is a need to improve communication between the university level facility maintenance and individual facility maintenance managers in order to track and implement programs, reduce redundancy, and strategically plan for the building as part of the overall campus (Lavy, 2008: 314).

b. University of the Free State, South Africa

The first building was constructed in 1905 but since the 1960s very few new buildings have been constructed on the campus. The focus traditionally had been on maintenance as opposed to real strategic optimization of all physical resources (Rycroft, 2006). The University of Free State is one of the universities that have promoted the concept of Facilities Management Unit from "basement to board room" (Becker 1990 in Lunn and Stephenson 2000) by including the position

of the director in the top management structure of the University. The Facilities Management Unit in the University of Free State is known as the Physical Resource and Special Project Management Department, "which is responsible for the provision and maintenance of all physical resources on the campus, from the lawns to laboratory equipment" (Rycroft 2006: 38).

The physical resources division executes both soft and hard Facilities Management functions:

> The physical resources section is responsible for building services such as cleaning and waste removal as well as horticultural services and hard surface maintenance (roads and pathways, among others). They also handle building and property insurance as well as space utilization audits and assessments. (Rycroft 2006: 39).

The Facilities Management Unit in the University of Free State has the full complement of in-house resources and selected specialized services providers. The operational services are executed through:

> …well established and run workshops, and outside contractors are only involved when specialized work is required…the reason for this is that in-house people have knowledge of the installations that you could not obtain from an outside contractor" (Rycroft, 2006: 39).

In this process, the Facilities Management Unit is contributing to skills development through job security, quality employment, working implements and materials suitable for the task, and suitable workplace interface that guarantees maximum productivity (Knopp, 2005; Carder, 1997).

2.5.2 Recognition of the Facilities Management Unit.

The recognition given to the Facilities Management Unit affects its performance. If Facilities Management is viewed as providing purely technical services with no significant strategic management relevance, the unit will provide mostly reactive service to the business of the organization. The survey of Facilities Management practice in some institutions of higher education in the UK by Housley (1997) suggests some factors that might influence the positioning of Facilities Management in any organization, namely:

- Professional status of the estates manager;

- Reporting line of the estates manager;
- The frequency of meeting with senior management;
- How the performance of the estates department is viewed by the institution (users and senior management);
- The importance given to the estates function in comparison with other functions and activities by senior management;
- The standard of communication between senior management and the estates department at the management interface (Housley (1997: 74).

In a typical university, the status of Facilities Management and its staff is also determined by the Vice-Chancellor and the director. Thus, if the Vice-Chancellor sees the role of estates as a resource management issue and the director agrees, then the estates unit will be a key player in the institution and it would be likely that the director of estates would be a member of the senior management team (Housley, 1997: 75).

Housley is in agreement with other authorities in the field of Facilities Management that facilities managers need, in addition to cognate technical qualification, good management skills. The professional qualification, competence of Facilities Management personnel, the quality of reporting, and communication with senior management affects the rating of Facilities Management Unit in any organization including universities.

2.5.3 Strategic planning and capital development

Estate strategy, as embodied in the strategic development plan, is the blueprint that maps out the direction of general and specific development plans of the institution within a defined time frame. The plan has Key Performance Indicators that enable the operators to monitor progress at any given time. There are diverse opinions as to which organ of the university is most suitable to prepare this plan. According to the research report of Housley (1997), the academics "…see property (facilities management) as a liability taking money from the teaching process," while the opinion of the estates director is that the strategic plan should be driven by academics; saying:

> …if the estates strategy is developed by the property (facilities management) department it becomes property led and some issues may eclipsed. If it is developed by the finance

people it becomes financially led. Neither of these is correct because essentially it has got to be business led and driven by the academics (Housley, 1997: 79).

Housley argues that an effective and functional strategic plan should be the product of the joint effort of the academics and all the service units in the university to ensure active participation in the execution of the activities necessary to ensure the accomplishment of the aims and objectives of the university.

2.5.4 Integration and management interface

Effective management interface requires that senior management maintains cordial relationships between it and the executing units as well as fostering interdependent relationships between the constituting executing units (Housley 1997; Carder 1995; Carder 1997). This approach facilitates each unit having a vertical relationship with the senior management and horizontal relationship with other service units. Regular meetings, reporting and communication in the two directions help to clarify any misalignment(s) of any constituent unit with the institution's aims and objectives (Housley, 1997).

The advantages of effective management interface include:

- Clear institutional aims;
- Communication of these aims to all groups within the university;
- Providing satisfactory relationship between senior management and all other groups; and
- Fostering effective communication between all groups in addition to the one each group has with senior management (Housley, 1997:79).

The atmosphere created by this relationship reduces the problem of differing groups working together from misinterpreting the organization's aims and objectives. The interface encourages the formation of synergy for the achievement of the aims of the organization, as exemplified by Housley (1997:82) in the model shown in **fig 2.7**

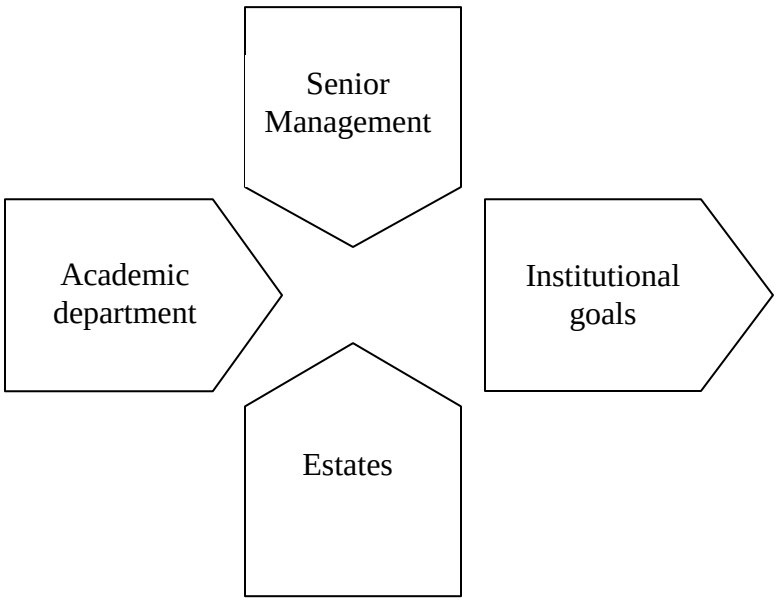


Fig 2.7 Management interface (After Housley, 1997:82)

2.5.5 Primary sources

Information in this section has been sourced from the website of the respective university, they are not academic papers. The information gleaned from them indicates the fact that Facilities Management Units differ in structure and function from one organization to another. The universities referred to in this section include three universities listed among the top ten universities of the world and three not listed among the top 200 universities in the world.

a. Yale University

The Facilities Management Unit in this University is simply described as:

> The Office of Facilities is responsible for the maintenance and operation of existing campus buildings as well as the planning, design and construction of new buildings. http://www.facilities.yale.edu/...

The structure of "The Office of Facilities" is a single unit with two main divisions. The two divisions are: Facilities Operations (FACOPS), responsible for the general maintenance and operation of support facilities in the entire University, executing its functions through five sub-divisions who in themselves have other sub-divisions (http://www.facilities.yale.edu/...l); and Facilities Planning and Construction (FACPC), responsible for Capital Project Planning and

Construction of support facilities including installation of new equipment, operating through two sub-divisions (http://www.facilities.yale.edu/...).

b. Massachusetts Institute of Technology (MIT)

The Facilities Management Unit in MIT is elaborate. The unit is known as MIT Department of Facilities, which sees itself as the "steward of the campus…to preserve and protect MIT's physical assets…with over 600 employees working in six divisions…" (http://web.mit.edu/...). The six divisions are: Business Resources; Campus Planning and Design; Engineering; Operations; Project Management (Design and Construction); and Utilities. Each division has multiple sub-divisions. The web page is well developed with concise and progressive information about the operation of each division available to the entire University community and some specific information accessible to the Facilities staff only. The unit promotes capacity building.

c. Imperial College, London

The Facilities Management Unit in this college is elaborate. The umbrella organization is known as "Estate Group". The two divisions within the Estate Group responsible for development, operation and maintenance are: Capital Projects and Planning Division; and Facilities Management and Property Services Division. Each division has multiple sub-divisions, mission statements and objectives to achieve.

The mission statement of the Facilities Management and Property Services Division reads thus:

> The Facilities Management and Property Service Division aspire to provide quality facilities and support services to academic staff, student and visitors to the College. We will endeavour to deliver innovative solutions in a safe, functional and cost effective manner whilst respecting the physical environment of our campus.

The stated objectives and strategies for accomplishing the objectives are:

> The Facilities Management Department has specific responsibilities to protect and maintain the College's property portfolio. This will be accomplished by:
>
> - Being customer-focused at all times
> - Understanding the needs of our customers
> - Working to agreed and defined service level

- Ensuring good value for money
- Understanding the College's business needs. http://www3.imperial.ac.uk/....

The Capital Projects and Planning Division use the Framework Contract instrument for the procurement of its capital projects with defined Key Performance Indicators established for the review and monitoring of individual project. "Each Framework Partner will be assessed according to their management of cost, time, quality and resources across all current projects" (http://www3.imperial.ac.uk/...). The result of each evaluation is discussed by the relevant stakeholders including the college administration. Excellently performing partners are commended while consistently poorly performing partners become the subject of review.

d. Facilities Management University of Virginia

The website simply describes their function thus:

> Facilities Management provides construction, renovation, maintenance and repair, utilities, grounds' care, custodial, trash and recycling and other services for University building and facilities. www.fm.virginia.edu

Though this may appear simple, their organizational structure shown in **figure 2.8** is complex with seven sub-divisions at directors' level, namely:

1. Finance.
2. Human Resources and Training.
3. Information Systems.
4. Energy and Utilities.
5. Facilities Planning and Construction.
6. Health System Physical Plant.
7. Operation and Maintenance. www.fm.virginia.edu/...

Divisions 4-7 have between six and twelve sub-divisions, with a portfolio for "Academic" under the 'Facilities Planning and Construction'. This portfolio is expected to foster a two way communication between the entire Facilities Management Unit and the academic counterpart. The Operation and Maintenance Division has another five sub-divisions namely:

1. Building Services.
2. Landscape

3. Work Management
4. Project Services
5. Facilities Maintenance

The sub-divisions 3-5 have between three and five other sub sub-divisions and are led by 'Assistant directors'. All positions in this elaborate structure are fully staffed. One can conclude that Facilities Management in this institution is recognized and incorporated into the top strategic management level. The University is maintaining this elaborate structure realizing that their expensive infrastructure needs excellent management to keep it all in good working in order to consistently support the core functions of the University.

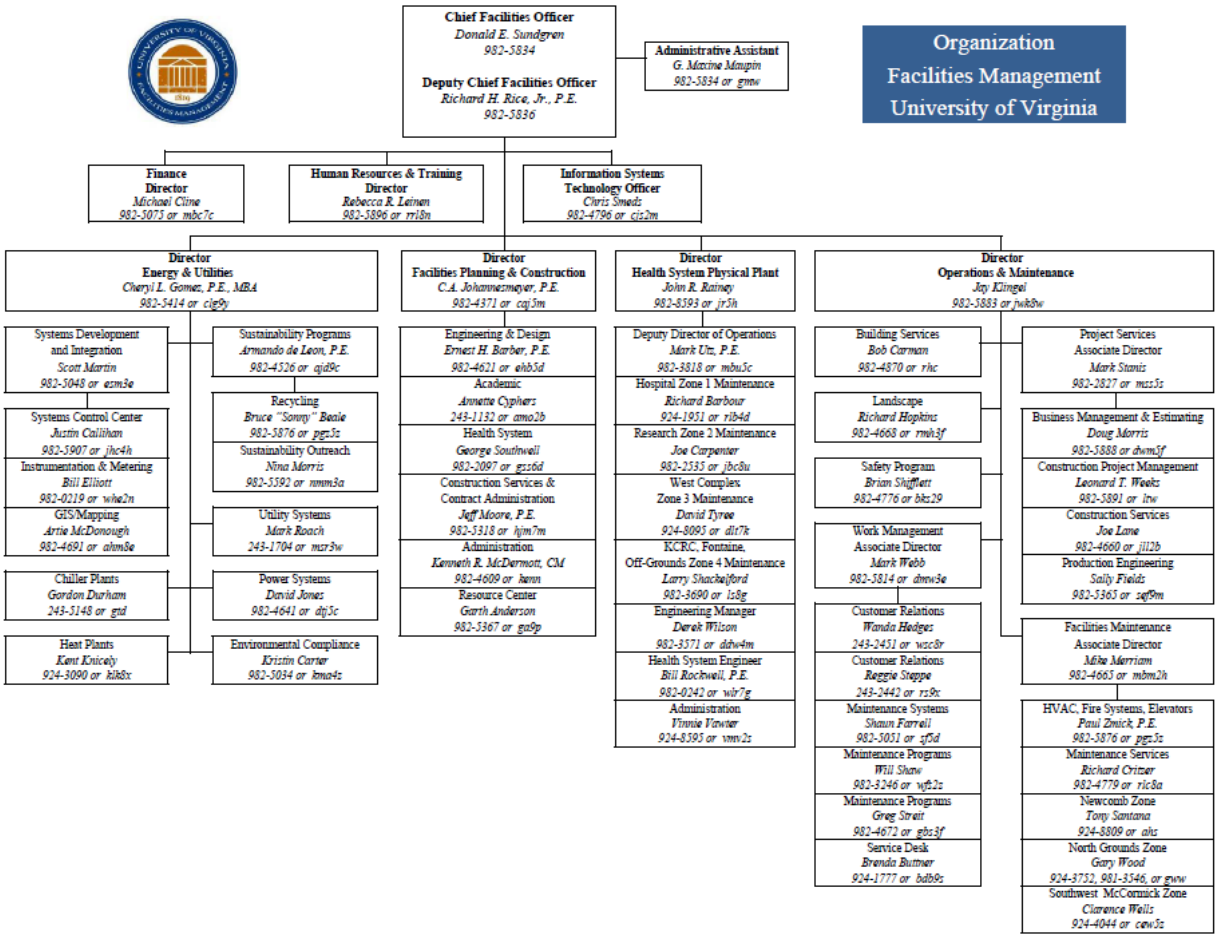


Fig.2.8 Facilities Management University of Virginia (www.fm.virginia.edu/docs)

e. Indiana State University Facilities Management.

The Facilities Management Unit of Indiana State University website reads thus:

> **Who we are**:
>
> Facilities Management is one of the oldest and largest departments at the University. Since inception on July 1, 1921 it has grown to include over 200 employees working in several divisions, including University Mail Services, University Fleet Management, Power Plant Operations and Maintenance, Grounds Maintenance, Custodial Services, Waste Management/Recycling Services, Building Operations and Maintenance, and Planning and Construction.
>
> **What we do:**
>
> Facilities Management plans, develops, and maintains the University's physical environment and provides services which enhance Indiana State University's mission of teaching, research, and public services in support of our students, faculty, staff and visitors. In doing so, we are constantly seeking creative, visionary and innovative solutions to better meet the needs of our campus while striving to create, promote, and maintain a safe and healthful campus. (www.indstate.edu/facilities,)

The organizational structure, **figure 2.9,** is simple with two broad divisions, namely:

1. Capital Planning and Improvements.
2. Operational Services. (www.indstate.edu/)

Each division has multiple subdivisions executing different support functions. This structure is similar to Facilities Management Units in many universities in Africa. In some institutions, the two divisions exist as separate and parallel organizations with few horizontal relationships. The trend and best practice, the world over, is to have all Facilities Management providers within an organization under the same umbrella for maximum productivity and collaboration. Thus the Facilities Management Unit can proactively support the core functions of the institution.

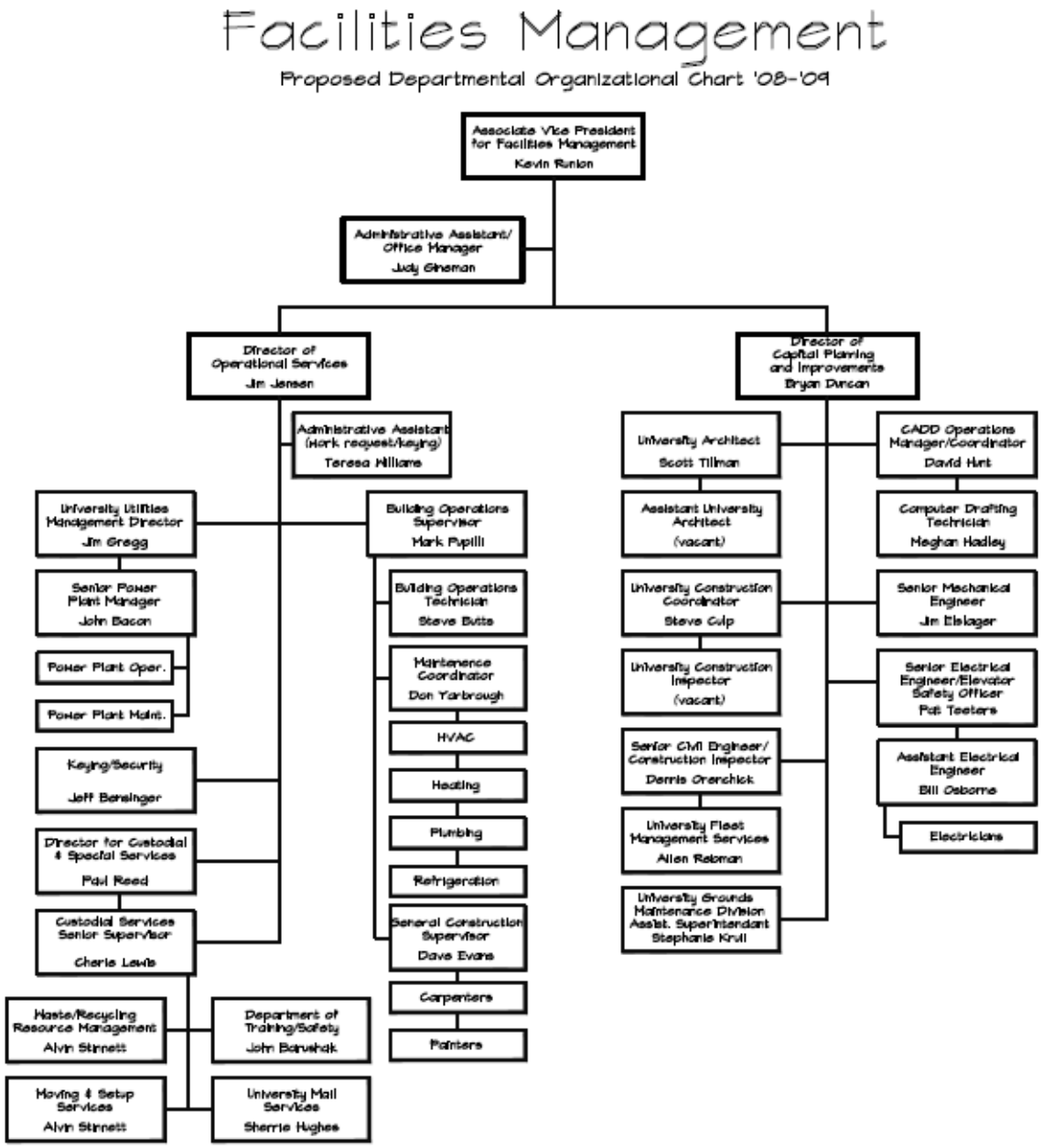


Fig. 2.9 Indiana State University Facilities Management Unit (www.indstate.edu/facilities,)

f. Facilities Management, University of Pretoria.

The University of Pretoria, established 1908, is among the more highly rated universities in South Africa with multi-campuses spread across three provinces at considerable distances from the main campus. This poses some challenges to the Facilities Management Unit.

The vision and mission statement of the unit are as stated below:

Vision

To be a quality driven leader in higher education estate and Facilities Management that benchmark nationally and internationally.

Mission

As a provider of integrated infrastructure and services the Facilities Management Department's mission is to contribute innovatively and cost effectively to the University (UP) by:

Facilities and Infrastructure

- Planning and accounting for all estates and facilities
- Providing customized buildings, sports fields and estates that satisfy the requirements of students, staff and visitors
- Maintaining this infrastructure to a high level of readiness

Service delivery

- Keeping the environment clean, hygienic and aesthetically pleasing
- Ensuring efficient utilization of facilities
- Providing specialized services like furniture, transport, stores, safety, health and environmental management

Additional income

- Sell or rent excess capacity to other clients. (http://web.up.ac.za/)

The Facilities Management Department comprises four broad divisions, each with multiple sub-divisions. The divisions are:

a. Planning and Administration
b. Project Management (Capital Project)
c. Campus Services
d. Maintenance and Operations. (http://web.up.ac.za/)

The presentation of its vision, mission statement, and identification of its role, services and the organizational structure (www.up.ac.za) suggests that the Facilities Management Department of the University of Pretoria has worked its way from 'basement to board room'. The structure is similar to current best practice of Facilities Management Units in the world.

Table 2.1 Comparison of Facilities Management Units in universities

University of	Organizational Structure	Mission statement	Functions	Execution of operation functions	Customer relations
Free State	Single organization with two divisions.	No clear statement	Soft and Hard FM services	More by in-house	Not clear but seems adequate
Imperial Coll.	One org. two divisions &multiple sub-divisions	Yes	Soft and Hard FM services	Both in-house & service providers	Has feedback loop
Indiana State	One org. two divisions &multiple sub-divisions	Yes	Soft and Hard FM services	Both in-house & service providers	Has feedback loop
MIT	One org. six divisions and multiple sub-divisions	Yes	Soft and Hard FM services	Both in-house & Service providers	Has feedback loop
Pretoria	One org. four divisions & multiple sub-divisions	Yes	Soft and Hard FM services	Both in-house & Service providers	Has feedback loop
Texas A&M	Single structure but independent divisions	None	Reactive functions	In-house	Seems adequate
Virginia	Single org. seven divisions & multiple sub-divisions	Yes	Soft and Hard FM services	Both in-house & service providers	Has feedback loop
Wits	Multiple independent divisions	CDP has but others not certain	Soft and Hard FM services	Service providers only	No feedback loop
Yale	Single organization with two divisions and multiple subdivisions	Somehow	Soft and Hard FM services	Not stated	Has feedback loop

Some common features of the Facilities Management Units in these Universities that are absent in the structure and operation of the University of the Witwatersrand include the concept of performing Facilities Management functions through a single umbrella organization with multiple main and sub-divisions, clear mission statement of the unit and a feedback loop from the customers**.**

2.6 Research gap

Several attempts have been made at assessing the performance of the Facilities Management Unit in institutions of higher education but most of the efforts have been tailored towards some particular aspects of Facilities Management practice and infrastructure but none of the reviewed

literature on Facilities Management in higher educational institution were specific on the clients' assessment of the contribution of the unit towards achieving the core objectives of teaching and research. Amaratunga and Baldry (2000) writing on "Assessment of Facilities Management performance in higher education properties" focus attention on the quality of the physical facilities saying:

> The … research attempts to build from the broad principles of facilities performance evaluation by developing a methodology for assessment of a facility's ability to satisfy the objectives of teaching within universities…It is hoped that the collection, interpretation, and analysis of information about performance measures of facilities will provide the key to better planning and design for the future (Amaratunga and Baldry, 2000:294).

The work of Lavy (2008): "Facility management practice in higher education buildings," places emphasis on the management of the 'building portfolio and the environment' and further suggests some practical steps for effective Facilities Management operations. In his words:

> Business success is characterized not only by annual revenue and profit margins, but also by the way various aspects of the building portfolio and environment are maintained: monitoring daily maintenance, operations, and energy consumption; conducting assessments and benchmarking studies; adapting and aligning with policies; and assisting with the implementation of the organistion's strategic and tactical planning (Lavy, 2008:303).

The research report of Housley (1997), "Managing the estate in higher education establishments", gives priority to the importance of the physical properties of the institution and the need to invest and manage them effectively for the support of the core objectives of the institution. He postulates that: "Cost is not the only reason for giving property high profile…the organization needs to be informed about its property, and the person(s) responsible for property must understand the business that the property resource is supporting" (Housley, 1997:72).This author develops the 'management integration interface' model in Fig 2.7, encouraging the administration to create atmosphere that could foster conducive relationship between the

academics and estate department to align their estate strategy towards achieving the institution's objective.

The gap observed in the above literature which form the focus of this research, is the assessment of how the University administration and academic components view the contribution of the Facilities Management Unit in the achievement of the University's core functions of teaching and research, and attaining the goal of being among the top 100 universities of the world by the year 2022. The research also examines the constraints of the Facilities Management Unit and makes comprehensive recommendation that will facilitate the development of an effective 'workplace interface' necessary for the achievement of the institution's objectives.

2.7 Conclusion

The structure and functions of Facilities Management is as dynamic as the context in which it is operating. In many institutions of higher education, Facilities Management functions are performed through multiple independent divisions but the best practice championed by Jensen (2008) and being practiced in both developed and developing economies favours the concept of a single structure. Such structure can be a simple two-division, such as in the University of the Free State, a moderate four-division such as in the University of Pretoria, the complex two divisions of Indiana State University or the multi-division as at the University of Virgin. The single structure encourages both vertical and horizontal relationships within the Facilities Management Unit, thus enabling the unit to function more strategically.

There are different arguments in the literature supporting the idea that practitioners in the field of Facilities Management could come from any professional background but possess good management qualities. However, the stringent requirements by the professional bodies for certification of its practitioners suggest that general management skills alone do not suffice. Best *et al* (2003) and other authors note that the effective facilities manager needs both 'hard and soft' skills in technical and modern management. The practitioners require reorientation and continuous training to keep abreast with developments in the field. The majority of the literature on assessment of the performance of Facilities Management emphasizes the quality, detailed, informative and interactive reporting as effective tools of communication between facilities

managers and their clients as well as providing senior management with comprehendible information for objective decisions.

The decision to execute the whole or part of Facilities Management functions through an in-house or external service provider should be taken based on both the economic value and the effect of such decision on the core functions of the organization. Several sources advance reasons and methods of out-sourcing but Kleenman (1994), Hui and Tsang (2004) opine that 'out-tasking' is more frequently used than out-sourcing in the Facilities Management environment. The concept of 'partnership' being used in the development of capital projects is also being advocated by authors such as Campbell (1995). This enables the service provider to be proactive and form a strategic alliance with the organization. The performance of a service provider is best measured through a simple, detailed and functional 'Service Level Agreement'.

Though there is a wide variety of Facilities Management software on the market, the choice of the appropriate tool should be guided by the organization's goals and aims of Facilities Management. Rycroft (2007) and Smith (2003) advise that these systems should be seen as 'tools' that need to be carefully selected and operated with dedication. The advantages and principles of using Facilities Management software for design, documentation of facilities history and operations are supported by a wide range of authors. The edited facilities information could be posted in the local intranet (where available) in a format that is accessible to the clients. Effective use of these technological supports empowers the facilities manger in his daily operations, forward planning, budgeting, and comprehensive reporting.

Many authors write on assessing different aspect of Facilities Management practice but Carder (1997), Kaplan and Norton (1992) discuss assessing 'clients' satisfaction at the 'workplace interface'. The generic environments of the workplace, demonstrated by Carder (1997), act as support facilities and the quality of their functional state is used to evaluate the effect of support services on the core activities of the organization. In the university context, the quality and functional state of lecture and laboratory facilities serve as 'inputs' for the performance of the core functions of other units (lecturers and laboratory staff); these inputs produce the effects they have on the 'business process' (teaching and research) and determine the quality of graduates

and research outputs of the academic staff weighed against the goals of the university, as well as its competitive advantages within the community of universities.

Though there are active research efforts in many areas of facilities management, the gap observed in the reviewed literature that provided information on the Facilities Management operations in higher education institution, is that there is no specific research aimed at measuring the effects of the performance of the Facilities Management operations on the core functions of teaching and research efforts of the universities and its effect on the achievement of the specific goals of the university. This is the focus that the present research seeks to explore.

CHAPTER 3: RESEARCH METHODOLOGY

3.0 Introduction

The case study for this research focuses on the operation of the Facilities Management Unit of the University of the Witwatersrand (Wits) with special emphasis on its contribution to the University's core functions of teaching and research as perceived by the University administration and the academic staff. The case study approach of qualitative research was chosen because the method facilitates the sourcing of detailed information that would answer the research questions in order to achieve the research objectives. The information on the operation of Facilities Management practice in the University was obtained through the administration of a 'semi-structured' questionnaire to a selected sample of the University community complemented with interview. The participants were drawn from the University administration, academics, service providers and the management staff of the Facilities Management Unit. The information obtained from the operators of the Facilities Management Unit were corroborated with responses obtained from other respondents such as the University administration, academics and service providers in order to clarify issues and validate the information obtained. The survey questions were designed around four themes, namely: the Facilities Management evolution and structure; operational strategies; tools; and assessment by its customers. The questions were developed from the information gleaned from literature on best practices supplemented with further questions during the interviews in order to address the research questions and achieve the research objectives simultaneously.

The interview schedule was in three categories, the first category being a one and a half hour interview with the Deputy Vice-Chancellor, Dean Faculty of Engineering and Built Environment, the Directors Campus Development Planning, Property and Infrastructure Management Division and the Manager, Call Centre. The second category was a one hour interview with the Heads of Schools, staff responsible for the facilities function in each school, the Manager, Space and Venue Allocation and the campus facilities managers. The third category was a thirty minute interview with laboratory managers, School administrator and service providers.

3.1 Research Methodology

The use of case study method in qualitative research is well developed in literature as a reliable approach. The method allows for in-depth and accurate information (Lateef, *et al*, 2010) about a particular situation or phenomenon to be collected within its context (Green and Thorogood, 2009: 46). As this research is an evaluation of the practice of Facilities Management in a higher education institution, the research questions raised and the stated objectives of the research can best be achieved through a case study approach. This method allows the researcher to relate with the operatives directly involved in the subject matter being investigated (Yin, 1989), while the semi-structured questions facilitate the sourcing of additional information during the course of interview**.** Generally, the limitation clause included in case studies suggests that the recommendations made at the end of the study are most relevant to the particular context studied and may be useful in other situation with similar conditions. Otherwise any inference to generalization ought to be taken with caution. The population and quality of the research sample plays an important role in credible qualitative research. The population and sample size for this research will be discussed in the next section.

3.2 Population

The population for this research was drawn from the University of the Witwatersrand's administration, the academics, senior and middle level management staff of the Facilities Management Unit, the service providers as well as the legal unit of the University.

3.3 Research sample.

The research samples consist of the Deputy Vice-Chancellor Finance and Operation (DVC-F&O) representing the University administration; the Faculty of Engineering and Built Environment (EBE) was chosen to represent the academic population for the following reasons:

1. The faculty is one of the oldest faculties in the University and has old and new infrastructure that represent the development of the University.

2. The faculty is made up of professionals from the built environment who also train the operatives who provide leadership for Facilities Management; thus they will be in position to critique the operation of the Facilities Management unit objectively and with a depth of technical knowledge.
3. The research findings and recommendations will be useful to the faculty in developing new curriculum or reshaping existing ones to enhance the production of appropriately trained professionals to manage Facilities Management Units.

The sample selected as academic representatives are: Dean of the Faculty, heads of the seven schools in the faculty, the laboratory manager or the staff responsible for the Facilities Management function in each school and the school administrators. However, one school declined to participate because they were conducting similar research at the same time as this research. The Directors of Campus Development Planning, Property and Infrastructure Management Division, Campus Facilities Managers, the Manager Space and Venue Allocation, and Manager Call Centre represented the Facilities Management Unit. The service providers were selected from internal, external and specialized service contractors. The legal unit was also consulted for the legal framework of the operational contract agreements being used in the delivery of Facilities Management services.

There are no strict rules in literature specifying the sample size in a qualitative research, except that the sample must be truly representative (Green and Thorogood, 2009). Nevertheless, some proposals suggests "6-8 subject to homogeneous samples and 12-20 for maximum variation or when testing for disconfirmation" (Zyzanski, et al., 1992:233). However, including experts in the chosen topic can reduce the number of participants needed in a study (Jette, et al, 2003) and "the sample must be appropriate, consisting of participants who best represent or have knowledge of the research topic. This ensures efficient and effective saturation of categories, with optimal quality data and minimum dross" (Morse, et al, 2002: 18). Limiting the sample size to the Faculty of Engineering and Built Environment was to make use of respondents with expert knowledge in the profession who could easily relate to the research questions and provide objective answers and suggestions.

Qualitative research has been subject of criticism: the burden of proof of authenticity demands that the researcher should justify the validity, reliability of the source and content of information, as well as the findings. It is important that the conclusions are verifiable so that the recommendations could be adapted for use in other similar settings.

3.4 Validity and reliability

Halinen and Tornroos citing Valdelin, (1974) argue that:

> The intense observation made in case studies gives opportunities to study different aspects and put these in relation to each other, to put objects in relation to the environment where they operate and use the abilities of *Verstehen* of the researcher (Halinen and Tornroos, 2005:1286).

This implies that the quality of case study research depends on the investigator's responsiveness because, "research is only as good as the investigator" (Morse, et al, 2002: 17). The investigator needs to approach this exercise with an open mind, creativity, flexibility and soft skills of interpersonal relationship to be able to gather the most essential information, sieve and discard the dross "that are poorly supported regardless of the excitement and the potential they first appear to provide" (Morse, et al, 2002: 18). The use of semi-structured questionnaires complemented by interviews could assist the researcher to produce a credible report, because this tool is easy to administer, facilitates direct feed-back from those most affected by the quality of the management (Walters, 1999) and allows the researcher to collect additional information during the interview. To ensure that the outcome of qualitative research is authentic, it must satisfy the conditions of: "Credibility, Neutrality or Confirmability, Consistency or Dependability, Applicability or Transferability …and Trustworthiness" (Lincoln and Guba, 1985, in Golafshani, 2003: 601).

The credibility test involves both internal and external validity of the qualitative research exercise:

> Internal validity refers to whether or not what has been identified as the causes actually produces what has been interpreted as the "effect" or "responses" and checks whether the right cause-and–effect relationships have been established…External validity criterion

> refers to the extent to which any research findings can be generalized beyond the immediate research sample or setting in which the research took place…. (Amaratunga, et al, 2002: 29).

It is therefore important that the researcher should be objective throughout the process of collecting information and analysis to bear in mind that the information being reported will be used in a wider setting beyond the immediate setting of the research objectives. Amaratunga, et al, citing Yin (1994) identified some key characteristics with which to establish the validity and reliability of qualitative research, three of them are listed as follows:

(1) establish a chain of evidence;
(2) have the draft study report reviewed by key informants;
(3) develop formal research study framework… (Amaratunga, et al, 2002: 29-30).

Discussing the importance of validity and reliability further, Gilchrist (1992) identifying with Amaratunga, et al (2002) raises some issues that include 'member checks' which require the researcher to recycle the analysis back to the key informants for confirmation of reported speech; and 'thick description' which involves detailed description of the context in which the enquiry took place (Gilchrist, 1992, in Crabtree and Miller, 1992:86-87).

The above principles were applied to this research. Cross-checking and comparing information from different sources enabled the researcher to harness the most useful information that answered the research questions and objectives. The information collected from different sources on the same subject requires careful synthesis so that:

> Through cross-checking observations among divergent data sources, apparent differences eventually may resolve themselves, and a favoured interpretation eventually may be constructed that coheres with all of the divergent data sources (Bordy, 1992:177).

In reality, some information came from one key source while other information was corroborated by one or more sources. The majority of the information obtained during course of this research was cross-checked with one or more sources.

3.5 Ethical considerations.

Though the objective of the research was to evaluate the practice of Facilities Management in the University of the Witwatersrand, inadvertently the information supplied might suggest the evaluation of the performance of an individual; which is not the objective of the research. In order to protect the identity of the respondents, guarantee their active participation and satisfy ethical considerations, the following guidelines were adhered to:

- The information will be used strictly for academic purpose;
- The identity of the respondents should be protected; their contributions should be presented in general terms except where it is absolutely necessary to make reference to the office or officer;
- After the interview, the respondents are required to vet the draft of the interview report. This is part of the measures to guarantee the confidentiality of the exercise; and
- The manuscript of the interview should not be made available in any public domain.
- At the end of the research, essential information that can support further research should be preserved by the researcher while the others should be destroyed.

3.6 Summary

The enthusiasm with which the majority of the respondents participated in the research demonstrates that the subject is an issue of great concern, a situation central to the achievement of the core functions of the University. Adopting the semi-structured questionnaire method complemented by interview, respondents were asked additional questions and held several interview sessions were held to cross-check and validate statements or clarify observations raised in different quarters. Respondents read through the drafts of the research interview and made necessary corrections so that the final documents aptly represent the discussion.

CHAPTER FOUR: FACILITIES MANAGEMENT WITHIN THE UNIVERSITY OF THE WITWATERSRAND.

4.0 Introduction

The Facilities Management Unit of the University of the Witwatersrand has gone through many phases in the last ten years in an effort at raising a unit that will provide the much needed support service in the most effective manner. The University experimented with outsourcing the management of these support services to private organizations with little success and had to revert back to in-house management. The demand on the present leadership of the Facilities Management Unit is to align the development, operation and management of the support services in order to achieve the set goals of the University of being a world class university. This chapter provides a brief history of the operational models of the Facilities Management Unit. The assessment of its performance in the workplace interface by its customers is weighed against the background of how such performance supports the achievements of the core functions of teaching and research.

4.1 The history.

The history of the early years of the University provides a background to the operation of the Facilities Management Unit in the University of the Witwatersrand. Murray's (1982) record states that in the 1920s, Mr. E.H. Waugh, the Municipal building surveyor served as honourary architectural adviser for the initial building programme. "On the maintenance side the best know figure was the carpenter, F. Pugsley …Two future directors of maintenance at the University, John Reekie and Alec Fergusson, received their basic training from him" (Murray, 1982:100). Discussing further on 'staffing' (Murray, 1997) the University had its own Maintenance Department responsible for the operation and maintenance of its buildings and grounds. The department was:

> …under J. W. Reekie as General Foreman, with 25 artisans and 5 apprentices on its staff; a Head Groundsman…a swimming bath superintendent…doubled as swimming coach. They were assisted by a 'native labour force' numbering 256 (Murray, 1997:161).

Further information about the formation and operation of the unit was that up till the year 2000, the University had a full complement of in-house staff in management, technician and artisan levels providing Facilities Management services to the University. Outsourcing was limited to major projects and repair of specialized equipment.

Following the University's restructuring in 2000, all service units including Facilities Management were affected. Between 2000 and 2007, the University experimented with what one of the interviewees described as 'double outsourcing'; where the Facilities Management functions were outsourced to private organizations that in turn outsourced the operational functions to other service providers. First, the Facilities Management function was outsourced for a contract period of three years. The contract was renewed for another three years but the performance was not satisfactory. The contract was determined and awarded to another service provider in 2005 for a three year period. Their performance did not satisfy the expectations of the University and the contract was terminated in 2007. Some of the respondents identified the following as reasons for the poor performance:

a. The majority of the service providers were former Wits maintenance employees who were retrenched during the 2000 exercise. The idea was that over a period of five years, these previous employees would be assisted in growing their business and have their skills improved where possible.
b. The outsourced management companies were constrained to use the ex-Wits employees on campus, instead of their own skilled sub-contractors.
c. The outsourced service providers were not able to suspend or dismiss a contractor for poor performance, but would receive penalties for some of the contractor's poor response and quality of work.
d. The poor service delivery of these sub-contractors did create an unfair reputation for the outsourced management organizations from the client's perspective, and for the outsourcing approach itself.
e. Payment for services rendered was slow, most times delayed beyond the normal thirty days, thus hindering performance times and creating an inability to purchase spare parts with which to carry out their work.

After these unsuccessful performances, Facilities Management functions reverted back to a partial in-house and outsourcing structure. The services were provided by the unit under the umbrella of "Property and Infrastructure Management Division" (PIMD). In order to improve on service delivery, 2009, PIMD was separated into two divisions namely: Campus Development and Planning (CDP) and Property and Infrastructure Management Division (PIMD). CDP is responsible for campus planning and capital development while PIMD retains the operation and maintenance portfolio.

The Facilities Management service in this University is currently being coordinated by the Deputy Vice-Chancellor Finance and Operations and the functions are performed by four distinct divisions, namely: Campus Development and Planning (CDP); Property and Infrastructure Management Division (PIMD); Services Department (SD); and Campus Control (CC). The two divisions CDP and PIMD that are principally connected with the development, operation and management of infrastructure for teaching and research will be given detailed consideration in this study.

4.2 **Organizational structure**

The organizational structure of CDP and PIMD is still being developed. During the course of the research interviews, it was discovered that the leadership of the two divisions report separately to the Deputy Vice-Chancellor - Finance and Operations. The Campus Control (security, access into the University, parking space, etc), Services Department (cleaning, residence management, transport, etc) and Finance Department, an arm of the University's Finance Division (general financial management and budgetary control) provide services to CDP and PIMD as occasions demand.

The leadership structure for the two divisions is as shown in **Fig 4.1** and **Fig. 4.2**.

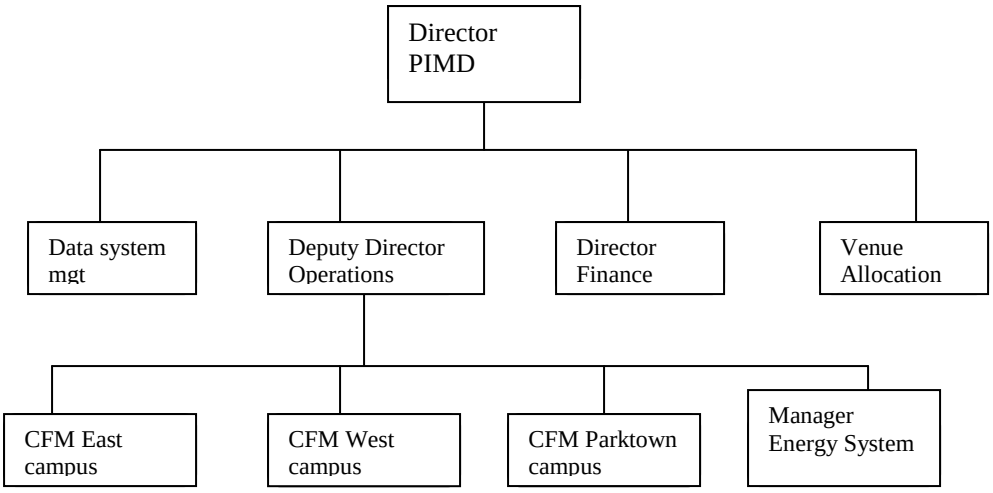


Fig. 4.1 The operational structure of PIMD (June 2010)

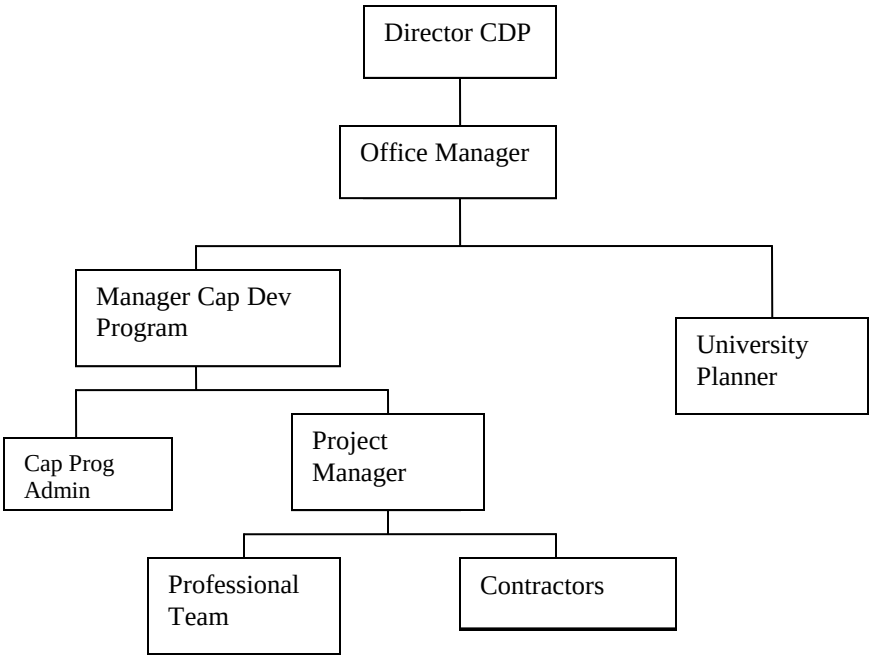


Fig. 4.2 Organizational structure for CDP

The organizational structure of PIMD was still evolving at the time of this research. In the interview with Director of PIMD, he said that there is no functional organizational structure at the time. The structure shown in Fig. 4.1 identifies the operational officials who were consulted during the research interviews. The staff in the three levels of the organizational structure were

in-house management personnel, either on contract or tenure appointment. On the other hand, the organizational structure of CDP obtained during the interview with its Director shows that the in-house staff are the Director, Office Manager, Manager Capital Projects Programme and Capital Programme Administrator. The University Planner, Project Manager, Professional Team and Contractors are engaged only on a project basis.

4.2.1 Functions

Typical of any Facilities Management Unit, the functions performed by the unit and its division are diverse. The functions are dynamic, reflecting the growth, strategic direction of the University, research interest, the University's response to specific national and international requirements and location. The listing below, obtained from the Directors of the two divisions, describes the major functions being performed by CDP & PIMD.

a. Campus Development Planning (CDP)

- Spatial development framework
- Capital project programme
- Property acquisition
- Management of public- private partnership for the development of student residence

b. Property and Infrastructure Management Division (PIMD)

- Maintenance management
- Maintenance of grounds
- Maintenance of sports fields and gardens
- Operational Health and Safety Issues
- Small projects: Refurbishment of existing facilities
- Energy management
- Venue allocation and management
- Assisting with specification development in new projects
- Central Audio Visual
- Mailing
- Central printing unit

- Call Centre for maintenance issues.

4.3 Strategic planning and capital development

The information on the strategic plan and capital development of the University provided by the Director Campus Development and Planning was corroborated by the Deputy Vice-Chancellor, that the University had operated a five yearly development plan periods until 2009. The new approach is a long range plan of twelve years with a yearly review. Currently, the University is working on a development framework that is treated as a dynamic document rather than as a 'blue-print'. This challenges the University to align its policies in a two-way process in order to achieve the objectives of the framework. The two-way process is described as follows:

> …on the one hand, policy should be strongly informed by the framework and the implications of the whole for the part; on the other, policy should refine and enrich the form of the framework (Louw and Dewar, n.d.)[1].

The thrust of the 'development framework' is aimed at promoting the University's unique internal identity and outreach into the local and national community. The broad description of this thrust in the framework is set out under the following headings:

1. **Promote Identity:** It is important to strengthen the visual presence of the University with strong, clearly defined edges and its internal spatial hierarchy should be strengthened. Internally, an important dimension of identity is the promotion of spatial groups around academic cognateness. Identifying appropriate groupings for this should be tasked to a working group of academic and spatial planners and the achievement of this should be part of a longer term management plan.
2. **Promote Outreach: The development of Urban 'Foyers'**. The term 'foyers' refers to the creation of university foci within some of the surrounding communities to which the university is committed. These foci should become centres for university research and outreach projects. Nationally, five foyers are suggested for illustrative purposes: Vrededorp, which could become focus for community and sport-based disciplines…; Braamfontein, which could become a foyer for arts and cultural

[1] Louw, P. and Dewar, D. Preliminary development & design framework for the University of the Witwatersrand. Urban Solutions, Architects + Urban designers.

> outreach activities; Hillbrow health precinct, which becomes a focus for health disciplines as well as Constitution Hill, which is a legal locus; the area between the Educational and Management sub-campuses, which can become a foyer for business-orientated activity; the professional educational hub on Empire road, which is a locus for adult and external education (Louw and Dewar, n.d.: 2&3).

The reasons behind the new drive of promoting the University's unique internal identity and outreach into the local and national community could be seen in the light of its location in the heart of the City of Johannesburg. From the inception of the University, the choice of the permanent site in Milner Park (now the East Campus) has multi-dimensional effects on the existence and drive of the University. According to Hofmeyer (Murray 1982), the location of the University is:

> …barely a mile from the town's centre and easily accessible from every part of it, yet isolated from the noisy bustle of its life…this University set upon a hill is indeed admirably placed for the linking together of the idealistic and the practical, which is not least among its tasks (Murray 1982: 103).

The University has developed beyond the initial site through expansion, merger and acquisition to the West Campus, Education Campus, Faculty of Medical Sciences and the Business School. The facilities in these different clusters were developed from different backgrounds. The 'development framework' aims, among other things: to create harmony, internal unity and uniqueness of the University; stand as a visible landmark different from the immediate environment yet integrative into the life of the City and the peculiarities of the surrounding communities (Louw and Dewar, n.d.). In each 'development framework' or precinct the University's unique internal identity and outreach into the local and national community are incorporated. The location of the precincts in the current development framework is shown in **Fig. 4.3**.



Fig. 4.3 Locations for spatial development (Louw and Dewar, n.d:14)

The content of the present 'development framework' consists of ten precinct plans, namely:

A. Charles Skeen Precinct
B. Jorissen Street Precinct
C. Sturrock Park Precinct
D. Enoch Santonga Precinct
E. Yale Road Precinct
F. Hofmeyer House precinct
G. NMCH Precinct
H. Jubilee+York Precinct
I. Management Precinct
J. Hillbrow Health/Con Hill Precinct.

These precincts represent spatial development areas within and outside the University campuses, as shown in **fig 4.3**. The projects being executed in the Charles Skeen Precinct that are of particular interest to this research are the completion of the fourth quadrant of the Chamber of Mines building[2] and the construction of large, non-departmentally-specific, lecture halls in the original Charles Skeen stadium. The aims of these two projects, according to the Director of CDP, are to reduce the problem of insufficient lecture and research space in the Faculty of Engineering and Built Environment, as well as addressing the shortage of large lecture space for the growing number of students in the University.

In the words of the Deputy Vice-Chancellor (Finance and Operations), the projects considered for execution in each precinct are developed using the principle of "Top-down middle-up" which allows for contribution from staff members at the middle level of leadership of the University. The teaching and research requirements are developed from the academic staff, collated first at the School level, streamlined at the Faculty level, discussed at central committee level, and then processed through University administration for approvals and implementation. Two crucial committees that collaborate with the office of the Deputy Vice-Chancellor (Finance and Operations) are the committee on development of 'Teaching Infrastructure' and the committee on the development of 'Research Infrastructure'.

4.3.1. Communication and execution structure

The Director of Campus Development and Planning disclosed during the interview that there are two levels of communication structure for consideration and execution of capital projects within each designated precinct. The first is the University Planning and Development Committee (UPDC) that coordinates communication during preparation of project proposals. The team is headed by a Senior Executive Team (SET) member of the University: other members are CDP; consultants; representatives of the finance division, legal unit, and faculty or unit who are the immediate beneficiaries of the proposed project(s). The CDP motivates the proposals for each precinct to the University Planning and Development Committee for detailed consideration. The

[2] The Chamber of Mines building provides accommodation for the Schools of Mining and Electrical Engineering, Engineering Library, the office of the Dean, Faculty of Engineering and Built Environment and the Faculty's administration offices.

content of the proposal includes a feasibility study, scope development, preliminary cost and funding prospectus. Projects that meet the requirements are given temporary approval and the funding prospectus forwarded to the University's advancement unit for fund raising. If the fund is secured substantially and the University is willing to write off the shortfall, University Planning and Development Committee communicates approval to the requesting faculty or unit and the consultants, thereafter, are commissioned to produce the detailed design and contract documents. This system ensures that developments within each precinct are regulated to promote the internal identity of the University and aligned each project to the University's goal of remaining a 'world class university'.

The second structure is the Technical Execution Team made up of Campus Development and Planning, project manager, consultants, contractor, the client and other project personnel as the occasion demands. Some interesting features at this level are that the number of representatives from the immediate beneficiaries of the project is increased to allow for more objective contribution and familiarization with the project. The client attends the site meetings, visits the project site and makes objective contributions through the Technical Execution Team. For example, the schools benefiting from the fourth quadrant project of the Chamber of Mines confirmed their involvement with the project through regular faculty and site meetings. These two structures being adopted for executing capital projects in the University are still in the process of fine-tuning to enhance an effective project delivery system.

4.3.2 Procurement method

The University has experimented with different project procurement systems in the past. Some of them produced good results but many others ended in strained relationships with the contractors, poor service delivery, high cost and time over-run. The system being experimented for the development of most of the present capital projects, disclosed by the Director of CDP during the ***interview,*** is known as the 'Framework Contract' using the Engineering Construction Contract (NEC3) option C document. This contracting system enables the contractor and the client to build strong relationships that serve as a vehicle that allow the contractor to align his business with the objectives of the client's goal in a win-win relationship. In this system, the contractor is

involved in the project from design to completion. The relationship within the project team (client, consultant and contractor) is that of a collaborating partnership. The vendors are selected through a competitive bid process arranged for vendors within specified category and specialization. Explaining further, during the course of the interview, the Director said that the experiment has yielded progressive relationships with two companies and a third group will be involved with the development of residences within the Parktown development framework.

In every contract document for a capital project, the mission statement of the University is clearly stated thus:

> The University established a Capital Project Programme (CPP) in 2008 to renew and expand its facilities and infrastructure to build a better campus for enhanced teaching and learning – for the present and the future in its drive to remain a world class university[3].

4.3.3 Project Closeout

In an effort aimed at developing better relationships with the end users, helping them to settle into their property with relative ease and facilitating its operation and maintenance, the Director of CDP disclosed during the interview that strong emphasis is being laid on proper project closeout sessions. These allow the project team to review the construction processes, noting the lessons learnt to guide the execution of other projects. It encourages a wider participation of the immediate beneficiaries of the project, providing opportunities to familiarize with the facilities in the project and their operations. The first attempt of a formal closeout session was the completion and handing over of the First National Bank (FNB) building. At the end of the exercise a set of the hard and soft copies of the 'As-built Documents' were handed over to the School of Accountancy and Property and Infrastructure Management Division, respectively, for the records, operation and maintenance purposes. The closeout sessions of the Chamber of Mines building is attempting to improve on that of the FNB building. The process is progressive involving the client and PIMD who take over the operation and maintenance. At the end of the exercise, a complete set of the 'As-built Documents' will be handed over to both the Dean of the

[3] Cited from the contract document for 'site health and safety management' for the capital developments in the Charles Skeen Precinct, 2009, C3:1.

Faculty and PIMD. It is expected that PIMD will make functional use of these documents for effective operation of the facilities.

The 'As-built' information is developed progressively during the construction process by documenting any alterations, amendments, omissions and additions. At the end of the project, each consultant is expected to produce required sets of comprehensive 'As-Built Documents' (ABD) and the initial design documents in hard and electronic format. A clause in their letter of engagement read thus: *The final 10% (ten percent) of the full fee payable will only become processed for payment on submission of a project completion report and "as built" drawings, acceptable to University authorized representative*.
The closeout session, the Director noted, has become a useful component in the University's learning curve from project conception, design, execution and operation.

The production of as-built information at the project closeout session is a welcomed development but may not be useful if these documents are not kept up-to-date. Naturally, it should be the responsibility of the operation division to keep these documents authentic at any given time. In the interview with, the Director of Property and Infrastructure Management Division he identified some factors that constitute hindrances to the division's ability to maintain up-to-date as-built information of the facilities in its portfolio. These factors include:

- Low capacity of cognate staff.
- Different agents of the University execute repair, alteration, extension and additions to the facilities without reference to PIMD.
- There is no comprehensive record of the history of the facilities in the portfolio of the division due to disjointed system of transfer of record from one administration to another.

Responding to the issue of 'As-built Drawings' and the handicaps of PIMD, the Dean, Faculty of Engineering and Built Environment, took the initiative to hire a private consultant to develop the current 'as-built' status of every facility within the faculty to accompany the scope development documents for proposed capital projects.

4.3.4 Risk management during construction

The two risky situations considered in this research are the effect of construction processes on teaching and research and the ease of evacuating occupants of buildings in the event of emergency. Efforts are being made to execute each project with the minimum disturbance and risk to the client (staff and students) and visitors to the community. The majority of the respondents during the interviews criticized the approach of CDP and their contractors mainly on the aspect of poor communication, lack of proper planning with client and absence of appropriate signage to educate and inform people most proximate to the project. The importance of proper signage is to guide all members of the University community and the physically challenged, so that activities around and across construction sites does not constitute danger to community members.

The second risk situation identified during the research was the lack of evacuation drill aimed at preparing members of the University community to know what to do under certain emergency situations. Beside the Faculty of Medical Sciences, no other faculty could recall when the last evacuation drill was conducted. The need for evacuation drill is increasing, realizing that there is growing number of buildings in the University with dry partition walls, security controls at the entrances, increasing number of student and staff. The majority of the alarm systems and signage are not functional and no trainings conducted for responsible personnel at the school or unit level.

Realising the importance of effective communication and evacuation drill, in mitigating these risks, the Directors (CDP &PIMD) noted these observations for necessary action. It may be useful to note that the University is not required to have their building plans passed by the Municipality; therefore the onus on complying with National Building Regulations, specifically the Fire Regulations, rests entirely with the University.

4.4 Operation and maintenance

The operation and maintenance function of Facilities Management in Wits is performed by PIMD. Responding to the question on operational strategy, the Director of PIMD opined that the strategy being adopted to manage the facilities in the multi-campus structure of Wits is to divide the facilities into three clusters namely: East, West and Parktown Campuses. Each of these campuses has a functional Facilities Management Office that deals directly with the customers at the Schools interface. The breakdown of the areas of coverage for each office is as shown below:

a. East Campus

- All facilities in the East campus except residences and retail outlets

b. West Campus

- All facilities in west campus
- All residences in east and west campuses
- Braamfontein residences
- Marks Park
- All retail outlets
- All facilities on Sturrock Park

c. Park Town Campus/Off-Campus

- Wits Education Campus
- Wits Business School
- Medical School
- Johannesburg Hospital
- Hillbrow Hospital
- Off campus residences
- Baragwanath Hospital, Soweto
- Frankenwald/Science park - Sandton
- Sterkfontein caves - North West Province

The facilities in each of the campuses have unique features and challenges. The East Campus was the original seat of the University, the majority of the facilities in this campus being older

than fifty years. According to the East campus' facilities manager, there is no record of systematic, planned or complete rehabilitation; most of the equipment is obsolete resulting in frequent breakdown and lack of availability of repair parts has led to huge backlog of deferred maintenance. The site now housing the West campus was given to the Witwatersrand Agricultural Society in 1906 for a show ground, on a lease agreement of 80 years (Murray, 1982). The basic structures erected there were warehouses, show ground stands or open sheds for display of articles for the annual Rand Show, Agricultural and Trade Fair. These facilities were acquired in the 1980s by the University and converted to academic and service functions. The Braamfontein residences and facilities in the Hillbrow health outlet were acquired from third parties. The facilities in the Parktown campus were acquired from a variety of sources, according to the Education campus' facilities manager. Wits Education Campus was acquired through the merger with Johannesburg College of Education; facilities in the Medical school, Johannesburg Hospital and Barragwanath Hospital (a former military hospital) (Murray, 1997: 174,178) were developed by the University and the state Department of Health (DoH); many of the buildings in the Wits Business School were heritage buildings given as private donations. For example, Ernest Oppenheimer donated the funds for some buildings in the Business School and land for residences (e.g. Ernest Oppenheimer Hall) to the University.

Due to the background and source of the infrastructure in the portfolio of PIMD coupled with disjointed transfer of records from successive managers, the present management of PIMD does not have a reliable data base for effective Facilities Management. The Director of PIMD volunteered in the course of the interview that "an operational data base and management system is being developed from the basics". Under the present circumstances, the division practices mainly breakdown maintenance, with some scheduled maintenance for plant, equipment and services that need to satisfy definite regulatory control. Some of the challenges facing the division in the management of this multi-campus institution with complex facilities in its portfolio include:

1. Low capacity in terms of operational personnel.
2. The need for improvements on documentation; facility history, as-built information, operation and asset audit.

3. The burden of a huge backlog of deferred maintenance of obsolete and broken down facilities; without sufficient funding.
4. The need for effective two-way communication to improve client satisfaction.

4.4.1 Facilities operation records/documents

The respondents to the research interviews all confirmed that there are no authentic operational records of maintenance history or as-built drawings for most of the old facilities. This is being introduced with some of the new structures being developed. The reasons for this include: the age of the facilities; poor record keeping; alterations, modifications, new installation and removals being executed by different agents and not properly documented. Furthermore, the dearth of old drawings may also be as a result of the fact that the University is not required submitting drawings to the local authority, where it would have been possible to trace documentation of older buildings. This also applies to buildings that were previously government owned, such as the hospitals, and possibly the Rand Show structures.

The Director observed that the development and management of teaching and research space is dynamic. Space modification should be related to existing features, and should comply with standards and appropriate regulations, documented for progressive operations. Some agents of the University that provide or upgrade the facilities for teaching and research within lecture and laboratory space, such as Computer Network Service (CNS), do so without due reference to PIMD and do not observe standard practice and appropriate building regulations. Similarly, some of the academic staff embarks on modification exercises for research laboratory areas without reference to PIMD unless such exercise runs into difficulties. The Director cited one example out of many instances:

> The Physics department designed a laboratory to make use of an existing space and commissioned the respective service providers. The project was only referred to PIMD for adjudication when the contractor could not construct the laboratory to the required standard and the client requested additional facilities to be incorporated into the ongoing project.

Therefore, developing an authentic operation database, including 'As-Built' information and facilities history, requires concerted effort and cooperation from all stakeholders in the University community.

4.4.2 Management of teaching venues

In the interview with the manager of venue allocation stated that management of teaching venues in terms of allocation and monitoring is the joint responsibility of the venue allocation office in PIMD, the school administrators and course coordinators. The allocation exercise is managed using the Facilities Management software called 'Syllabus Plus'. The school administrators confirmed that between July and September each year an enquiry is sent from PIMD to all schools to submit their request for "Teaching Venue Booking" for the next year. The requests should include type, size of space, purpose (lecture, tutorial or seminar), and time table. There are two broad classifications of teaching venues; one category is that domiciled within a specific school and the other, those available for inter-disciplinary teaching or courses with large students' enrolment. The school administrators gave credit to PIMD since they were usually assisted, as much as possible; to accommodate their requests within their facilities; but this is becoming difficult with the growing population of students. The first phase of the allocation exercise is completed before December; however, in January some of the allocations are revisited when the final figures of registered students become available.

Furthermore, within the first few weeks of the semester, a space allocation audit is conducted by PIMD using the Close Circuit Television (CCTV) installed in the large lecture halls, physical inspection of the use of allocated spaces and reports from school administrators, lecturers and course coordinators. This information enables the monitoring of the effective use of the teaching space, reallocation of space not being used or not used effectively. The success recorded so far is due to the collaborative efforts of all stakeholders. However, the challenges being experienced in this exercise, as identified by the school administrators and PIMD, are precipitated by:

1. Lack of an adequate number of large lecture spaces to accommodate classes with large student enrollment;
2. Inadequate number of specialized teaching spaces such as drawing studios;

3. Lecture spaces with obsolete equipment, broken seats and malfunctioning teaching facilities;
4. Unethical behaviour of some school administrators and course coordinators who book more space than necessary and are reluctant to release under-utilised space;
5. Attachment to particular lecture space(s); especially those closer to the offices of the lecturers.

The venue manager stated in clear terms that PIMD has good knowledge of the physical state of most of the lecture halls and this is taken into consideration during allocation.

The Director of Campus Development and Planning Division volunteered that the development of the multi-disciplinary lecture hall complex in the Charles Skeen Precinct is aimed at reducing the problem of scarcity of large lecture spaces to accommodate classes with large student enrollment. Furthermore, a committee is working on the upgrading and refurbishing of old lecture halls, in keeping with the goals of the University. The academics on the other hand, observed that physical and electronic spot checks on the use of allocated lecture space are not sufficient tools to ascertain the effective use of the allocated space. The most authentic source would be the student enrolment centre with authentic data base for all registered students and their courses. The information on students' enrolment would reduce problems 4 and 5 above.

4.4.3 Maintenance of laboratory and workshops.

Laboratories in the University of the Witwatersrand can be classified into two categories, namely: teaching and research laboratories. The development of teaching laboratories is usually treated under capital development while development of research laboratories is considered under refurbishment, modification or alteration exercise which falls within the jurisdiction of the operation division. In both the teaching and research laboratories, the sourcing of the equipment, installation, operation and maintenance is coordinated between the laboratory manager, the Head of School and the lecturer in charge of the research laboratory. PIMD's operation is limited to the repairs to the fabric of the structure housing the laboratories and the services (electrical, plumbing, carpentry, etc). The reasons for this dichotomy, as explained by the laboratory managers and the Head of Schools, is that laboratory equipment is costly and specialized,

therefore requires specialist attention so that the equipment can function optimally and produce accurate results.

4.4.4 **Outsourcing management**

All operational functions of PIMD are outsourced to registered service providers. According to the Director, the register is structured according to trades, specialization and general services. The level of interaction and contractual relationship is determined by the service request which can be divided into three categories, namely: Trade Specific Service Request, General Service Request and Specialised Service Request. The magnitude of work to be executed in each of the categories determines the contract instrument to be used. When the magnitude of work is small, a simple work request card is the chosen contract document, otherwise, a bill of quantities is prepared, quotations received from an appropriate number of service providers and a 'work order' is used as the contract document. In the case of a 'specialised' service, a Service Level Agreement (SLA) is developed for the contract administration. At the moment, the Service Level Agreement is in the form of a memo specifying the work to be executed, the frequency, the duration and the rate to be paid for the services. However, the new management of PIMD in conjunction with the Legal Office of the University is developing a standard Service Level Agreement that can be adapted for the management of different operation contract relationships. The objectives of the new Service Level Agreement are summarized as follows:

- To streamline the number of service providers;
- To manage and monitor performance; ensure compliance to standards and regulations; and
- To build reliable working relationships and maintain a balanced approach to managing risk associated with contract.

PIMD maintains regular contact with subcontractors and the specialized service providers in normal operations. The trade specific contractors (electrical, plumbing, carpentry, painting, etc.), could be invited from any of the Area Offices or through the Call Centre when their service is needed. The specialized service providers, through the SLA, maintain and manage the plant or equipment allocated to them, following a 'scheduled maintenance plan'. According to the

campus facilities managers, other service requests that involve diverse disciplines or are of large magnitude require joint inspection, detailed discussions with the client, development of scope of work, detailed bills of quantities and schedules of work, identification and allocation of the fund for the project before inviting quotations from interested service providers.

Table 4.1 Outsourcing procedures

S/no	Range	No of quotation	Approvals process
1	Below R2000.00 VAT excl	No quote.	Client, inspector or Area manager.
2	R2000-5000.00	1	Area manager.
3	R5000-7500.00	2 1	Operation manager PIMD - building, plumbing, carpentry, steelwork Operation manager PIMD – h/vac, electrical
4	R7,501-25,000.00 R25,001.00-49,999.00	3 2 3	Operation manager PIMD - building, plumbing, carpentry, steelwork Operation manager PIMD – h/vac, electrical Operation manager PIMD -
5	Above R50,000.00 R250,000.00-R499,999.00	3 5	Project - Director, Finance Manager, Operation manager PIMD Tender - Director, Finance Manager, Operation manager PIMD

The service providers are selected from the list of registered vendors with the University, especially in their area of specialization or trade. The principle of selection is based on performance history, quality of previous work, adequate financial backing, quality and calibre of internal staff; and not necessarily the tender with the lowest quotation. The work order raised in item 2 (**table4.1**) is forwarded in the form of a motivation memo from the Campus Facilities Manager to the Operation Manager or the Director. The work orders raised in items 3 – 5 (above table) are motivated by a memo from the Operation Manager. Each memo recommends one of

the contractors for consideration. The management may accept or reject the recommendation on the following grounds:

- The contractor has many uncompleted jobs in progress;
- To reduce the complaints that some contractors are overtly being favoured;
- If the management has any unresolved complaints against the contractor from clients on the execution of previous jobs.

Ideally, PIMD jointly monitors execution of project along with the client, who endorses satisfaction, when the piece of work is completed, before PIMD certifies completion and signs off the contractor. In the case of unsatisfactory performance, PIMD withholds its endorsement until the issues are resolved. However, in reality, due to low capacity of operation personnel, PIMD is not able to cope with the demands of inspection and supervision of execution effectively.

4.4.5 **Service delivery**

Generally, the rating of the performance of PIMD on service delivery by members of the University community is not satisfactory both in terms of response to request and quality of service. The root cause of poor performance has been attributed to poor management skills of those who provide leadership in the division, as there are no marked differences when Facilities Management services were provided in-house, nor during the full outsourcing nor during the partial outsourcing. However, the Deputy Vice-Chancellor (Finance & Operations) observed that the nature of complaints is changing since the capital and operation functions were separated. Instead of most complaints centering on lack of response to request, the tone is changing to delay in response to request, an indication of some improvement. Recognizing the negative comments from those receiving their services, the new management of PIMD is experimenting on a number of management styles and structures to facilitate improved service delivery, some of which include:

1. Allocating areas of operation to specific staff in each of the area offices according to location. For example, in the Parktown campus, a member of staff is designated to oversee the operations and maintenance in the residences, another takes charge of the

Education Campus while the third combines the Faculty of Health Sciences and the Business School. The area manager provides general leadership and oversees the operation and maintenance function in the sites outside the immediate clusters of the campus.

2. Developing a functional list of staff responsible for facilities matters in each school and scheduling periodic meetings to discuss maintenance issues, space and system modifications, scheduled maintenance, renovations and providing updates on requests lodged with PIMD.
3. Efforts are being made to reclassify the service providers and streamline their areas of operation to facilitate effective monitoring, ensuring improved quality of service delivery and accountability.
4. In order to sustain healthy relationships with service providers and improvements in service delivery, efforts are being made to ensure that payment for services rendered, duly certified, properly invoiced and documented, are concluded within thirty days.
5. Documentation and analysis of the maintenance history of each facility with the aim of identifying the frequency of breakdown, the state of the component or facility and the deferred maintenance, which will facilitate the development of scheduled maintenance, budgeting and objective reporting for management decisions.
6. Continuous education of units on the importance of coordinated action based on effective communication during planning and execution, so that every new request can be seen and anchored on an appropriate relationship with the existing state of the facility. This process will facilitate documentation and development of authentic operational records.
7. A roster for staff and selected trade specific contractors, on stand-by duty, is being maintained to provide assistance during emergency situations.

Laudable as these proposals sound, the tangible benefits can be felt when there is a demonstration of commitment to its execution at all levels of PIMD structure. This requires, among others, that the leadership of PIMD should embark on a dynamic system of capacity building to enhance the productivity of the existing staff. The service providers, especially the

ex-Wits staff, raised some administrative issues that requires by PIMD management. Some of the observations are listed below:

- PIMD should be flexible on the time demands on the contractors, as the strict enforcement of the 7: 00am to 5:00pm availability (with or without any assigned job) is not economical to their organization.
- If contractors are expected to be on stand-by duty from 5:00pm to 6:00am each day, but only compensated for completed call-out services; in effect, if there is no call-out, such contractor will be idle and yet spend his resources without any compensation. The management of PIMD should provide some incentives to retain these contractors.
- The desk officers of the respective unit with restricted access, should be readily available in order to assist the contractors have easy access to the source of problem and address them during emergencies.

4.5 **Information Technology support**

In the interviews with the managers of Data system management and Energy system, it was discovered that there are four principal Facilities Management software packages in use by PIMD. Computer Aided Design (CAD) for the documentation of drawings; 'Syllabus Plus' for the management of 'teaching venues'; Archibus/FM, a Computer Maintenance Management System (CMMS), otherwise known as an Integrated Workplace Management System (IWMS), used for the daily management of general operations; and Building Maintenance System (BMS) for the management of energy distribution and control systems. All communications or requests relating to Facilities Management in general are processed through a central office, referred to as the 'Call Centre'.

The integration of these systems into the wider University intranet is in progress. Currently, the finance, procurement and bulk store are integrated into the 'Oracle' network, used by the Finance Division for the management of the entire University financial transactions. Efforts are being made to synchronize the venue allocation system with the student enrolment database which is also managed with the "Oracle" network. The University community can communicate with the Facilities Management Unit via the Archibus maintenance system. Efforts are being made to

activate the link on the intranet to enable each registered customer to view the status of execution of their requests. The Archibus and the Building Management Systems are the main software being used for operation and energy management. At the time of my interviews, the energy audit was also being prepared by the lecturers in the School of Electrical and Informatics Engineering, which is why they declined to participate in the present research.

4.5.1 Management of clients' request.

According to the Manager of data system analysis, the management of clients' requests follows the sequence summarized below:

1. Clients send their request to the Call Centre through the Campus Facilities Managers Offices, email, phone or fax.
2. Each request is given a reference code, with a different code number assigned to a work request and work order to facilitate tracking and reporting.
3. Once the client has logged a first request at the Call Centre, it is registered onto the Archibus data-base and the client receives an email notification with an intranet web-based FMDesk link. Through this link, each client can view all work requests status, updates, costs, contractor details and contacts pertaining to each request.

The majority of the respondents during the interviews confirmed the receipt of the initial email confirmation of the request from PIMD but subsequently do not receive further correspondence on status of execution and they are not able access the status of execution through the designated intranet link. The clients are then compelled to make repeated calls to PIMD to get their requests addressed. It is a fundamental technical problem. Efforts were made during the research to activate the link with one of the senior laboratory staff; it was not successful, even with repeated visits of the technician.

4.5.2 Periodic reports.

The manger of the Call Centre produces different reports for the various arms of the Facilities Management Unit of the University. The reports include: a weekly report for the management meetings of the campus facilities managers, a monthly report for the Director of PIMD and

monthly reports for other departments such as services, residences, sports and grounds administration. The details of each report are determined by the request of the end users. A typical weekly and monthly report for facilities managers and the Director contains the information about the work requests received within the period under reference, status of execution and the cost incurred. Presently, these periodic reports are circulated within PIMD only: the structure requires basic adjustments in order to effectively communicate to other stakeholders.

Table 4.2 below, shows an extract of a 421 page document of the work requests recorded at the Call Centre for the month of March 2010, while **tables 4.3** and **4.4** show the summary of the status of execution, each available in a 13 and 32 page report respectively. From the structure of these reports, it is difficult to measure performance.

Table 4.2 The first page of work requests submitted to PIMD for the month of March 2010

University of the Witwatersrand
March 2010 Detail of all work requests
Page 1
2010/06/24

Building Code	Assigned to Work Order	Work Description	Date Work Requested	Service Contractor Code	Date Work Completed	Total Cost
127	70792	Professional services to HVAC.Work over R2000.00 not to be carried out without an approved quotation.Remove, investigate and quote on repair of leaking pump. Replace packing with mechanical seal.	2010/03/01	PUMPDATA	2010/04/15	R5,462.88
145	70793	Quotation only. Do not commence work.Remove, investigate and quote on repair of swimming pool filter pump which has seized	2010/03/01	PUMPDATA	2010/05/10	R0.00
127	70794	Electrical maintenance.Work over R2000.00 not to be carried out without an approved quotation.Repair noisy pump motor fan.	2010/03/01	MJL	2010/03/29	R538.65
127	70795	Professional services to HVAC.Supply and install 1x 24000 BTU York Midwall Unit in rooom GH525,as per Quote Q5362 (R8930.00 Excl. VAT), approved by Richard Kallis.	2010/03/01	PERFECTAIR	2010/04/12	R10,180.20
131	70796	Airconditioner service and installation. Contractor to complete document F0005 attached to work order. Contractors to supply a copy of purchase documentation for aircon installation.Supply and install 1x 18000 BTU York Midwall Unit in room 236, as per Quote Q5432 (R8100.00 Excl. VAT), approved by Richard Kallis. Contractor to confirm date of installation with Bruce Patterson.	2010/03/01	PERFECTAIR	2010/04/12	R9,234.00
446	70797	Building general maintenance.Work over R2000.00 not to be carried out without an approved quotation.Repair/replace broken toilet soap dispenser in room 2B34. Urgent	2010/03/01	SUPERCARE	2010/03/18	R0.00

ARCHIBUS

Table 4.3 Summary (First page) of completed works as at 4th April 2010

University of the Witwatersrand
March 2010 work requests complete by 4th April
Page 1
2010/06/24

Building Code	Assigned to Work Order	Date Work Requested	Service Contractor Code	Work Request Status	Date Work Completed	Total Cost
113	70864	2010/03/01	PIMDAREAMANAG	Completed	2010/03/01	R0.00
126	71153	2010/03/03	RIBACH	Completed	2010/03/03	R0.00
225	71291	2010/03/03	AERCO	Completed	2010/03/03	R38,498.51
225	71294	2010/03/03	WSPFM	Completed	2010/03/03	R51,870.00
516	71304	2010/03/03	ABCSERVICES	Completed	2010/03/03	R0.00
310	70810	2010/03/01	LINPRO	Completed	2010/03/04	R3,933.00
426	71522	2010/03/04	UNITED	Completed	2010/03/04	R0.00
437	71523	2010/03/04	UNITED	Completed	2010/03/04	R0.00
505	71625	2010/03/05	RELIABLEHOME	Completed	2010/03/05	R0.00
225	70840	2010/03/01	JKSIGNS	Completed	2010/03/09	R1,203.04
225	70838	2010/03/01	JKSIGNS	Completed	2010/03/09	R341.69
890	70877	2010/03/01	MVLV	Completed	2010/03/09	R325.93
203	71167	2010/03/03	KEVINS	Completed	2010/03/09	R0.00
839A	70830	2010/03/01	LINPRO	Completed	2010/03/10	R831.06
222	70907	2010/03/01	RELIABLEHOME	Completed	2010/03/10	R203.60
113	70928	2010/03/01	RELIABLEHOME	Completed	2010/03/10	R269.61
225	70938	2010/03/01	LINPRO	Completed	2010/03/10	R383.04
222	70942	2010/03/01	ABCSERVICES	Completed	2010/03/10	R73,279.20
220	71015	2010/03/02	RELIABLEHOME	Completed	2010/03/10	R394.55
510	71024	2010/03/02	RIBACH	Completed	2010/03/11	R466.26
222	71000	2010/03/02	KEVINS	Completed	2010/03/11	R191.52
224	70985	2010/03/02	KEVINS	Completed	2010/03/11	R574.56
511	70954	2010/03/02	GATEMISSION	Completed	2010/03/11	R693.00
224	70974	2010/03/02	KEVINS	Completed	2010/03/11	R453.72
222	70950	2010/03/01	KEVINS	Completed	2010/03/11	R1,559.52
222	70910	2010/03/01	KEVINS	Completed	2010/03/11	R453.72
222	70924	2010/03/01	KEVINS	Completed	2010/03/11	R191.52
510	70915	2010/03/01	RELIABLEHOME	Completed	2010/03/11	R198.70
502C	70861	2010/03/01	MVLV	Completed	2010/03/11	R196.02
144	70920	2010/03/01	JKSIGNS	Completed	2010/03/11	R407.62
515	70844	2010/03/01	SUNSHINE	Completed	2010/03/11	R1,465.58
515	70845	2010/03/01	SUNSHINE	Completed	2010/03/11	R1,465.58
515	70848	2010/03/01	SUNSHINE	Completed	2010/03/11	R1,465.58
515	70856	2010/03/01	SUNSHINE	Completed	2010/03/11	R1,465.58
895	70829	2010/03/01	MATHALE	Completed	2010/03/11	R1,359.91
506	71176	2010/03/03	RELIABLEHOME	Completed	2010/03/11	R430.69
143	71113	2010/03/02	GATEMISSION	Completed	2010/03/11	R1,195.00
510	71132	2010/03/03	RELIABLEHOME	Completed	2010/03/11	R227.54
222	71345	2010/03/03	RIBACH	Completed	2010/03/11	R409.37
113	71287	2010/03/03	DATACOM	Completed	2010/03/11	R695.40
873	71238	2010/03/03	MVLV	Completed	2010/03/11	R359.10
310	71259	2010/03/03	RELIABLEHOME	Completed	2010/03/11	R228.34
225	46590	2010/03/04	DATACOM	Completed	2010/03/11	R12,402.63
113	71447	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
511	71388	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
405	71393	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
446	71399	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
446	71404	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
310	71408	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
172	71412	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
517	71420	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
102	71422	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
412	71430	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
433	71432	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
131	71435	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
128	71439	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
407	71442	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
220	71445	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
220	72137	2010/03/11	ABCSERVICES	Completed	2010/03/11	R0.00
143	71457	2010/03/04	RIBACH	Completed	2010/03/12	R215.78
510	71383	2010/03/04	MVLV	Completed	2010/03/12	R385.83
143	71352	2010/03/04	RIBACH	Completed	2010/03/12	R224.32
515	71353	2010/03/04	MVLV	Completed	2010/03/12	R277.02

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Table 4.4 Summary (first page) of completed works as at 30th April 2010.

University of the Witwatersrand
March 2010 work requests complete by 30th April
Page 1
2010/06/24

Building Code	Assigned to Work Order	Date Work Requested	Service Contractor Code	Work Request Status	Date Work Completed	Total Cost
113	70864	2010/03/01	PIMDAREAMANAG	Completed	2010/03/01	R0.00
126	71153	2010/03/03	RIBACH	Completed	2010/03/03	R0.00
225	71291	2010/03/03	AERCO	Completed	2010/03/03	R38,498.51
225	71294	2010/03/03	WSPFM	Completed	2010/03/03	R51,870.00
516	71304	2010/03/03	ABCSERVICES	Completed	2010/03/03	R0.00
426	71522	2010/03/04	UNITED	Completed	2010/03/04	R0.00
437	71523	2010/03/04	UNITED	Completed	2010/03/04	R0.00
310	70810	2010/03/01	LINPRO	Completed	2010/03/04	R3,933.00
505	71625	2010/03/05	RELIABLEHOME	Completed	2010/03/05	R0.00
225	70838	2010/03/01	JKSIGNS	Completed	2010/03/09	R341.69
225	70840	2010/03/01	JKSIGNS	Completed	2010/03/09	R1,203.04
890	70877	2010/03/01	MVLV	Completed	2010/03/09	R325.93
203	71167	2010/03/03	KEVINS	Completed	2010/03/09	R0.00
839A	70830	2010/03/01	LINPRO	Completed	2010/03/10	R831.06
222	70907	2010/03/01	RELIABLEHOME	Completed	2010/03/10	R203.60
113	70928	2010/03/01	RELIABLEHOME	Completed	2010/03/10	R269.61
225	70938	2010/03/01	LINPRO	Completed	2010/03/10	R383.04
222	70942	2010/03/01	ABCSERVICES	Completed	2010/03/10	R73,279.20
220	71015	2010/03/02	RELIABLEHOME	Completed	2010/03/10	R394.55
510	71024	2010/03/02	RIBACH	Completed	2010/03/11	R466.26
222	71000	2010/03/02	KEVINS	Completed	2010/03/11	R191.52
224	70985	2010/03/02	KEVINS	Completed	2010/03/11	R574.56
510	71132	2010/03/03	RELIABLEHOME	Completed	2010/03/11	R227.54
143	71113	2010/03/02	GATEMISSION	Completed	2010/03/11	R1,195.00
222	70950	2010/03/01	KEVINS	Completed	2010/03/11	R1,559.52
511	70954	2010/03/02	GATEMISSION	Completed	2010/03/11	R693.00
224	70974	2010/03/02	KEVINS	Completed	2010/03/11	R453.72
222	70924	2010/03/01	KEVINS	Completed	2010/03/11	R191.52
510	70915	2010/03/01	RELIABLEHOME	Completed	2010/03/11	R198.70
222	70910	2010/03/01	KEVINS	Completed	2010/03/11	R453.72
895	70829	2010/03/01	MATHALE	Completed	2010/03/11	R1,359.91
144	70920	2010/03/01	JKSIGNS	Completed	2010/03/11	R407.62
502C	70861	2010/03/01	MVLV	Completed	2010/03/11	R196.02
515	70856	2010/03/01	SUNSHINE	Completed	2010/03/11	R1,465.58
515	70844	2010/03/01	SUNSHINE	Completed	2010/03/11	R1,465.58
515	70845	2010/03/01	SUNSHINE	Completed	2010/03/11	R1,465.58
515	70848	2010/03/01	SUNSHINE	Completed	2010/03/11	R1,465.58
506	71176	2010/03/03	RELIABLEHOME	Completed	2010/03/11	R430.69
873	71238	2010/03/03	MVLV	Completed	2010/03/11	R359.10
310	71259	2010/03/03	RELIABLEHOME	Completed	2010/03/11	R228.34
113	71287	2010/03/03	DATACOM	Completed	2010/03/11	R695.40
222	71345	2010/03/03	RIBACH	Completed	2010/03/11	R409.37
225	46590	2010/03/04	DATACOM	Completed	2010/03/11	R12,402.63
220	71445	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
113	71447	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
511	71388	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
405	71393	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
446	71399	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
446	71404	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
310	71408	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
172	71412	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
102	71422	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
517	71420	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
412	71430	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
433	71432	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
131	71435	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
128	71439	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
407	71442	2010/03/04	RIBACH	Completed	2010/03/11	R123.29
220	72137	2010/03/11	ABCSERVICES	Completed	2010/03/11	R0.00
503	71638	2010/03/08	MVLV	Completed	2010/03/12	R656.36
921	71644	2010/03/08	VEMO	Completed	2010/03/12	R4,970.40
225	71903	2010/03/09	MEDUSA	Completed	2010/03/12	R6,064.80
225	71904	2010/03/09	MEDUSA	Completed	2010/03/12	R11,935.80

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4.5.3 Facilities' history.

According to the Manager of the Data System management during the interview, the history of each facility in the portfolio of PIMD is documented in the Archibus system since the entire request and execution record is processed through the system, which can be accessed for analysis for further use. The frequency of request on a particular facility provides a necessary indication of the facility's condition. However, due to frequent changes in the administration of the Facilities Management Unit over the years, these records are not comprehensive. Furthermore, any action initiated by clients that did not make reference to PIMD or the Call Centre will not be reflected in the system.

4.5.4 Building Maintenance System (BMS)

In the interview with the Energy system manager, he said the BMS system enables the facilities manager to monitor the HVAC system, energy supply, distribution and consumption pattern as well as identifying abnormal consumption and tracing the source. The system also allows the facilities manager to regulate the energy consumption through a careful study of the pattern of space usage by the client, taking note of the 'peak and off peak' periods. The system is quite sensitive: it enables the operator to identify the exact location of the problem in the network and gives clear directives on what to do, thus avoiding guesswork.

The advantages of the system are multi-dimensional. It could be used to monitor any alteration or addition to the energy consumption pattern which will show in the 'frequency modulation graph' of the energy consumption pattern of the affected facility or client. A functional BMS system is capable of monitoring energy consumption from the energy in-take sources through the sub-stations to the particular facility that contributed to the rise in the consumption and identify any faulty equipment in the distribution network with relative ease.

Further, he opined that the pilot project, initiated some ten years ago, provided connections to all the campuses with room for progressive expansion. There has not been any expansion to the network since then due to lack of continuity in management and financial constraints.

Furthermore, as a result of low technical capacity, the majority of the facilities initially connected to the system have been de-activated by contractors, some replaced with manual controls and others neglected. Efforts being made by the new management are to re-activate existing facilities progressively, expand the network through 'continuous connection' using cables or 'remote access' through an integrated circuit of cell phones connected to receivers at the control panel and incorporating the connection of new facilities being developed within the system. In this regard, the newly completed fourth quadrant of the Engineering Chamber of Mines Building is connected to the system; while efforts are being made to reconnect the first three quadrants.

In conclusion, he said that, the proposed refurbishment of the existing network includes the connection of all the 112 electricity meters to the network and employment of staff members who are technically knowledgeable in electrical and mechanical installations in each campus office to man the installations. However, in view of the rise in electricity tariff, PIMD is considering alternative source of energy supply.

4.6 **Assessment of performance**

Through the semi-structured questionnaire accompanied by interview, the Facilities Management Unit (CDP & PIMD) expressed how they assess the performance of their respective functions and their views were compared with how the University administration and the academics expressed their level of satisfaction in the performance of the functions. The performances were measured, in a scale of 1-5 against definite characteristics considered specific to each division and the respondents provided additional explanations to substantiate their assessments where necessary. Table 4.5 shows the composition of the respondents to questions on performance assessment, while Table 4.6 Show the average score in the assessments for CDP and Fig. 4.4 shows the graphical representation of the assessment.

Table 4.5 Respondents to the question on performance assessment

Class	Sample size	No of response	Percentage %
CDP	1	1	100
Administration	1	1	100
Academics	8	7	87.5

Table 4.6 Average score of the assessment of the performance of CDP

Respondent	KPI	Level of consultation	Quality of internal mgt& reporting	Quality of project delivery	Delivering project within budget	Delivering project on time
CDP	-	2	2	3	3.5	3
Admin.	-	4	4.5	4	4	4
Academics	-	2.13	1.75	2.38	4.5	2

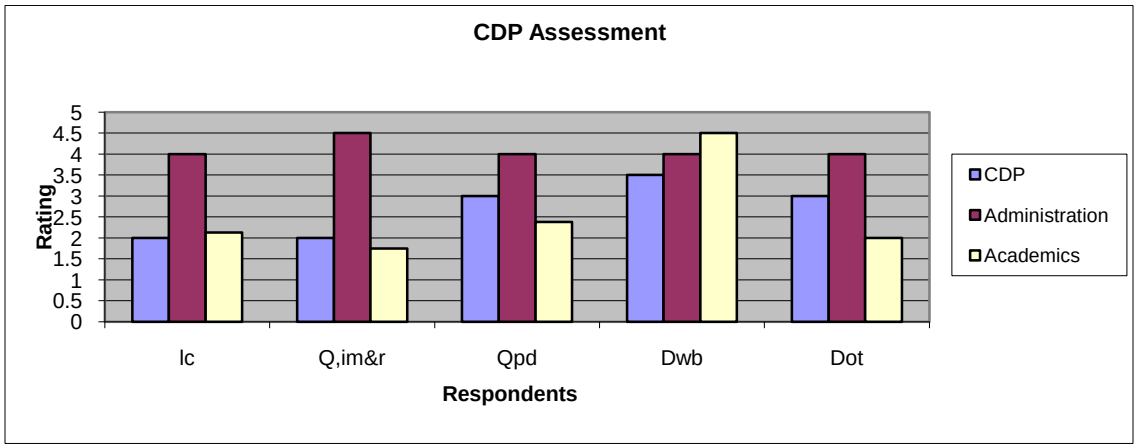


Fig. 4. 4 Graphical representation of assessment of the performance of CDP

The assessment of Campus Development and Planning Division and its customers (University administration and the academics) revealed that the division does not have any Key Performance Indicators (KPI) with which to measure its performance and that of its service providers. Furthermore, the administration and the academics expressed their satisfaction with the performance of CDP in terms of delivering projects within cost limits and they rated their

performance higher than CDP rated itself. The administration was quite satisfied with the performance of CDP and rated them high in every item. However, the academics expressed reservations in the level of consultation with clients during the period of project execution. Other areas where the division needs improvements include: quality of internal project management and reporting; quality of project delivery; and delivering projects within time schedule.

The Director of CDP accepted these observations as fair representation of their performance in the present circumstances. Noting that each capital development project is dynamic, the lessons learnt in one project form a vital component in the learning curve that will assist in improving performance in the execution of subsequent projects.

In a similar sense, all the respondents confirmed that PIMD does not have any Key Performance Indicators (KPI) for the measurement of their performance nor that of their service providers. The University administration and the academics expressed satisfaction with the management of the allocation of teaching and research venues, noting also that the division could do better by networking with the student enrollment centre for more accurate data. The shift in the nature of complaint from lack of response to delayed response was seen by the University administration as a mark of progress. However, the academics, who are at the receiving end, are not satisfied with the rate of response to their requests, this item has the lowest rating of **1.83,** in so much as they are compelled to make repeated contacts before receiving attention or seek alternative solutions. The University administration and the academics agreed that PIMD need to improve in the areas of communication with customers, the quality and functional levels of the services within the teaching and research facilities.

Table 4. 7 Respondents to the question on performance assessment of PIMD

Class	**Sample size**	**No of response**	**Percentage %**
PIMD	4	3	75
Administration	1	1	100
Academics	8	7	87.5

Table 4.8 Average score of the assessment of the performance of PIMD

Respondent	KPI	Consultation	Space mgt (lect/lab/off.)	Functional services	JIT response
PIMD	-	3.3	3.0	3. 3	3.5
Admin	-	2	4	2	3
Academics	-	2.0	2.75	2.33	1.83

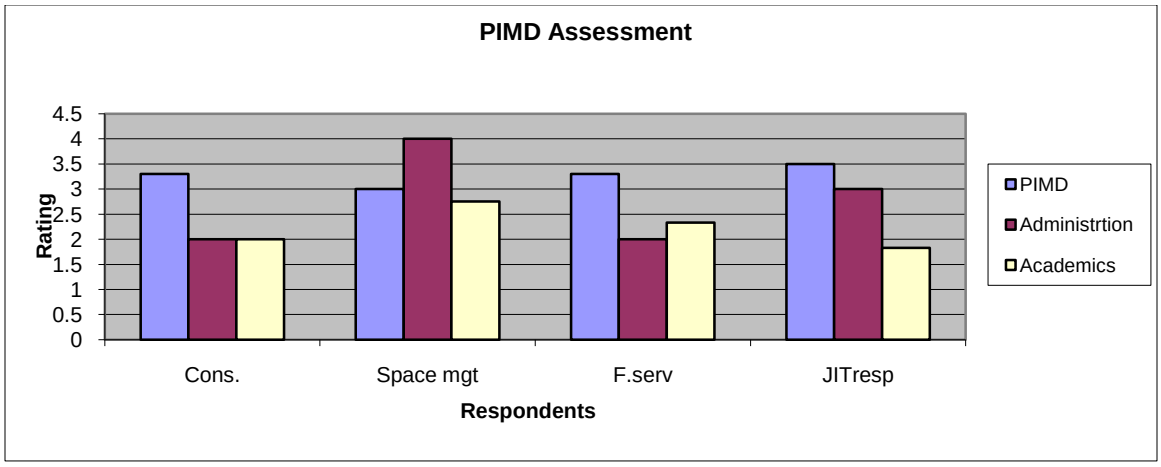


Fig.4. 5 Graphical representation of assessment of the performance of PIMD

The Director of PIMD identified with some of the observations raised but was also quick to add that the apparent delay in response to requests from the academics, especially in respect of modification of existing space for specialized use such as for laboratory, thus:

- Indecision on the part of some academic staff; they change their requirement many times in the process.
- Laboratory development requires specialist treatment, which requires time to source the necessary information and expertise.
- The majority of the requests in this regard come to PIMD at a late stage in their planning process, sometimes when the equipment has arrived and the client has logistic problems with space or installation.

The Dean's contribution aptly summarises the scenario between the academics and PIMD:

> Unfortunately, many times, this is poorly handled. In some instances, PIMD will only be consulted when the equipment has arrived and cannot go through the door; additional service points are needed or the space earmarked needs refurbishing. On the other hand, when PIMD are contacted early, sometimes they drag their feet, present incomplete proposals or unrealistic estimates. However, when the communication process is properly managed, the end results have been very satisfactory.

It imperative therefore to improve on the communication level between all the stakeholders in order to reduce the incidence of trading blames and work towards achieving the set goals of the University.

4.7 Summary

The Facilities Management Unit of the University of the Witwatersrand has gone through different phases and experimentation with varied degrees of success and failure. The current practice of separating capital development from operation and maintenance has brought to fore the section that requires overhauling in order to improve their performance towards achieving the goals of the University of being a world class university. The structure and technological tools at the disposal of Property and Infrastructural Management Division are suitable for effective management of Facilities Management functions in a multi-campus institution. The division requires competent personnel at all levels (management and operation) knowledgeable in Facilities Management practice to run the structure and use the technology for effective service delivery. The implications of the assessment will be discussed in details under research findings.

CHAPTER FIVE: FINDINGS AND DISCUSSION

5.0 Introduction

The practice of facilities management in the University of the Witwatersrand compares favourably with the general description of the profession in terms of structure and functions. The organizational structure of the facilities management unit in Wits is still evolving: different structures have been used at different times, leading to the present four division structure being experimented upon. The functions performed range from as ordinary as mail delivery to as complex as development of major capital projects. The divisions of the facilities management unit given closer attention in this study are the Campus Planning and Development as well as Property and Infrastructure Management Divisions, which are responsible for the development, operation and management of teaching and research facilities. The findings and the accompanying comments will be discussed around the following subjects:

1. The organizational structure and functions
2. Strategic planning and capital development
3. Operation and maintenance
4. Outsourcing management
5. Information Technology support
6. Assessment of performance

5.1 The organizational structure and functions

The two divisions, Campus Development and Planning and Property and Infrastructure Management Divisions, which are actively connected with the provision, operation and management of infrastructure for teaching and research, have vertical relationship through the office of the Deputy Vice-Chancellor (Finance and Operation) and horizontal relationships through the performance of service functions on a project basis. The CDP organizational structure leans heavily on external service providers (on a project basis) with a handful of in-house management staff. On the other hand, PIMD's structure is still evolving. One of the mandates of the new administration is to fill the necessary vacancies in the division for effective

operation. The three levels organizational structure in **Fig. 4.1** have the senior management staff in levels one and two, who provide the strategic leadership for the division, while the middle level management staff in level three provides leadership in the satellite offices at the Parktown, East and West Campuses, while the junior staff resident in the satellite offices coordinates the inspection and supervision of the service providers who execute the operational functions.

Discussion

The structure and function of the general facilities management unit and its sub-divisions are dynamic reflecting the organization it serves. Some of the factors that influence the structure and functions include the recognition accorded the unit by the organization, the quality and competence level of the operatives, and the operational strategies. If estate management is viewed as a purely technical activity and not viewed as a strategic function then the facilities manager will find it difficult to add value to the business of the organization (Housley, 1997). Specifically referring to universities, Housley further reveals that the perception of the Vice-Chancellor and the Director of facilities management unit are crucial in the matter of recognition (Housley, 1997).

The recognition given to the facilities management unit influences the performance of its role in the development, operation and management of the support function which in turn affects the performance of the core functions of the organization. The relationship and recognition is enhanced when an organization realizes that the facilities management unit provides the connections between the organization, its employees and its physical space (Donald, 1994 in Grimshaw, 1999), which is the workplace interface (Carder 1995). Jensen, (2008) provides a synthesis of the opinions of Barrett and Baldry (2003) and Becker (1990) on the relationship of facilities management unit and the organization and the product of their performance as summarized below:

1. Integrated strategic FM with a fully integrated relationship, where a dynamic, ongoing dialogue takes place between the corporate strategic planning and strategic FM.

2. Proactive strategic FM with a two-way relationship, where the strategic planning takes place in parallel and interdependent at corporate level and in FM with mutual exchange of information
3. Reactive strategic FM with one-way relationship, where FM reacts but does not influence the corporation's strategic initiatives.
4. Passive non-strategic FM with only an administrative relationship, where FM provides support but is not involved in the strategic planning process (Jensen, 2008: 493).

The desire of many universities is to have a facilities management unit that could operate in levels 1 and 2 above. To achieve this objective while at the same time trying to manage some inherent deficiencies in the in-house structure of the facilities management unit, some universities have separated capital development functions from operating and management to be executed by different divisions. This approach could provide some temporary and immediate solution but in the long term, internal rivalry and competition would impair their judgment and become ineffective in achieving the goals of the university (Jensen, 2008). Against the background that the University of the Witwatersrand has experimented with different models of facilities management with little success, the present multiple division structure and specifically separating capital development functions from operation and management could be a temporary measure to enable the administration to identify the problem areas and devise lasting solutions. The best practice, being adopted the world over, is the integrated facilities management unit where all facilities management functions are performed under one umbrella organization. The advantages of this approach include vertical and horizontal relationships within the facilities management unit, a holistic approach in the provision of functional support services that enhances the effective achievement of the university's core objectives, to make provision of "support functions more customer oriented and to reduce cost" (Jensen, 2008: 498). Currently, the facilities management unit of the University of Sydney operates as one unit, thus:

> The FMO is responsible for planning, development, maintenance and operations of the university's facilities. FMO carries out these responsibilities through its four operational groups:
>
> (1) facilities strategic planning;

(2) project services;
(3) facilities services; and
(4) environment and heritage (Gabriel, 2003: 234).

The quality and competence level of the management and operational personnel should be given diligent consideration (Housley, 1997, Tay and Ooi, 2001, Barrett and Baldry, 2003) in order to achieve these objectives.

5.2 Strategic planning and capital development

The portfolio of CDP includes campus planning and execution of capital developments. The composition and key operational strategies of the division are as follows:

1. CDP is composed of an in-house and an external management team with professional staff in the fields of Civil Engineering, Architecture, Quantity Surveying and Project Management. The in-house team, along with the relevant external professionals, translates the brief from the client into the development scheme suitable for the respective precinct.
2. CDP has conceived a spatial development framework mirroring the strategic objectives of the University to serve as a guide through which the Division can deliver the infrastructural development of the University.
3. The Division executes its development projects through external consultants and contractors using the 'framework' contract system of the Engineering Construction Contract (NEC3) option C. The approach facilitates the development of good contractual relationships, improving the execution of subsequent projects and smoothing the transition from one project to another.
4. The establishment of the 'University Planning and Development Committee' (UPDC) and 'Technical Execution Team' (TET) have allowed closer integration of all stakeholders to the development process and alignment of individual requests to the overall strategic objectives of the University.
5. Project closeout is accorded due recognition forming an important part in the University's learning curve on project conception, design, execution and operation. The increase in clients' involvement, improvement in project documentation and handing over certified

'as-built' documents facilitates effective operation and maintenance by the client and PIMD.

6. There are obvious deficiencies in the communication system, the structure for managing the risks associated with its development projects and preparation of occupants for any emergency.

Discussion

CDP has a modest organizational structure; the portfolio staff are competent professionals in the engineering and built environment fields suitable for the projects undertaken by the unit. The success of CDP could be linked to a good staff complement, dynamic procurement system and prompt settlement of contractual obligations. The active involvement of all stakeholders follows best practice of more progressive facilities management where "line function" departments work closely with facilities managers from the earliest part of the inception phase to improve facilities integration, avoid duplication and improve buildability (Heywood and Smith, 2006). The composition of the stakeholders depends on the nature, size and complexity of the project and the benefiting constituency. A clear landmark expected at the early stage of their involvement is to articulate the project concerns that will later become facility performance criteria (Heywood and Smith, 2006). Representatives of the stakeholders that participated at the planning stage translate into the execution governance for effective implementation.

5.3 Operation and maintenance

The operation and maintenance function of facilities management at Wits is performed by PIMD. The Division has the responsibility of managing facilities of different ages, complexities and composition in its portfolio. The researcher found that:

- The East campus was the seat of the University from its inception; the facilities were developed by the University, with the majority of them older than fifty years.
- The facilities in its portfolio in the West and Parktown campuses came from different backgrounds; jointly developed, acquired, transferred, or through donation to the University.

Due to the background, age and sources of the infrastructure in the portfolio of PIMD, coupled with disjointed transfer of records from successive managers, the present management of PIMD does not have a reliable data base for effective facilities management. The strategy being adopted to manage the facilities in this multi-campus structure is to divide the facilities into three clusters namely: East, West and Parktown Campuses. Each of these campuses has a functional facilities management office that deals directly with the client, exercises delegated authority and is connected through the intranet to the central management of PIMD for effective communication. The challenges facing the division in the management of this multi-campus institution with complex facilities in its portfolio include:

1. Low capacity in terms of operation personnel.
2. The need for improvements on documentation; facility history, as-built information, operational and asset audit.
3. The burden of a huge backlog of deferred maintenance, obsolete and broken down facilities and low funding.
4. The need for effective two-way communication to improve client satisfaction.

The reasons for the dearth of authentic operational records in the form of maintenance history or as-built documents is compounded by the age of the facilities, poor record keeping, alterations, modifications, new installation and removals, executed by different agents of the University and not properly documented with PIMD. In particular, the academic staff sometimes embarks on development or modification of teaching and research space without reference to PIMD until such exercise runs into problems, either in terms of logistics, regulatory standard or adjudication. Furthermore, since no regulation stipulates that the University should submit drawings to the local authority; this is where it would have been possible to trace documentation of older buildings.

The efforts being made by the new management is to develop functional operational records; liaising with CDP to develop as-built documents of the new structures being developed and any modification exercise.

Discussion

The management of facilities of different ages and complexities in a university with a multi-campus structure is a common experience in older universities. This is the experience of the University of Sydney:

> Established in 1850, USYD is Australia's oldest university, with approximately 40,000 students…spread over 600 buildings, which in turn are distributed over 15 campuses (Gabriel, 2003:234).

The disposition of the facilities management unit of the University of Sydney is to take advantage of modern information technological tools to manage the assets of the University 'in other to achieve its goals towards excellence in teaching and research' (Gabriel, 2003:233). During project closeout, as-built documents are usually handed over to the client and the operation and maintenance division. However comprehensive these records may be at this stage, they may not be useful for facilities operation (Song, et al 2002) due to the changes in the functional use of the facilities in its life cycle. In this regard, O'Brien (2001) and Gabriel (2003) suggest the development of a dynamic asset register to incorporate the facility history and current changes. An authentic facilities operation record is useful for 'planning and designing of spaces, maintenance, training of operation personnel, and actual operation' (Clayton, 1998: 3), otherwise, the facilities management operation is executed through guesswork. 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: 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: 311). Comprehensive information and forward planning foster effective communication between the facilities management unit and its customers.

The primary purpose of an operation and maintenance division is to maintain the respective facilities in functional state. Though the operation history may be stored in the computer or any other system, these records may not be useful if they are not analysed to determine the facilities or component conditions. Lavy (2008) demonstrates the importance of analysis of facilities

history in his research on a faculty building in Texas A&M University. The analysis enabled him to develop a ten year budget for three different "facilities condition index[1]" thus:

> It can be seen that the investment required from the university in order to keep the FCI (Facilities Condition Index) in its current condition is estimated at $1.98 million over the next ten years; $2.96 million is needed to improve the FCI to 15 percent, and $3.87 million for improving it to 10 percent[1] (Lavy, 2008: 311).

The primary strategy and priority of PIMD should be the documentation of all the University's assets and the formulation of a coherent and comprehensive management plan; however this would be costly and require skills that may not be available. This said, the cost savings in being able to budget for maintenance, repairs and replacement in an efficient and effective manner could outweigh the initial cost in the medium to long term.

5.3.1 Management of teaching venues.

The management of teaching venues in terms of allocation and monitoring was found to be the joint responsibility of venue allocation office in PIMD, the School administrators, lecturers and course coordinators. The allocation exercise is managed using the Facilities Management software called 'Syllabus Plus'. The management of the exercise has been fairly satisfactory to the respective stakeholders, under the present circumstances of limited teaching space to accommodate the growing number of students. It was further revealed during the research that PIMD could access the student enrollment database to validate the submissions from the respective Schools for effective spaces allocation; noting that periodic checks and monitoring through the "Close Circuit Television" (CCTV) should be used as secondary not primary source of information.

Discussion

By adopting the principles of effective communication, collaboration and active participation of stakeholders, the Space and Venue Allocation office of PIMD has been able to manage the teaching venue creditably. However, efforts should be made to ascertain the occupancy rate, so that the large lecture spaces are occupied progressively. The annual routine of teaching space

allocation and general venue management can be improved through dynamic 'space audit' (Gabriel, 2003) in order to identify the type, size and features. "This then allows the effective and intelligent management as well as reporting on any space and its set of attributes in the database" (Gabriel, 2003: 235). Furthermore the database can be linked to the student enrolment database, room booking and timetable system so that a just-in-time response and the 'fitness for purpose' of the venue could be reported to all stakeholders (Gabriel, 2003).

The expressed concerns of the venue allocation committee about the constraints of inadequate numbers of large or specialized lecture halls, combined with refurbishment and upgrading old lecture halls, are being incorporated into the strategic plans for the development of teaching and research facilities of the University. However, recognizing that the growth in students enrolment does not assume a continuous linear relationship, instead of continuous expansion of the physical teaching venues, that may latter become redundant (Amaratunga and Baldry, 2000), efforts should be made to explore the use of modern technology that could allow students to interact with lectures using the intra or internet within a defined radius from the lecture venue.

5.3.2 Management of workshops and laboratories.

During the research exercise, it was discovered that the development of workshops and laboratories in the University of the Witwatersrand (either under capital development or refurbishment) was the joint responsibility of CDP or PIMD and the benefiting school, coordinator or lecturer. However, the operation and management is coordinated between the laboratory manager, the head of school and the lecturer in charge of the research laboratory. PIMD's operation is limited to the repairs of the fabric of the structure housing the laboratories and the services (electrical, plumbing, carpentry, etc).

The laboratory technicians carry out the routine maintenance on the plant and equipment following a scheduled maintenance plan. When any plant or equipment requires major repair, the supplier or its accredited service providers are invited; the quotation for the repairs are processed through PIMD for the issue of the work order. The laboratory manager supervises the execution of the repair work.

The School of Civil and Environmental Engineering, School of Mechanical, Industrial and Aeronautical Engineering, the School of Mining Engineering and the School of Chemical and Metallurgical Engineering confirmed that they were satisfied with the operation and management of their workshops and laboratories by their in-house staff. Against this backdrop some of the academics are advocating that the maintenance of building services in the schools be transferred to the schools for prompt and effective management. The advantages of this suggestion include: executing facilities management services as an extra assignment to portfolio staff without excessive overhead cost; it encourages multi-skills for the portfolio staff; and it ensures a just in time response to request (Lavy, 2008). On the contrary, the disadvantages of this suggestion include: inability to develop strategic or tactical plan; the approach is more reactive than proactive; it is difficult to coordinate the facilities management operation (Lavy, 2008) and align them to the goals of the University.

5.3.3 Managing sourcing strategies

The University of the Witwatersrand has experimented with a number of sourcing strategies for the execution of facilities operations. Between the year 2000 and 2007, the facilities operation function was outsourced to two private organizations sequentially. The relationships did not provide the desired result of the functional operation and management of the support facilities that could effectively support the client's core function of teaching and research. Some of the major shortcomings observed include: misunderstanding of the nature and terms of the relationship; no functional internal structure to manage the relationship; the outsourced agents did not demonstrate sufficient competence in the management of the outsourced function as evident in the lack of authentic facilities record, forward planning, budgeting, training, development and discipline of service providers. Due to the fact that the client did not observe any significant improvement in the quality of service delivery and no significant cost savings, the University terminated these relationships and returned the management of facilities operation to an abridged in-house and external service providers' structure.

Currently, all operational functions of PIMD are outsourced to service providers maintained in their register which is structured according to trades, general and specialized services. There is

an informal classification of the service providers as “in-house” and “outside” contractors. The ‘in-house’ contractors are ex-Wits staff who formed their own enterprises, while the ‘outside’ contractors are those who were not former Wits staff. It is surprising that this dichotomy still exists, after the gestation period. Those found competent ought to be engaged and allocated work based on past performance or appropriate tender to comply with best practice.

The level of interaction and contractual relationship is determined by the service request in any or combination of three categories, namely: Trade Specific Service Request, General Service Request and Specialised Service Request. In an effort to improve on service delivery and reduce the delay in response time, PIMD adopts a structure of delegated authority allowing officers to take decision on the execution of contractual responsibilities, depending on the amount involved. When the service of any contractor is needed, notification is received from the Call Centre or through the area office in any of the satellite campuses. The magnitude and complexities of the work request determines the number of competitive quotations to be submitted for consideration. The contract is awarded, in addition to other considerations, to the most reasonable quotation and not the lowest tender. The contract instrument could be a simple work request card, work order for Trade Specific and General Service Requests or service level agreement for Specialised Service Requests. One of the priorities of the new PIMD administration is to correct some of the shortcomings observed in some of the contract instruments, especially the ‘service level agreement’. In this regard, the new service level agreement being developed is to provide a standard contract instrument suitable for the management of all operational contracts.

The contract instrument notwithstanding, technically, where multiple service providers are used to execute one or more facilities management function as against bundling many of these functions to one service provider, is referred to as ‘out-tasking’ rather than ‘out-sourcing’. Thus PIMD, like many other facilities management units in institutions of higher education, practice more of ‘out-tasking’ than ‘outsourcing’.

The low performance of the service providers and poor supervision by personnel from PIMD precipitates the delayed response to clients request, delayed execution, and low quality of service delivery. These have negative effects on the support services for effective teaching and research

and indeed on customers' (administration and academics) satisfaction. Many factors have been identified including, but not limited to, low capacity of operational personnel, lack of competent management capability, incomplete information to the contractors from the Call Centre, lack of easy access to the source of the problem, and no established link person between PIMD and respective units. Some of the remedial strategies being experimented include:

8. Reclassifying the service providers and streamlining their areas of operation to facilitate effective monitoring, ensuring improved quality of service delivery and accountability.
9. Effectively managing a functional list of staff responsible for facilities issues in each school or unit, scheduling periodic meetings to discuss general and scheduled maintenance, space or system modification, renovations and updates on requests lodged with PIMD.
10. Allocating areas of operation to designated staff in each of the area offices of PIMD.
11. Maintaining a roster for staff and selected trade specific contractor, on standby duty to provide assistance during emergency situations.

Laudable as these proposals may appear, there is no practical evidence of the implementation of proposals 1-3 above, notably item 2. There is no formal or informal communication from PIMD, either from their main office or area offices to the respective head of schools or units explaining the rationale behind item 2 and soliciting their cooperation to nominate their representative. However, some of the contractors interviewed raised two complaints in the execution of item 4 above. There is inadequate remuneration for call duty, and access to contractors on stand-by duties is not always available.

Discussion

Out-sourcing or out-tasking is gradually becoming a standard approach of executing operational functions in the facilities management industry worldwide, with each organization adopting the variants that are most suitable for their operations. Some of the procedures may not totally comply with best practices but enable the organization to achieve results. In other instances, neglect of standards coupled with poor management structure has lead to chaos and failures. The success rate of any outsourcing exercise depends on the level of preparedness of the organization: "…it is critical to assess if the circumstances and timing are right to pursue

outsourcing" (Campbell, 1995: 19). The level of preparedness can be measured by the quality of internal structure with which to manage the relationship, details of the service agreement, the competence level and availability of appropriate service providers in the local market (Campbell, 1995).

Technically, the method of executing operational functions being adopted by PIMD is more of "Out-tasking" than "Out-sourcing". Out-tasking means hiring individual, specialized vendors to provide one or more facilities management functions, while out-sourcing means hiring a full-service, single vendor to provide many services bundled together (Kleeman, 1994). Furthermore, the basic differences between the two methods discussed by Hui and Tsang (2004) revolve around the content, scale and administration of the contract as summarized below:

- Outsourcing is "*where a whole package* of support function is off-loaded to an external service provider", whereas out-tasking system is adopted in executing *specific tasks or work packages* through multiple service providers.
- The contractual period for an outsourcing relationship usually covers at least one year, renewable annually. The contractual period of an out-tasking relationship ranges from few days to several months.
- In outsourcing, the in-house staff complement is small; they serve as coordinators between the client and the external service provider. On the contrary, out-tasking requires sizable complement of in-house personnel who initiate and plan the service activities as well as lead the external service provider for the delivery of the needed services.

The development of a standard Service Level Agreement (SLA) is a sign of progress towards best practice in facilities management but the success of the exercise lies in effective management. The implementation should be progressive, first ensuring that there is a full complement of appropriate internal operative personnel. The is because the internal operative personnel are to develop the specification of service level in the agreement which is generally described in qualitative rather than in quantitative terms and require some level of expertise. "Here the specification must deal with outcomes and satisfaction levels…" (Lawes, 1994:10). These outcomes and satisfaction levels are measured through defined Key Performance

Indicators (Lavy, et al 2010; McNeeney, 2005) that must be clearly stated in the agreement. The professional background of the client's personnel responsible for the development of the specifications (Lawes, 1994) and management of the execution would determine the quality of service delivery. The exercise should commence with a few trades specific service providers in each campus. The result of the evaluation after a given time- frame will determine the pattern for further implementation.

The structure of PIMD that provides for graded delegation of power in the administration of the operational function is aimed at reducing delays in authorizations. However, the negative effect that the low capacity of operational personnel is having on the management of the out-tasking exercise includes poor supervision of operations, lack of timely certification and delays in processing of completed contractual obligations. These, in turn, affect the payment process and the financial capacity of the service providers. The four remedial strategies proposed to enhance effective service delivery should be implemented with dedication. Furthermore, a deliberate plan for capacity building for the in-house management team as well ensuring a similar scheme is being implemented by the service providers, would guarantee the development of a credible in-house team and service providers that can provide functional support services. The ease with which the in-house team could adapt to meet these challenges depend upon "the skills and capabilities of the employee and their wiliness to continue in training and development" (Atkin and Brooks, 2000: 71). The capacity building scheme should ensure that the operative personnel are competent in professional practice to continuously satisfy the provisions of relevant legislation and standards, retain membership of appropriate industrial body or association and to keep pace with the application of modern technological developments in their respective disciplines. Capacity building requires some capital investments which are inevitable if the facilities management unit is to satisfy the organization's needs (Atkin and Brooks, 2000).

5.4 Information Technology support

There is a variety of facilities management software packages available in the market but each client requires diligent search and adaptation of the most suitable for the management of the facilities in its portfolio. The advantage of these tools is in their effective use and not in the

installation of variety of underutilized tools. Currently, PIMD have the following software: Computer Aided Design (CAD) for the documentation of drawings; 'Syllabus Plus' for the management of 'teaching venues'; Archibus/FM, otherwise known as an Integrated Workplace Management System (IWMS), used for the management of the general operational functions; and Building Maintenance System (BMS) for the management of energy distribution and control systems.

All communications or requests relating to facilities management in general are processed through a central point commonly referred to as the 'Call Centre'.

The research revealed that the use of the Archibus software is limited to the management of client requests and periodic reporting while the BMS is used for the management of the energy systems, as summarized below:

1. Once a client logs his first request at the Call Centre, he is now registered onto the Archibus data-base and receives an email notification with this link http://infrastructure/FMDesk/fmd. Through the link, the client can view work request status, updates, costs, contractor details and contacts pertaining to each request.
2. Periodic reports are produced weekly and monthly for appropriate PIMD's management meetings. The weekly reports give the breakdown of requests recorded for the week and the status of execution, while the monthly report, produced in the first week of the next month, contains the request, status of execution and cost incurred.
3. The history of each facility, requests and records of execution, are stored in the Archibus system, available for analysis and use for effective facilities management. However, due to frequent changes in the facilities management unit over the years, these records are not comprehensive.
4. The BMS system is used to monitor the energy supply, distribution and consumption pattern as well as to identify abnormal consumption and trace the source. Due to low technical capacity, the majority of the facilities initially connected to the BMS system have been de-activated. This has made it difficult for PIMD to effectively monitor energy supply, manage the distribution, or identify source(s) of abnormal consumption. Efforts being made by the new management are to re-activate the existing network, expand the network through 'continuous connection' using cables or 'remote accesses' through GSM connection with a

receiver at the control panel, connect the 112 electricity meters to the network and employ staff members that are technically knowledgeable in electrical and mechanical installations in each campus office.

5. At the time of this research, the CAD software for the documentation of drawings is dormant due to low capacity.

Discussion

The wisdom of using multiple software for managing different aspects of Facilities Management operation include easy access and management of information, localizing operational faults within the network of the separate systems, and providing backup information if there is any fault with the central system (Rycroft, 2007). The two factors responsible for ineffective use of available information technological tools are "poor choice of system and an ineffective control of data in the system" (Rycroft, 2007: 22). Efforts should be made to integrate the separate systems to a central system and link to the local intranet or the Web for easy access to the wider organization (Gabriel, 2003). The integration process should be progressive leading to full automation of facilities management services.

The American Productivity and Quality Center (APQC) identified ten key advantages of using information technological tools in facilities management by progressive organizations. The four listed below are relevant to facilities management units in higher educational institutions:

1. Information technology in facilities management must be a part of the organizational culture to make an impact on the organization's plan;
2. Building relationships and *maximizing the use of technology* are the most critical issues for addressing facilities management information technology strategy.
3. *User-friendly, integrated access to key information* is necessary for facilities management to be viewed as a partner to the organization.
4. Understanding customers' needs for FM information and following through by *providing usable information* results in satisfied customers (APQC, 1998: 7).

There is evidence of huge investment in information technology in the University of the Witwatersrand, but PIMD does not seem to have complementary competent operative personnel

to use these tools for effective communication with its customers, maximum use of the available technology, the operational systems in PIMD are not user-friendly, not integrated and clients have limited access to usable key information. Thus the capacity drive of PIMD does necessarily mean engaging new hands but should incorporate retraining of existing workforce to upgrade their knowledge in the use of available tools.

Inadequate information stored or retrieved from the database leads to the generation of faulty reports that are not helpful for forward planning, budget and operation managements.

Standard software such as the Archibus system should have "flexible report writer that allows customized reports and analysis of performance and other data…" (Rycroft, 2006: 29). Generally, the quality of the reports generated depends on the knowledge of the operator of the system and understanding of the requests of the end users. The Archibus system is able to provide a wide range of support systems for effective facilities management operations. The volume of requests currently being processed through the Call Centre could reduce if the clients can access the intranet to view the status of execution of their requests. Furthermore, to improve on the quality of communication and relationship with clients as well as build reliable data base for objective reporting to management, the current monthly reports require some improvements that include:

a. Reducing the entire report into a table format, for ease of comprehension and reduction in the volume of paper;
b. Sorting the requests according to specific unit or clusters of facilities, such as School level;
c. Reflecting the report of the two preceding months in each current report;
d. Providing visual representation of the reports; and
e. Providing explanatory notes.
f. Providing easy comparison of current expenditure relative to appropriate subject heading in the operational budget.

The information contained in tables 4.2, 4.3 and 4.4 are represented according to the above recommendations, in table 5.1 which demonstrates how much easier the report is to interact with. As shown in this table, 27.15% of the work requests logged in March have been addressed by the first week of April, the period for reporting on March work requests. However, four weeks later, over 30% of the requests were still outstanding. It can be assumed, therefore, that some of the requests logged in January and February may have spilled over to March and April. This serve to

buttress the fact that information about the work requests of the two preceding months should be included in any current month's report, for more objective assessment of performance.

Table 5.1 Total Work requests issued for March (all campuses)

2995	March				April				
day ending	7	14	21	28	4	11	18	25	30
qty completed	9	85	286	463	813	1114	1621	1914	2013
% completed	**0.30%**	**2.84%**	**9.55%**	**15.46%**	**27.15%**	**37.20%**	**54.12%**	**63.91%**	**67.21%**

Suggestions b, c and d were experimented with by compiling the comprehensive report of the request lodged with the Call Centre from the School of Civil and Environmental Engineering for the period of January to March 2010 as shown in Appendix B. The eight page report was reduced into a table format as shown in table 5.2. At a glance, table 5.2 provides the essential information in the eight page report of Appendix B.

Table 5.2 Summary of periodic report on work request from Hillman Building

Problem Type	JAN	FEB	MAR	Total Issued	Total Completed	Cost
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

Furthermore, figure 5.1 shows the graphical presentation of the status report, while figure 5.2 shows the financial commitments. . Visual presentation of reports in the form of graphs and charts are powerful tools for effective communication; it enhances easy comprehension of the report and facilitates appropriate management decisions (Chou et al, 2010).

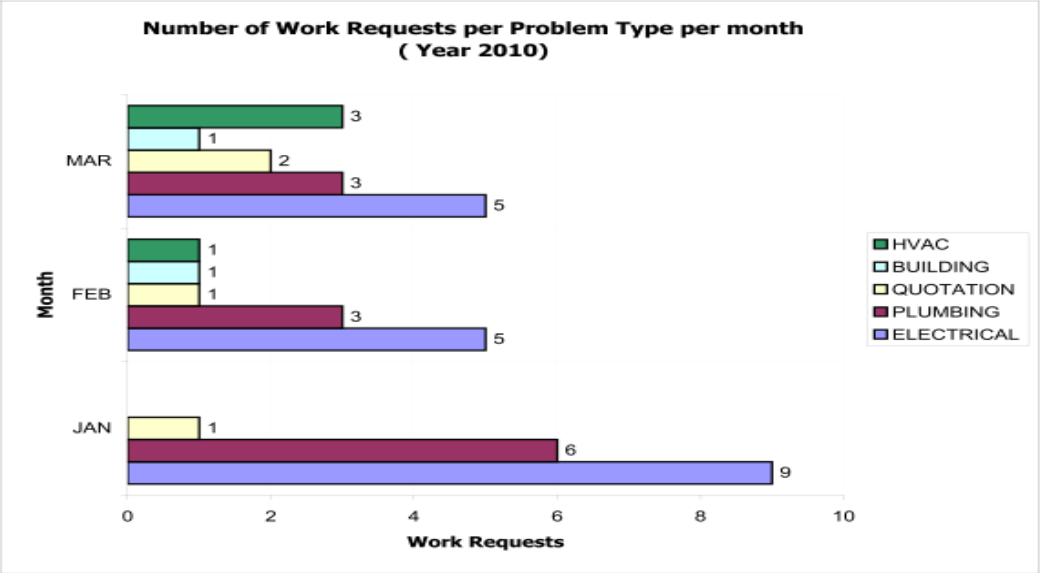


Fig. 5.1 Graphical presentation of the report on the requests from Hillman building

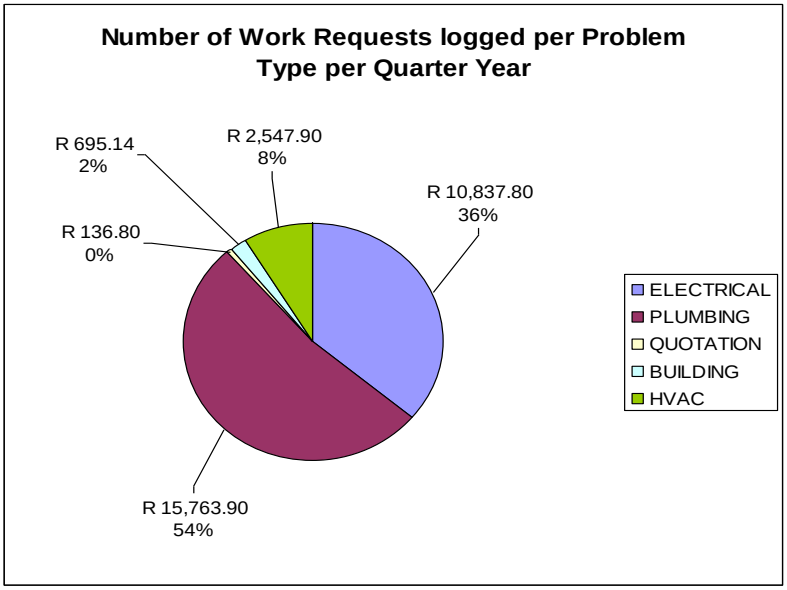


Fig. 5.2 Financial involvement of the work request from Hillman Building.

However, due to some logistical problems, it was not possible to provide explanatory notes to this report or compare the expenditure with any operational vote head. The notes should provide: explanation to terminology, such as Quotation; reasons for uncompleted works; emphasis of recurring requests or deferred maintenance and their implications on the component they

represent. The notes should also indicate the cost implication of executing the 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 PIMD are concerned about maintenance.

And the Dean added:

> It is a good start. I would also like to see an age analyses (30 days, 60 days, etc) of the addressing of complaints or requests.

With such comments, the client is prepared to participate and jointly find solutions to observed problems and contribute suggestions objectively.

In order to maintain effective communication links with all stakeholders, a similar report could be prepared for each of the seven Schools in the Faculty, but only the executive summary and graphs for the seven Schools may be forwarded to the Dean of the Faculty of Engineering and Deputy Vice-Chancellor Finance and Operations for information and necessary management decisions.

Similar to Archibus software, the BMS software is under-utilized. The reason for this includes lack of adequate technical expertise on the part of the operatives in the respective campuses, the contactors' inefficiency, management's lack of commitment and financial constraints. The savings that could be realized through effective monitoring and management of energy supply and distribution outweigh the initial investments in rehabilitating and maintaining the existing network, expansion of the network and employing competent technical personnel. Generating a reliable database would facilitate effective monitoring and management of energy distribution as well as being able to develop alternative sources of energy. This is currently being developed by the staff of the School of Electrical and Information Engineering in conjunction with PIMD.

5.5 Assessment of performance

During the course of this research, it was evident that the CDP was aware and committed to contributing to the achievement of the goals of the University being a world class university. This commitment can be seen in the reflection of this goal in the contract instrument for the execution of capital projects. The same commitment was not evident in the operations of PIMD. The declaration of intent is one thing, the actual execution of the programmes to realize the intention is another vital component that requires careful evaluation.

The research revealed that the customers (University administration and the academics) have a modest view on the performance of CDP but noted that the division does not have any Key Performance Indicators (KPI) with which to measure its performance and that of its service providers. Though satisfied with delivering projects within cost limits, the areas that require improvements include: consultation with clients during the period of project conception and execution; quality of internal project management and reporting; quality of project delivery; and delivering projects within time schedule. These observations were seen as fair representation of the performance of the division and accepted the challenges they presented as useful learning experience in delivering projects to customers' satisfaction.

The assessment of PIMD also revealed that they do not have any Key Performance Indicators (KPI) for the measurement of their performance nor that of their service providers. The University administration and the academics expressed satisfaction with the management of the allocation of teaching and research venues. However, the academics, who are at the receiving end, noted the inadequate performance of PIMD in the operation and maintenance of the functional services connected with teaching and research facilities. This is evident in the slow rate of response to their requests, ineffective and inefficient treatment of the request, in most cases; compelling them to make repeated contacts before receiving attention or prompting them to seek alternative solutions.

The Director of PIMD, while identifying with some of the observations, added that poor communication between it and the academics was a factor responsible for the perceived low

performance in some essential areas, especially modification of existing space for specialized use. The Dean of the Faculty of Engineering and Built Environment corroborated the observation of PIMD in this regard. What is important here is an indication that communication between PIMD and their customers needs to be improved, including educating the customers in the strategic and tactical necessity for following the established procedures and channels of communication.

Discussion

The standard, quality, aesthetics and functional state of the physical facilities and the environment within and around a university 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: 246). The declared objective of the University of the Witwatersrand is to be a world class university in the near future. Achieving this objective should challenge the facilities management unit to align the performance of their functions by setting definite goals against which their performance could be measured periodically. These goals should consist of short, medium and long term plans, adopting consistent appraisal with defined set of criteria. These goals are severally referred to as Key Performance indicators (KPI) or Performance Metrics (PM) (Varcoe, 1996, Lavy, *et al.* 2010). One of the advantages of developing performance measurement is that it provides the foundation for a facilities benchmarking process (Lavy, *et al.* 2010). There are various classifications of Key Performance Indicators, the three most relevant to the development, operation and management of infrastructure for teaching and research in higher educational institutions are, financial, physical and functional indicators. The syntheses of the measurable goals in these indicators from Lavy, *et al* (2010) are shown in **Table 5.3 - 5.5** below.

Table 5.3. Financial Indicators.

	Indicators	Description
	Operating costs	All cost related to facility operation, such as insurance, repair and maintenance, cleaning, waste disposal, wages and overheads, etc
	Utility costs	Monthly or annual cost of utilities, including electricity, fuel oil, gas, water, sewage, etc.
	Capital costs	All costs required to purchase, develop or extend building property, to procure plant and equipment, etc.
	Grounds-keeping cost	Cost for labour (in-house or contracted-out) and materials required for landscaping, storm water management, and parking lot or garage maintenance.
	Deferred maintenance and deferred maintenance backlog	Cost of maintenance of property, plant and equipment that is postponed from a facility's operating budget cycle due to financial constraints.
	Current replacement value (CRV)	An estimated cost of restoring the building to its original condition and function.
	Facility condition index (FCI)	Represented by the ratio between the total cost of deficiencies to the CRV, or by the ratio between the costs of Deferred maintenance to the CRV.

(Lavy, *et al* 2010: 450-451)

Table 5.4 Physical Indicators

Indicators	Description
Building physical condition-quantitative: Building Performance Index (BPI)	Indicates the physical-functional state or condition of a facility in terms of building components, systems and processes
Building physical condition-qualitative: general building maintenance in: building physical condition; sanitary, plumbing and storm water; mechanical services; and lighting and electrical systems.	Includes maintenance in terms of routine repairs, major and minor repairs and replacements in: building physical condition; sanitary, plumbing and storm water; mechanical services; and lighting and electrical systems.
Property and real estate	Includes real estate area and provides an estimate of owned versus leased area in order to know what fraction is owned and what is leased
Waste	Total waste generated for disposal, waste to landfill, hazardous waste, cost of waste disposal, and amount of waste recycled or reused.
Health and safety	Includes an estimation of condition of employees' health and safety and organization's compliance with applicable codes related to the health and safety of employees.
Accessibility for disabled	Provision for disabled and preparedness of facility to accommodate special needs of handicapped people.
Resource consumption-energy.	Total energy consumed by entire facility, including stored fuels or gases; energy consumed in HVAC system, lighting, domestic hot water, etc.
Resource consumption-water.	Total building water use; total water consumption minus reused, recycled and treated water.

(Lavy, *et al* 2010: 452-453)

Table 5.5 Functional Indicators

Indicators	Description
Parking	Availability of parking spaces
Space utilization	Measures over-used and under-used spaces, adequacy of space, and proper space management.
Adequacy of space	Suitability of space for proper functioning of the facility. Sufficiency of space for various building operations, maintenance, equipment, and other supportive systems.
Customer/building occupants' satisfaction with products or services	Measures the ability to deliver quality products and services to customers, effectiveness of their delivery, timeliness, and overall customer satisfaction with building, building services, and building systems.
Learning environment, educational suitability, and appropriateness of facility for its function	Appropriateness of a facility to perform its functions in terms of functional, spatial, and psychological aspects.
Appearance	Exterior and interior visual qualities, harmony with surrounding, scale and proportion of spaces, and visual stimulation of the facility.

(Lavy, *et al* 2010: 456-457)

The above generic Key Performance Indicators can be further streamlined to reflect the peculiarity of the customer's core function (Loosemore and Hsin, 2001). Around these performance indicators the facilities manager could develop points of reference or benchmarks which serve as a standard against which relative performance is judged (Loosemore and Hsin, 2001). The benchmarking exercise can be used in an inter-building, intra-building or facility sense to measure performance. "The inter-building assessment is a comparative evaluation in which the building under study is evaluated against a similar building. In intra-building evaluation, the building is assessed on its own, based on its individual performance" (Lavy, *et al*, 2010: 411). The benchmarking exercise can be extended to organizations outside the respective university, comparing one aspect or another of the facilities' operation in order to emulate best practices. In order for both exercises, Key Performance Indicators and benchmarking, to be successful, " it is very important that a clear and sharp focus be applied to the benchmarking activities – what is the problem, why is it occurring and how much does it need to improve" (Varcoe, 1996). It is imperative, therefore, that both CDP and PIMD should develop functional and dynamic Key Performance Indicators for the respective facilities being developed or managed and reflect the performance measure in the periodic reports; adopting either intra-facility or inter-facility benchmarking.

CDP's internal evaluation aligned with the administration and the academics in the assessment of its performance, realizing that there is room for improvement. The success rate of CDP, so far, may be connected to the quality and consistency of the staff in the division, a dynamic procurement system and prompt settlement of contractual obligations. Nevertheless, the division needs to improve in the areas of consultation with clients, quality of internal management and reporting, quality of project delivery and delivering projects within time schedule. The present organizational structure where there are only two in-house technical staff may be under-resourced. The many capital projects going on simultaneously have a wide range of project stakeholders to relate with. In an effort to cope with the administrative demands, they are lacking in active project supervision which is presenting negative evidence in delivering quality projects, reporting and relationships with the client. Therefore, in order to improve on project delivery, the efforts of the present in-house staff may need to be complemented with more senior and middle level professionals in the engineering and built environment professions.

The disadvantages in the existing structure that lean heavily on hiring professional team members on a project basis include:

a. Inability to transfer knowledge from one project to another, since there is no guarantee that the project team will transit from one project to another;
b. Each new project team requires re-orientation in order to be able to manage their project with the aim of achieving the goals of the University;
c. The closeout sessions are not likely to be conducted objectively, especially where any of the team members is indicted and they may be unwilling to share knowledge and ideas that can be used by their competitors in the future.

The framework contract method being used for the execution of capital development is one of the modern and dynamic project procurement methods that allow the contractor to be part of the project team from inception. The tools for management control, reporting and communications inherent in this procurement instrument facilitates the execution of improved quality projects within cost and time schedule.

The observation from the academics that, though projects are delivered within budget, the content and quality are compromised and the projects are not delivered on time, raises some

fundamental questions that should be examined in greater detail. Anbari, referring to Kerzner (2001), observes that if a project is to be delivered within schedule after a period of not so impressive performance, the schedule can be crashed by employing increased resources at an additional cost. Conversely, if the project is to be delivered within a budget ceiling, it may require that less skilled resources are employed, or reduction in the content and quality of the project schedule and possibly extending the project duration (Anbari, 2003). The earned value reporting system allows the project manager to carry along all stakeholders and enable them to interact with the project objectively. Taking note of the performance before reporting, identify the appropriate corrective measures to be taken, the project manager is able to forecast and manage the project completion cost as well as the completion time to the satisfaction of stakeholders.

Reflecting on the performance assessment of PIMD, it would appear that PIMD overrates its performance. The assertion of the Director that most of the observations from the administration and the academics are not a fair representation of the efforts of the division is fairly difficult to defend, since there are inherent weaknesses within PIMD and its operations. For example, the operations of the Call Centre directly affect the relationship between PIMD and the wider University community, as it manages the information flow between PIMD and their customers. At the moment, customers' inability to access the status of their work request results in multiple communications, frustration or the tendency to seek an alternative solution without reference to PIMD. Furthermore, the periodic reports produced from the Call Centre are only circulated within PIMD without any reference to the customers. The format of the report is difficult for any other user to relate with, in that the report is not structured, does not relate to any Key Performance Indicator and there is no evidence of intra or inter-facility benchmarking. The percentage of completed works evident in any typical report presents a poor reflection of the performance of the division. PIMD need to improve on the mechanisms of its internal structure and services in order to earn the respect of its customer.

The desire of the new administration of PIMD to improve on service delivery is commendable, especially through identifying a responsible person for facilities management in each unit, such as at school level. This approach will bridge the gap in communication, provide explanation of

the execution status of requests, effectively manage the execution of each request, and evaluate proposals for modification, extension or alteration, with the ultimate aim of providing a prompt response to customers' requests. This ideal should translate from proposal to actions, similar to the argument of Amaratunga and Baldry (2002) that performance measurement should be accompanied by appropriate performance management in order "to make effective use of its performance measurement outcomes" (Amaratunga and Baldry, 2002: 218). They explain further that, performance management provides:

> …organizations the opportunity to refine and improve their development activities…provide feedback based on specifics rather than generalizations and are based on specific objectives derived from the desired outcome of performance measurement results (Amaratunga and Baldry, 2002: 218).

This forum provides rapid feedback about the conditions of the facilities, which could help both the customer and PIMD to refine and adapt consistent and continuous improvement in the facilities' performance (Cohen et al, 2001 in Lavy et al 2010). Effective use of this forum will bridge the existing communication gap, improve on customer satisfaction, develop and operate support facilities in the most functional state that could enhance the performance of the core functions of teaching and research so as to achieve the University's goals.

Reviewing the developments in CDP and PIMD, it can be seen that these divisions are not equally committed to the realization of the goals of the University. If the goal of being a world class university is to be realized within the set time frame, it requires therefore, that a holistic re-examination of the operations of these two divisions and indeed the other divisions be conducted so that facilities management functions can be performed under one umbrella organization. The single umbrella concept is what is commonly referred to in literature as 'integrated facilities management'. This single organization can then adopt pragmatic management tools that incorporate multiple and interrelated performance measurement criteria such as the 'balance scorecard'.

The balance scorecard, as discussed in section 2.4, enables the facilities management unit to adopt a holistic assessment of the performance of its functions, reviewed in the light of the relevant perspective by answering the appropriate question. In this regard, each division takes

responsibility for the operation of the whole unit. It provides a “one stop” source of information on facilities management operations. At a glance, the facilities management unit can review the ‘financial perspective’ and justify whether it is providing the client with value for money invested through the unit. It allows for self critique. On the other hand it enables the client to relate the financial investment to the quality of service received (Kaplan and Norton, 1992), to ask relevant questions and challenge the Facilities Management Unit on definite areas the require improvements. The balance scorecard actively engages both the customer and the Facilities Management Unit in a mutual partnership that continuously monitors the activities in the workplace interface (Carder, 1997), so that the input from the Facilities Management Unit will generate positive multiplier effects in the performance of the core functions of the organization.

The other two perspectives of the balance scorecard relate directly to the facilities management unit. Adapting the ‘internal business perspectives’ to the present case study suggests that some of the activities being performed by the divisions may need realignment in order to enable each division to concentrate on their areas of excellence that would ensure maximum productivity (Brown and McDonnell, 1995). This in turn will challenge each division to develop its internal capacity to enable them provide innovative approaches in the execution of their functions that would enhance the overall performance of the unit and facilitate the achievement of the goals of the University.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

Facilities Management practice in the University of the Witwatersrand is similar to what obtains in many old institution of higher education that operates from multi-campuses; the structure and functions are dynamic reflecting the status of the institution. The Facilities Management Unit is required to develop and manage facilities of different ages and complexities in its portfolio. The Facilities Management functions in wits are currently being performed by four distinct divisions, namely: Campus Development and Planning (CDP), Property and Infrastructure Management Division (PIMD), Services Department (SD) and Campus Control (CC). However, CDP and PIMD are the two divisions principally connected with the development, operation and management of infrastructures for teaching and research. Each division has vertical relationship through the office of the Deputy Vice-Chancellor – Finance and Operations and occasional horizontal relationships on a project basis.

In this research, the Facilities Management customers considered were the senior management of the University and the academics who execute the core functions of teaching and research. To achieve the research objectives, it was considered important to measure the customers' satisfaction through evaluation of the performance of the Facilities Management Unit at the 'work place interface' (Carder, 1997), where the output of the unit moderates the inputs of the academics in the performance of the core functions of teaching and research. This ultimately affects the realization of the University's objective and its competitive advantage in the community of universities.

It is imperative, therefore, that facilities managers in the university setting should possess academic and professional qualifications that will enable them to translate the strategic objectives of the university into the development, operation and management of facilities for the pursuance of the core functions of teaching and research; communicate effectively and relate with their academic counterparts and senior management staff of the University. The success of this endeavour requires a synergy between the academics and the Facilities Management Unit.

The conclusions presented below are the product of the information gleaned from literature on best practice and the findings from the case study. The synthesis of the research question and objectives is as follows:

- Explore the management strategies, systems or structures for the development, operation and management of the facilities in the University's multi-campuses.
- Evaluate the understanding, preparedness and commitment of the unit to achieving the objective of the University of being one of the top 100 universities of the world in 2022.
- Examine how the University administration and the academic staff perceive the contributions of the Facilities Management Unit in the achievement of the core functions of teaching and research against the background of the goals of the University.
- Examine the constraints of the unit and evaluate the technological tools in use that can be adapted for use in Facilities Management Units in other higher education institutions in developing countries.

6.1.1 The facilities Management structure and strategies in Wits

In the last ten years, the University of the Witwatersrand has experimented with four different types of Facilities Management system. It can be concluded, therefore, that the idea of coordinating Facilities Management operations from the office of the Deputy Vice-Chancellor (Finance and Operation) demonstrates the University's commitment to the strategic importance of the unit to the overall achievement of its set goals. Furthermore, performing the Facilities Management functions through multi-divisional structure and especially separating capital development from operation and maintenance are temporary measures that may enable the University to isolate the problems in each division that are negatively affecting the overall performance of the support functions, so that due attention can be focused on such.

The structure and operational capacity of CDP is modest but heavily dependent on external service providers. The division has developed a 'spatial development framework' reflecting the unique setting of each campus. With this, it manages the capital projects, both new and rehabilitation works earmarked for each precinct. As shown in section **4.3**, there are ten precincts in the current development framework. The thrust of the 'development framework' is aimed at

promoting the University's unique internal identity and outreach into the local and national community.

The operational strategies as discussed in sections **4.3.1** to **4.3.3** show that the benefiting units are actively engaged with the projects from the concept stage, through the development, operation and management of the proposed projects within each 'development precinct'. However, CDP requires improvements in the areas of quality of internal management and reporting, quality of project delivery and delivering projects within time schedule. Some of the factors responsible for these negative observations could be traced to the fact that majority of the operating personnel are hired on a project basis as discussed in section **5.3.6**. Effective project supervision, coordination and reporting for quality in multiple projects are beyond the capability of two in-house staff.

PIMD, on the other hand, has a functional generic structure suitable for the management of facilities operations in a multi-campus setting. The structure includes Facilities Management offices in each of the campus operated by in-house staff (Section **4.2**). The structure provides for the exercise of delegated authority in order to reduce delays in decision making processes and all operational functions are executed through registered service providers. However, the division adopts more of reactive than proactive approach to its operation; there is no strategic plan, authentic operational records and some of the office holders does not seem adequate for their tasks. There is very little interaction between the academic staff and the Facilities Management Unit.

The 'Framework contract' instrument is used for the execution of capital development projects, while the instrument used for managing operational functions depends on the volume of work, complexity and the amount involved. In section **4.4.4**, it was found that the contract instrument can be a simple work request card, work order or service level agreement. Under normal circumstances, these arrangements may work but could become very difficult to manage in the event of disputes and risks management. Efforts are being made to develop standard service level agreements for the execution of all operational service requests. However, the success of this endeavour hinges on the quality of the management structure and competence of the operational personnel to develop, coordinate and supervise the operation of the instrument. The decision to

use the 'Framework contract' (NEC3) for the execution of capital project, is to foster a commitment of using each capital project as part of a learning curve to improve CDP's ability to deliver on a "continuous improvement" philosophy.

6.1.2 The Facilities Management Unit and University's objective for 2022.

The evidence gathered during the research indicated that CDP is demonstrating some understanding and commitment to achieving the goals of the University, while the commitments of PIMD are not quite as obvious. The CDP has:

- Developed a "spatial development framework" for the University that was approved for implementation in 2009.
- Created a mission statement: "To provide a cost effective reliable Facilities Management services to the University community to enable it to achieve its strategic objectives in a safe environment".
- ensured that the statement of its action plan be included in every contract document for the execution of capital project thus:

  The University established a Capital Project Programme (CPP) in 2008 to renew and expand its facilities and infrastructure to build a better campus for enhanced teaching and learning – for the present and the future in its drive to remain a world class university (See section 4.3.2).

The inability of PIMD to articulate and align their operation towards achieving the goals of the University could be seen from the fact that preceding management left disjointed records of the condition of the facilities in the portfolio. Therefore, some of the objectives of the service delivery (See section **4.4.5**) proposals are aimed at developing credible database that would reflect the state of the facilities in its portfolio; create avenue for effective communication with their customers and improve on the capacities of the operational staff.

The conclusions that can be drawn include the fact that CDP is aligning with the University's goals because it has competent operational personnel, working from an approved strategic plan (Spatial Development Framework), and provided with the fund to execute the approved projects.

On the other hand, due to frequent changes in the administration of PIMD without proper transfer of records, low capacity (in terms of quantity and competence level) of operational personnel, lack of effective communication with the customers, the Division does not have authentic database for effective facilities operation. It therefore cannot develop functional strategic plan to align with the University's goals. The observed gap can only be bridged if both Divisions are equally resourced in terms of personnel, competence and funding. Furthermore, the proposition of 'effective management interface' where senior management create the atmosphere for cordial relationships between it and the executing units as well as encouraging interdependent relationships between the executing units will facilitate the closure of this observed gap (Housley, 1997, Carder, 1995, Carder, 1997). The interface encourages the formation of synergy for the achievement of the aims of the organization, and creates feedback loops that allow the executing units and management to jointly critique the performance of each unit.

6.1.3 Assessment of performance.

a. **Campus Development and Planning Division (CDP**)

The Campus Development and Planning Division are regarded favourably by the University administration and the academics for delivering projects within cost limits. However, they expressed reservations in the level of consultation with clients during the period of project execution and closeout sessions. Other areas that deserve attention include: quality of internal project management and reporting; quality of project delivery; and delivering projects within time schedule. These areas are critical to the achievement the goals of developing the infrastructure for teaching and research.

The conclusions that could be drawn from the above observations are that while the majority of the capital projects (new or rehabilitation) are completed within budget; the management and reporting structure does not educate the benefiting unit adequately; the quality of the completed projects and the delivery time requires improvement. The implications of executing projects within budget and the projects are also associated with negative observations suggests that the reduction (trade-offs) in the content and quality of the project schedule were not properly managed (Anbari, 2003). In a typical project scenario, one of the constraining factors that

compel projects to be executed within cost limits is the difficulty of raising additional funds. Generally, it is difficult to create a wide band for contingencies to accommodate any variation in project cost during planning, as some of the variations have significant cost implications. Under these circumstances, project managers and the relevant stakeholders usually have roundtable talks to agree on essential 'trade-offs' that will not compromise the strategic importance of the project. It appears that CDP is not effectively managing this essential component in their project delivery system, despite working with a "framework contract" that is designed to overcome this.

b. Property and Infrastructure Management Division (PIMD).

The University administration identified progress in PIMDs performance, reflecting that there is a shift in the nature of complaint about the performance of PIMD from lack of response to delayed response to requests. These customers equally expressed satisfaction with the management of the allocation of teaching and research venues. However, the academics, who are at the central to the core activities, are not satisfied with the rate of response to their requests, in so much that they are compelled to make repeated contacts before receiving attention or seek alternative solutions. The University administration and the academics agree that PIMD needs to improve in the areas of communication with customers, as well as in the quality and functional levels of the services within the teaching and research facilities.

In the light of these observations, it can be concluded that PIMD has not been able to manage its operation through effective communication with its respective customers, as discussed in sections **4.6** and **5.3.6**. This is evident in the following:

- The customers cannot interact effectively with PIMD through the Call Centre on the status of their request, giving rise to repeated calls;
- The periodic reports are not circulated to customers to keep them abreast with developments;
- If the reports were to be circulated in the present format, it would be difficult for the customers to relate with PIMD effectively;
- Due to some negative experiences in the past, many Heads of Schools do not consult PIMD when developing important documents such as 'Strategic Plans';

- More critically, the experience of inadequate performance prompts the client units to avoid the services of PIMD, leading to a spiral of incomplete and inaccurate records on the status of facilities; this is fundamental to strategic and tactical planning.

The periodic report is a tool of effective communication between Facilities Management Unit and other stakeholders. Carder (1995) suggests that facilities managers should present periodic reports in a simple format, so that the customer can relate with the state of the facilities in the portfolio, identify possible constraints to the achievements of the core function of the organization and demonstrate prudent financial management. PIMD may be performing its level best, within available resources, but the customers are not involved, informed or incorporated adequately to be able to appreciate its constraints.

6.1.4 The constraints of the unit and technological tools

The major constraint discovered during this research in the operation of CDP is the inadequate number of in-house professional personnel. CDP is a new division tasked with the responsibilities of planning and executing multiple capital developments. It is lagging behind in terms of effective project management and reporting to customers, and these projects are not delivered within scheduled time frame. These deficiencies cannot be effectively handled by the two in-house staff currently managing the division.

Some of the specific and general constraints of PIMD include:

- Low capacity in terms of operational personnel;
- Lack of authentic facilities operation documents;
- The burden of huge backlog of deferred maintenance, obsolete and broken down facilities; and low funding;
- Lack of effective two-way communication to improve client satisfaction.

In specific situations, such as developing laboratory facilities, some of the constraints have been:

- Indecision on the part of some academic staff; they change their requirement many times in the process.
- Laboratory development requires specialist treatment, which requires time to source the necessary information and expertise.

- The majority of the requests in this regard come to PIMD at a late stage in their planning process, sometimes when the equipment has arrived and there are problems with space or installation.

The conclusion that can be drawn from the above constraints centres on effective management of information, as discussed in sections **4.4; 4.6** and **5.3.** The University administration is aware of the shortage of essential operational manpower in PIMD and has challenged the new management to fill these vacancies. The low capacity of operational personnel should include capacity building of the existing staff complement.

6.1.5 Information technological tools

The following information technological tools are being used by the Facilities Management Unit of the University: Computer Aided Design (CAD) for the documentation of drawings; "Syllabus Plus" for the management of teaching venues; "Archibus/FM", otherwise known as an Integrated Workplace Maintenance System (IWMS), used for the management of the general operational functions; "Building Management System" (BMS), used for the management of energy distribution and control systems; "Oracle", used for financial management and the intranet for communicating information for internal consumption, as discussed in sections **2.3**; **4.5-4.5.4** and **5.3.5**; Gabriel, (2003); Rycroff, (2007).

The conclusions that can be drawn from the available evidence is that there is huge investment in information technology in the University of the Witwatersrand, but these tools, are not effectively integrated in the University for effective communication with the wider University community. For example, the activities of the teaching venue allocation are not synchronized with the student enrollment database; customers of PIMD cannot access usable key information from the Archibus database; and the BMS software is under-utilized. The CDP provides information about its activities on the page "Building a better campus" on the internet, but information about the activities of PIMD is not available or hidden in an obscure site.

The capital outlay and technical capacity for the installation and operation of these technological tools may be beyond the reach of many universities in most developing countries. However, the Archibus or the Building Maintenance System (BMS) could be used to manage the entire Facilities Management operations. Progressively, other management tools could be introduced to manage sub-sections of the facilities operations which could be integrated into a central system (Gabriel, 2003). It may be useful to note that these "technological tools" can enhance productivity and give significant advantages if they are used effectively in an integrated system. A good facilities manger can achieve many of the benefits they offer with very conventional software; the secret is in the capacity of staff to operate and manage the system at their disposal.

6.2 Summary.

The synthesis of the research question and objectives is restated as follows:

- Explore the management strategies, systems or structures for the development, operation and management of the facilities in the University's multi-campuses.
- Evaluate the understanding, preparedness and commitment of the unit to achieving the objective of the University of being one of the top 100 universities of the world in 2022.
- Examine how the University administration and the academic staff perceive the contributions of the Facilities Management Unit in the achievement of the core functions of teaching and research against the background of the goals of the University.
- Examine the constraints of the unit and evaluate the technological tools in use that can be adapted for use in Facilities Management Units in other higher education institutions in developing countries.

The information in sections 6.1-6.1.5 clearly demonstrates that the research questions have been answered and the research objectives achieved. Both CDP and PIMD have an organizational structure suitable for effective management of Facilities Management Unit in a multi-campus setting.

The merits of the operational strategies being used by CDP for executing the capital projects, such as effective stakeholder involvement and adopting the 'framework contract' as the procurement system should be complemented with an adequately resourced in-house project team in order to deliver quality projects to meet the aspirations of the University. PIMD, on the

other hand requires major re-orientation in attitude as well as capacity building to be able to make maximum use of its existing structure and tools; pragmatic management that would foster active interactions with customer and effective communications aimed at educating and informing the customers. Through careful analysis of the records available from the Call Centre of a basic facility unit such as one of the schools, the facilities' history, deferred maintenance, component and facilities conditions can be established; and the information could be used to develop an action plan, operational and long-term budget.

CDP has demonstrated greater commitment to developing infrastructure suitable for teaching and research that would facilitate achieving the goals of the University. Such commitment is shown in the dynamic document containing the spatial development framework, mission statement and progressive implementation of projects earmarked for each precinct and in its adoption of a standard procurement instrument; while the commitment of PIMD is not quite as evident. Therefore, in order to achieve the goals for the 2022 target, both divisions should be adequately resourced and encouraged to network with each other.

The customers' assessment of the performance of Campus Development and Planning Division was favourable in the area of delivering projects within cost limits. However, they expressed reservations about the extent of effective project management, communication and education of the customers during the period of project execution and closeout sessions. CDP management viewed the assessment of the customers as objective critique that indicates room for improvement. On the contrary, PIMD need to see the customers' assessment of its performance as objective critique that should encourage the unit to strive to improve on its communication with its customers so as to effectively channel energy into providing the services to meet the need of the customer.

The constraints impairing the effective performance of the two divisions centre on low capacity and ineffective use of the existing structure and available tools. Therefore, the University would need to complement their investment in capital developments with concerted efforts on capacity building; in terms of increase in staff numbers as well as retraining of existing staff. The technological tools at the disposal of the Facilities Management Unit of Wits are beyond the

reach of Facilities Management Unit in many institutions in the developing countries. The import lies not in the number or expense, but the effective use of the tools, no matter how few or modest.

On the basis of the conclusions drawn in this research, the following recommendations are suggested which can be implemented in short, medium and long term basis. Areas for further research have been identified at the end of this section.

6.3 RECOMMENDATIONS.

The recommendations proposed in this section of the research are grouped into two broad categories, namely: short to medium term and long term. The short to medium term solutions could be implemented within one year while long term solution may require several years.

6.3.1 Campus Development and Planning (CDP)

a. Short to medium term.

- Increase the number of in-house professional staff from the engineering and built environment professions to complement the existing two; in order to boost its project administration and thus improve on quality of project delivery;
- Use the 'earned value' method (integral to the framework contract) for both project management and reporting and actively engage the beneficiary of each project with details: progress, delays, trade-offs, cost and time variance, and proposals (Anbari, 2003; Chou, et al, 2003).
- Maintain effective communication with customers most proximate to ongoing construction projects, provide adequate signage to guide the entire University community, especially the physically challenged, strictly observe all relevant health and safety regulations as well as fire safety regulations.

b. Long term.

- Consistently and diligently educate serving and emerging leaders within the University community on the philosophy of the 'Spatial development framework/precinct'.

- Ensure that representatives from the Operation Division (PIMD) in the Technical Execution Team (TET) are competent professionals from the engineering and built environment professions.
- CDP should develop flexible and adaptive structures as well as take advantage of modern technology to provide functional and dynamic lecture facilities that would facilitate students' participation in lectures within a defined radius from the physical lecture venue (Amaratunga and Baldry, 2000; Gabriel, 2003).
- The Facilities Management Unit (CDP & PIMD) should keep pace with developments in teaching methodologies to be able to give advice and direction on how this might impact on the strategic management of facilities.

6.3.2 Property and Infrastructure Management Division (PIMD).

a. Short/medium term.

- Conduct detailed facilities audits in order to know the state of the components and facilities in the portfolio, prepare plan of action and develop long range budget (Hayes, 2006; Kennedy, 2008; Lavy, 2008).
- Conduct skills and positions audit in order to know the available skills, suitability for the positions and identify the gaps to be filled and put in place a training programme.
- Update the register of service providers; implement the proposed Service Level Agreement (SLA) progressively, commencing with a few trade specific service providers. The result of the evaluation would determine the necessary adjustment required for future implementation;
- Identify and relate with the contact persons responsible for Facilities Management operations in each school.
- Adapt the following suggestions with the view to improving the quality of the current monthly/periodic reports:
    - Sort the requests according to local units such as 'schools', identify duplicated requests;
    - Report separately on requests for major renovation, alteration, and requests that are executed through Service Level Agreement, because these categories of work requires longer time durations;

- Reflect the progress of work on the requests for the last two months preceding the current report;
- Provide easy comparison of current expenditure relative to appropriate subject headings in the operational budget;
- Provide visual expression to all reports;
- Provide explanatory notes;
- Provide quarterly report and circulate to all Schools;
- Prepare executive summary and visual records for the Deans of the faculties and the Deputy Vice-Chancellor (Finance and Operations). (Section 4.5.2; Carder, 1995; Chou, *et al* 2003)

b. Long term.

- Provide for training and staff development to include trade certification, professional registration and continuous professional development in order to update the knowledge of all operational personnel;
- Activate the link of the Archibus system to the intranet, so that each registered client can access the status of execution of his/her request and effectively interact with PIMD. This will reduce the number of repeated requests being reported to the Call Centre;
- Reactivate the existing BMS system in phases, completing a functional unit, e.g. one campus at a time. Expand the network to cover other facilities progressively;
- Network with the School of Electrical and Informatics Engineering to adapt the energy audit document, integrate into the BMS system for effective management of the energy demands of the University;
- Develop and monitor a feedback system to encourage a two-way communication between PIMD and its customers;

6.4 Organizational structure.

The study of the operations of CDP and PIMD has brought to fore their levels of understanding and commitment to the goals of the University. While CDP demonstrates appreciable level of commitment, there is no evidence of PIMD's commitment. The survey suggests that the performance of CPD and PIMD can be improved upon if their current functions and those of

other divisions could be redistributed so that extremely divergent functions could be eliminated allowing each division to focus on areas most relevant to their operations. In order to integrate the performance of the various divisions towards achieving the goals of the University, it is considered reasonable to coordinate all the Facilities Management functions under a single organization (Gabriel, 2003; Jensen, 2008). This approach is being embraced by universities in both developed and developing economies as shown in section **2.5.5 a-f**. The single structure proposed below has five main divisions and multiple sub-divisions. The divisions and the sub-divisions being suggested would allow for simple separation of the hard and soft functions for the development, operation and maintenance operations. The organizational structure in this proposal is flexible: it could allow for the introduction of new divisions or merging of any of the proposed ones. Preferably, the vertical leadership structure in any division should be between two and four leadership levels.

Some of the advantages of this single structure organization include having a one-stop source of information for and about the Facilities Management Unit; effective alignment of the efforts of the respective divisions towards the achievement of the organization's objective; effective utilization of internal resources ensuring that no division is completely self sufficient; encourages each division to strive for excellence in performance and healthy cooperation; and extremely divergent functions are eliminated allowing each division to focus on areas most relevant to their operations. Fig. 6.1 shows the typical organizational structure of the proposed Facilities Management Unit. While figs 6.2-6.6 shows the organizational structures of the main divisions and their sub-divisions.

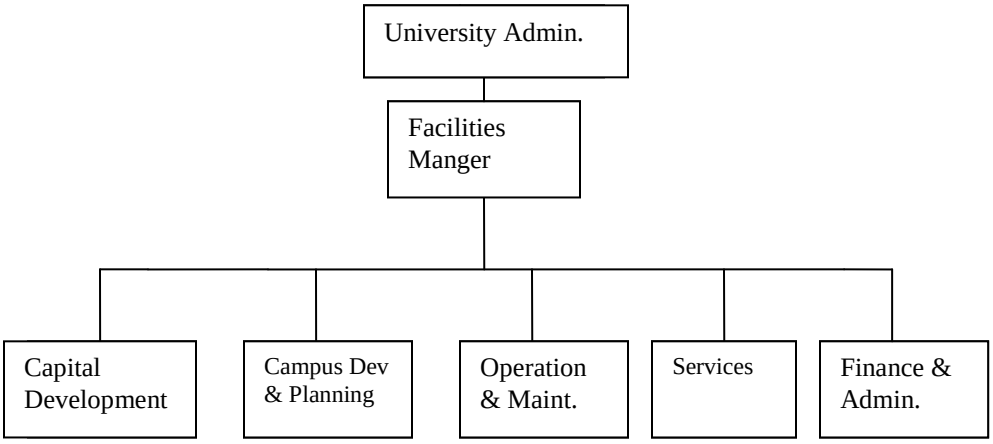


Fig 6.1 Organisational structure of the proposed Facilities Management Unit.

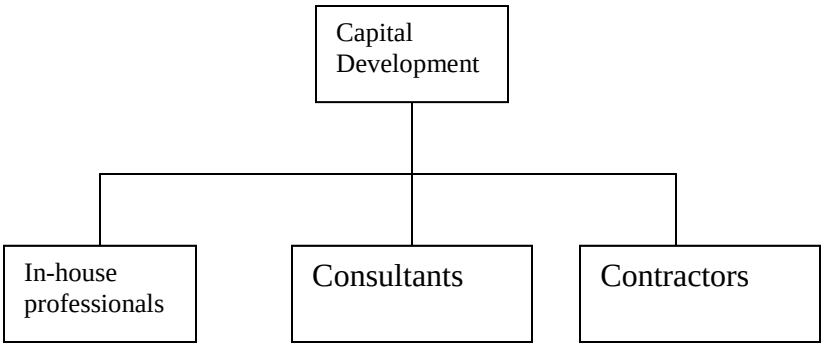


Fig. 6.2 Organisational structure of Capital Development Division

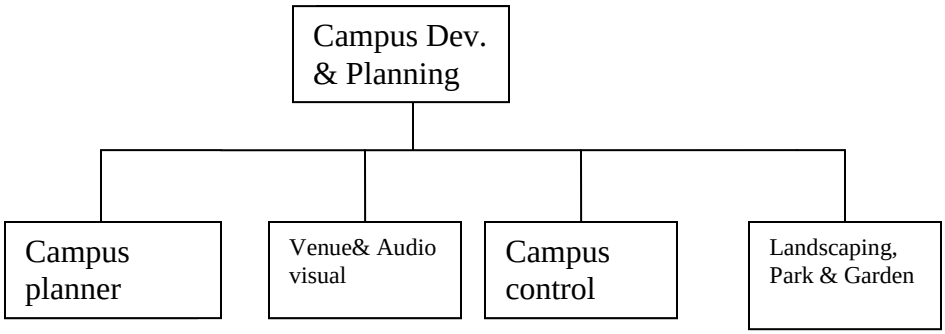


Fig. 6.3 Organisational structure of Campus Development and Planning Division

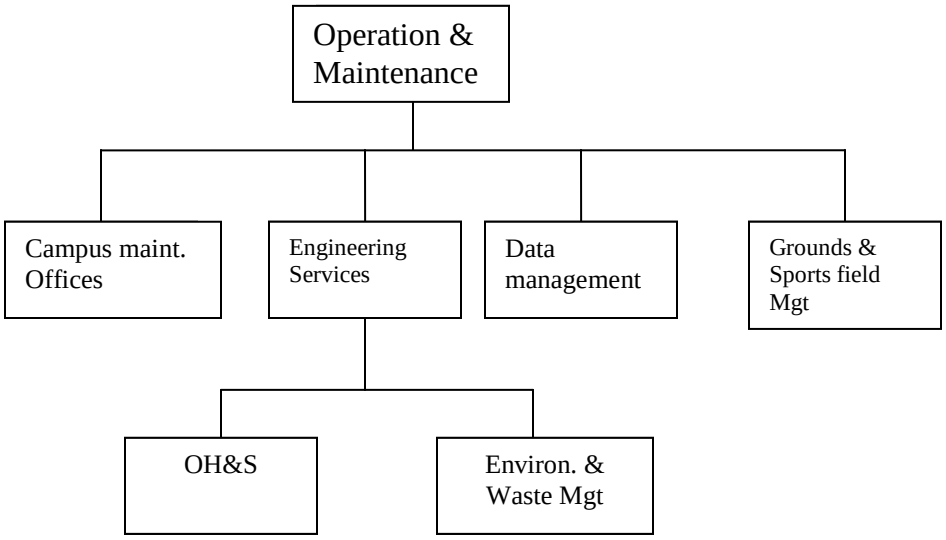


Fig. 6.4 Organisational structure of Operation and Maintenance Division.

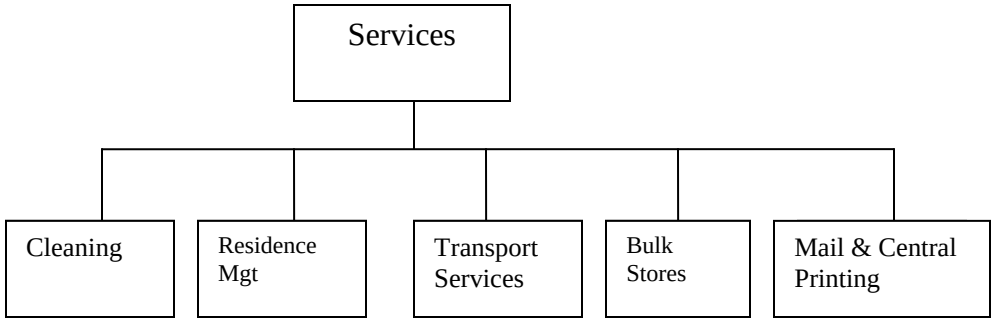


Fig. 6.5 Organisational structure of Services Division

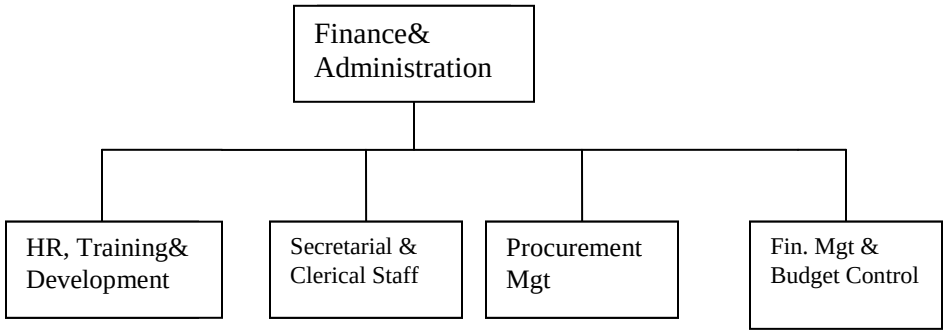


Fig. 6.6 Organisational structure of Finance and Administration

The function of the Human Resource, Training and Development portfolio in this proposal is to serve as the facilitator for continuous capacity building in the whole Facilities Management Unit from senior management to the lowest operational staff, including service providers; as against the idea of segmental capacity building approach. The portfolio would manage effective information flow during transition (transfer, resignation, retirement, or dismissal), in the form of comprehensive handing over notes; orientation for new employees and retraining for serving personnel.

6.5 Capacity building

The concept of capacity building is familiar terminology in general management circles and particularly in development projects (Berg 1993), but the implementation, in many instances, does not effectively achieve the aims. Literature suggests that the gap exists because the majority

of the capacity building exercises do not adopt holistic but segmental approaches. The four components of a holistic capacity building exercise identified in order of importance are:

- Structure, systems and roles;
- Staff and facilities;
- Skills; and
- Tools (Potter and Brough, 2004:336).

The organizational structure proposed in section **6.4**, seeks to address the "structure, system and roles" component of the capacity building. The structure provides for flexible but functional role definition that facilitates integrated management system where each division in the structure reports on its activities both to educate colleagues and to accept objective critique. The integration encourages vertical and horizontal relationships evident in the sharing of resources and identification of capacity gaps that need to be filled. This management system should be replicated in the respective divisions and provides a holistic approach to addressing identified needs. During the course of this research, investment in capital developments and in information technology facilities were obvious, but human resource capacity building was not given the same attention. However, low capacity in skilled operational personnel presents major challenges, as can be inferred from the problems that have persisted through the several restructuring exercises of the Facilities Management Unit.

The dearth of skilled operational personnel from the engineering and built environment profession, generally in South Africa and by extension the Facilities Management Unit of the University of the Witwatersrand, can be traced to two principal factors. Firstly, during the Apartheid regime, the blacks who form the majority of the country's population were denied access to formal education in professional courses such as engineering and built environment professions (Feinstein 2005, cited in Ogbeifun and Fitchett 2009:4). They were discriminated against in gaining access to apprenticeship and were not allowed to seek employment in the formal sector as tradesmen (Fitchett 2009). Secondly, towards the end of Apartheid regime and in the early years of independence, many of the whites educated in the engineering and built environment profession left the country. Against this background, the two options available that would facilitate capacity building in terms of increased number of skilled operational personnel are hiring skilled personnel from outside the country or train them 'on-the-job' through

structured initiatives and continuous professional development. The latter is more reliable and has the potential of long term benefits. It is imperative, therefore, that concerted efforts should be put in place for functional capacity building structure to harness the potential in the existing staff and equip them to effectively use available resources to provide functional support services to enable the University to achieve its goals.

In the mean time, before implementation of the proposed organizational structure, the University administration should commission the Faculty of Engineering and Built Environment and the South African Facilities Management Association to network with CDP and PIMD to conduct:

- Skills and position audit;
- Design and implement skill enhancement training;
- Orientation of new and serving personnel in industry's best practice;
- Orientation for selected students from the Faculty of Engineering and Built Environment and retired technicians to assist in sorting the facilities record available at the Call Centre and assist the respective Facilities Management Offices in the satellite campuses to update the records. This will provide a foundation record of the facilities history and backlog or deferred maintenance, and information for objective planning.

On a long term basis, the Faculty of Engineering and Built Environment (EBE) in collaboration with the South Africa Facilities Management Association (SAFMA), should mount three educational programmes to meet the demand in the industry in the tactical and strategic management levels (Lai, 2010; Tay and Ooi, 2001 and Best et al, 2003) as follows:

- Professional qualification in Facilities Management; to provide theoretical training to current practitioners without cognate engineering and built environment background;
- Bachelor degree in Facilities Management; to produce facilities managers at the 'operation level';
- Postgraduate degrees in Facilities Management; to produce leaders at the strategic level of the industry as well as raise academic manpower for Africa and other developing countries.

6.1 Future research direction

It has been firmly established through this research that the resource level (in terms of competent personnel and funding) of the Facilities Management Unit affects their ability to develop, operate and manage the support facilities effectively for the achievement of the goals of its organization. Therefore, in order to achieve the goal of being one of the top 100 universities in the world, it is being recommended that the University should conduct further research in the following areas:

- **Benchmarking Facilities Management operation with peer group: Collaboration for progress**. The standard, quality and functional state of the physical facilities and the technological support contribute significantly in the ranking of a university among the community of universities. However, the competence level of the operators of the Facilities Management Unit determines the quality of these support facilities. Therefore, benchmarking local operation with those of the highly rated universities of the world, in areas such as: capacity building, functional state of support facilities and development and use of modern teaching methodologies, can fast track the learning curve of the Facilities Management personnel which will reflect on the quality of the support facilities. Through the process of 'benchmarking' the Facilities Management Unit continuously measure the performance of the support facilities against similar institutions in order to identify areas of continuous improvement that will enhance the ranking of its university in the community of universities.
- **Managing service providers from out-tasking to partnership**. The success being recorded in the use of the "Framework contract" procurement instrument can be attributed to the quality of the operating personnel, either as the contractor, consultants or the in-house staff. To achieve a similar feat in the delivery of operational services requires systematic development of the operation personnel, operating instrument and the service provider. It is therefore imperative to develop a structure that can facilitate continuous capacity building in both operational personnel and registered services providers. The investment and involvement in their growth can encourage long term relationship in the form of partnership.

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APPENDIX A: RESEARCH QUESTIONS.

1. Typical Questions: Campus Development Planning Division

Could you give a brief history of the evolution of Facilities Management unit in WITS from beginning till date?

What is the list of the specific functions being performed by CDP?

What is the vision of the University in terms of infrastructure development?

What is the vision and mission statement of CDP?

From your organizational structure, it appears that capital programme is independent of other units, how do they relate?

Strategic Planning

1. Do you have a Strategic Facilities Development/Plan (SFP)?
2. What is the duration and content ?
3. Who are the main contributors when formulating the plans?
4. What input do you have from the academics and other service units/departments?
5. How do you manage/ monitor the execution of the SFP?
6. What are the execution model and procurement strategies?
7. What are the communication structures during preparation and execution?
8. What is the importance of 'quality and risk control' and how are they reflected in your strategic plans?
9. Do you include 'Life Cycle Costing' in your plan and why?
10. What are the sources of funding CDP activities?
11. Is PIMD represented at the strategic management level of the University or how does PIMD relate to the business decisions of the University?

A. Capital developments

- Before the birth of a capital project, what are the determining factors considered by PIMD?
- While developing a capital project (New/Capital refurbishment), other than staff of capital project unit, what role(s) does the internal members of CDP play?
- How and when do you involve the benefiting faculty/unit in the development of capital projects?

- Do you have competent and sufficient internal capacity to design and manage capital project?
- Do you outsource, what, and at what stage?
- What are the approval structure/stages for capital projects?
- What procurement system(s) do you adopt for the execution of your capital projects?
- How do you select your vendors?
- During construction, what are the methods of documenting as-built information to reflect the necessary changes made?
- Do you have all the funds for a capital project before commencement or built into succeeding financial years
- What are the payment structure in terms of process and timing?
- Do you have any special format of reporting progress of work to client and sponsors?
- What importance do you attach to close out session in a capital project?
- Which is/are the last project(s) where you had a formal close out session?
- Does your close out documentation include 'As-built drawings', 'Operation and Maintenance Manuals' and orientation for the client in terms of new equipment?
- What role does the operation and maintenance unit of CDP and the user department play during construction and close out sessions?
- What are the sources of funding capital projects?
- What is the relationship between CDP, the University and the donors for capital projects?
- What role do the donors play during execution of the project they are funding; e.g. nominating vendor and other project personnel?
- What are your methods of archiving capital projects?

Assessment

- Is there any structure within CDP to measure the level of performance?
- Is there any feedback system to measure the level of customer satisfaction of CDP's services?
- What is the rating of CDP on the following items, in a scale of 1-5; with 5 being the highest score:
- How would you assess the performance of CDP on the following items:
    - What are the Key Performance Indicators being used by CDP and in what areas?
    - What is the level of consultation with customers before and during project execution?
    - What is the quality of CDP's project management and reporting system?
    - What is the quality of the completed project and how does it meet the academic needs?
    - Are the projects delivered within budget?
    - Are the projects delivered within time schedule?

2. Typical Questions: Property and Infrastructure Management Division

1. Could you give a brief history of the evolution of facilities management unit in WITS from beginning till date?
2. What is the list of the specific functions being performed by PIMD?

3. What is the vision of the University in terms of infrastructure development?
4. What is the vision and mission statement of PIMD?

B. Operation and maintenance

- Could you give a brief history of the evolution of facilities management unit in wits?
- Do PIMD have a maintenance policy?
- Which of these systems are in operation in the unit: planned, scheduled or breakdown maintenance?
- How do you handle complaints and requests?
- Do you often relate space modification to as-built drawings?
- Have you rejected any request on the basis that the execution will undermine the as-built facilities?
- How many of the facilities being managed by PIMD have authentic as-built information?
- Do you have facilities operation document/asset register for each building/facility under your control?
- How do you document the maintenance history for each property/facility?
- Who manages lecture space allocation?
- How do you ascertain the level of effective usage?
- How do you relate with the academic units with respect to space allocation and functional services?
- What role do you play and when if academic staff require a specialized research laboratory?
- Do you practice benchmarking and how?
- Does your periodic report contain Facilities Condition Index (FCI), Component Index (CI), and Life Cycle Cost (LCC)?
- What are the challenges of managing operation and maintenance in the multi-campuses?
- How have been handling these challenges?
- How are the functions of the Campus Facilities Managers (CFM) coordinated within PIMD?
- What are your sources of funding?
- Who pays for the maintenance services in the faculties/departments/units?

- Do you execute your maintenance operation through in-house staff or outsourced services?
- How do you determine what activity to execute in-house and or outsourced?
- How do you develop the work package for each outsourced service?
- Is the work packages job location or trade related?
- Do you maintain 'service level agreement' (SLA) with all or selected service provider?
- Is your SLA for long, medium or short term services?
- How do you select your service provider?
- What are the involvements of each unit when a piece of work is being executed in their unit?
- Who certify levels of completions?
- What is the payment system for outsourced services?

ICT Tools

- What are the various FM software being used by PIMD and for what services?
- What is the quality of ICT support to the academic and administrative units of the University?
- What are the levels of FM information available on the intranet?
- What is the level of automation of FM services so far?
- What are the hindrances to full automation of FM services?
- What are some logistic problems being experienced with our ICT support and how are they being handled?

Assessment

- Is there any structure within PIMD to measure the level of performance?
- Is there any feedback system to measure the level of customer satisfaction of PIMD's services?
- How would you assess the performance of PIMD on the following items:
    - What are the Key Performance Indicators being used by PIMD and in what areas?
    - What is the level of consultation with customers generally?
    - The allocation and management of lecture and research space
    - What is the functional level of the facilities in the lecture/research venues?
    - What is the response rate of PIMD to customers' requests?

3. Typical Questions: Campus Facilities Managers

Could you give a brief history of the evolution of facilities management unit in WITS from beginning till date?

What is the list of the specific functions being performed by PIMD?

What is the vision and mission statement of PIMD?

C. Operation and maintenance

- Do PIMD have a maintenance policy?
- Which of these systems are in operation in the unit: planned, scheduled or breakdown maintenance?
- How do you handle complaints and requests?
- Do you often relate space modification to as-built drawings?
- Have you rejected any request on the basis that the execution will undermine the as-built facilities?
- How many of the facilities being managed by PIMD have authentic as-built information?
- Do you have facilities operation document/asset register for each building/facility under your control?
- How do you document the maintenance history for each property/facility?
- Who manages lecture space allocation?
- How do you ascertain the level of effective usage?
- How do you relate with the academic units with respect to space allocation and functional services?
- What role do you play and when if academic staff require a specialized research laboratory?
- Do you practice benchmarking and how?
- Does your periodic report contain Facilities Condition Index (FCI), Component Index (CI), and Life Cycle Cost (LCC)?
- What are the challenges of managing operation and maintenance in the multi-campuses?
- How have been handling these challenges?
- How are the functions of the Campus Facilities Managers (CFM) coordinated within PIMD?
- What are your sources of funding?
- Who pays for the maintenance services in the faculties/departments/units?
- Do you execute your maintenance operation through in-house staff or outsourced services?
- How do you determine what activity to execute in-house and or outsourced?
- How do you develop the work package for each outsourced service?
- Is the work packages job location or trade related?
- Do you maintain ‘service level agreement’ (SLA) with all or selected service provider?
- Is your SLA for long, medium or short term services?
- How do you select your service provider?
- What are the involvements of each unit when a piece of work is being executed in their unit?

- Who certify levels of completions?
- What is the payment system for outsourced services?

ICT Tools

- What are the various FM software being used by PIMD and for what services?
- What are the levels of FM information available on the intranet?
- What is the level of automation of FM services so far?
- What are the hindrances to full automation of FM services?
- What are some logistic problems being experienced with our ICT support and how are they being handled?

Assessment

- Is there any structure within PIMD to measure the level of performance?
- Is there any feedback system to measure the level of customer satisfaction of PIMD's services?
- How would you assess the performance of PIMD on the following items:
    - What are the Key Performance Indicators being used by PIMD and in what areas?
    - What is the level of consultation with customers generally?
    - The allocation and management of lecture and research space
    - What is the functional level of the facilities in the lecture/research venues?
    - What is the response rate of PIMD to customers' requests?

4. Typical questions for Lecture space allocation: Manager, space and venue allocation

PIMD and School administrators.

1. How do you manage the allocation of lecture space?

2. How do you ascertain the level of effective usage?

4. What problems have you encountered with lecture space management?

5. What would you consider to be the main reasons for these problems?

6. What suggestions would proffer to reduces these problems?

5. Typical questions for the manager of Call Centre

1.What is the format for the receipt and recording of complaint from client?

2. How do you communicate the complaint to the appropriate unit for attention?

3. What is the meaning of reference code?

4. How do you monitor the status of execution of complaints?

5. How and when do you generate reminder, in the event of delay?

6. Do you have system of providing update on the status of complaint to client?
7. How do you generate periodic report- weekly, monthly, quarterly, or annually?
8. How do you document the maintenance history of a facility?
9. Does your report include graphs, pie and bar chats?
10. Have you prepared any report to assist in budget preparation?
11. What are some of the problems you have had while dealing with client?
12. What suggestions do you have that would help to improve the relationship of PIMD and her client?

6. Typical questions: Manager Energy Services

1. How do you use the BMS to monitor and manage energy supply and consumption?
2. Are all energy intake and sub-stations connected to the system?
3. How many buildings are connected to the BMS network?
4. When was the last update? No update
5. What are the proposals for expansions?
6. Are all the new buildings connected to the BMS network? Or have internal censors to monitor energy consumption?
7. What are the advantages of the BMS system?
8. Any plan for alternative source of energy supply and why?

7. Typical questions for contractors: Ex-Wits staff.

1. How did you start as a contractor to Wits?
2. How many groups of contractor, according to trades, came from former Wits staff that you know?
3. What preparatory steps were put in place to enable them function in the new arrangement?
4. How did you cope in those early years?
5. What was the relationship between the contractors and the outsource managing agent? 6. How did the performance of the contractors affect the services of the outsource companies?
7. How many of the old wits staff are still functional contractors today in Wits?
8. What could be the reasons for the drastic reduction?
9. How do you get information about work that requires your attention?

10. Many clients complain about delay in response to their request, what would you say could be responsible?

11. How often do PIMD supervise your work?

12. Do you use the bulk store? How competitive are the price of items obtained in the bulk store compared to outside stores? What are the advantages of the bulk store to contractors? When do you pay for items obtained from bulk store- before or after payment for the job done with the material? Do you pay cash or through internally deducted?

13. Do you have any suggestions that could help to improve the performance of PIMD?

8. Typical Questions: Deputy Vice-Chancellor- Finance and Operations.

1. Could you give a brief history of the evolution of facilities management unit in WITS from beginning till date?
2. How is Facilities Management functions performed in Wits, through a single organization structure?
3. What is the vision of the University in terms of infrastructure development?
4. What is the vision and mission statement of the Facilities Management Unit?

B. Strategic Planning

5. Is there any Strategic Facilities Development/Plan (SFP) being operated by PIMD?
6. What is the duration and content?
7. Who are the main contributors when formulating the plans?
8. Are there any input from the academics and other service units/departments?
9. What are the communication structures during preparation and execution?
10. Is 'Life Cycle Costing' included in the plan, if not, why?
11. What are the sources of funding PIMD activities?
12. Is PIMD represented at the strategic management level of the University or how does PIMD relate to the business decisions of the University?

D. Capital developments

- Before the birth of a capital project, what are the determining factors considered by PIMD?
- How and when do PIMD involve the benefiting faculty/unit in the development of capital projects?
- Are there competent and sufficient internal capacities to design and manage capital project?
- Do they outsource, what, and at what stage?
- What are the approval structure/stages for capital projects?
- What procurement system(s) do you adopt for the execution of your capital projects?
- How do you select your vendors?

- Do you have all the funds for a capital project before commencement or built into succeeding financial years
- What importance do you attach to close out session in a capital project?
- What role does the operation and maintenance unit of PIMD and the user department play during construction and close out sessions?
- What is the relationship between PIMD, the University and the donors for capital projects?
- What role do the donors play during execution of the project they are funding; e.g. nominating the vendor and other project personnel?

E. Operation and maintenance

- Do PIMD have a maintenance policy?
- Which of these systems are in operation in the unit: planned, scheduled or breakdown maintenance?
- How many of the facilities being managed by PIMD have authentic as-built information?
- Who manages lecture space allocation?
- How does PIMD ascertain the level of effective usage?
- Do PIMD practice benchmarking and how?
- Does the periodic report from PIMD contain Facilities Condition Index (FCI), Component Index (CI), and Life Cycle Cost (LCC)?
- What are the challenges of managing operation and maintenance in the multi-campuses?
- What are your sources of funding?
- Who pays for the maintenance services in the faculties/departments/units?

E. ICT Tools

- What is the quality of ICT support to the academic and administrative units of the University?
- What are the levels of FM information available on the intranet?
- What are some logistic problems being experienced with the ICT support and how are they being handled?

F. Assessment 1: Capital projects

- Is there any structure within CDP to measure the level of performance?
- Is there any feedback system to measure the level of customer satisfaction of CDP's services?
- How would you assess the performance of CDP on the following items:
    - What are the Key Performance Indicators being used by CDP and in what areas?
    - What is the level of consultation with customers before and during project execution?
    - What is the quality of CDP's project management and reporting system?
    - What is the quality of the completed project and how does it meet the academic needs?
    - Are the projects delivered within budget?
    - Are the projects delivered within time schedule?

G. Assessment 2: Operation and maintenance.

- How would you assess the performance of PIMD on the following items:
    - What are the Key Performance Indicators being used by PIMD and in what areas?
    - What is the level of consultation with customers generally?
    - The allocation and management of lecture and research space
    - What is the functional level of the facilities in the lecture/research venues?
    - What is the response rate of PIMD to customers' requests?

9. Typical Questions: The academics

1. Could you give a brief history of the evolution of facilities management unit in wits?

2. What is the vision and mission statement of PIMD?

Strategic Planning

3. Do you know if PIMD have a Facilities Strategic/Development Plan (SFP)?
5. What is the duration and content ?

6. Who are the main contributors when formulating the plans?
7. How and when do you communicate your capital development needs to PIMD for inclusion in Strategic Facilities Plan?
7. Do you include 'Life Cycle Costing' in your plan and why?
8. Is PIMD represented at the strategic management level of the University?

4. Capital developments

- During construction, what are the levels of your involvements?
- Do you have all the funds for a capital project before commencement or built into succeeding financial years
- Have you participated in the closeout session of any project in your Faculty/school?
- Does the closeout documentation include 'As-built drawings', 'Operation and Maintenance Manuals', and client orientation, in terms of new equipments?
- What role do the donors play during execution of the project they are funding; e.g. nominating the vendor and other project personnel?

5. Operation and maintenance

- Do PIMD have a maintenance policy?
- Which of these systems are in operation in the unit: planned, scheduled or breakdown maintenance?
- Do you often relate space modification request to as-built drawings?
- Are there authentic as-built drawing(s) for the facilities in your Fculty/School?
- Who manages lecture space allocation?
- How do you ascertain the level of effective usage?

- How do you relate with PIMD units with respect to space allocation and functional services?
- What role do PIMD play when your academic staff requires a specialized research laboratory?
- What are the sources of funding maintenance operation?
- Who pays for the maintenance services in the faculties/departments/units?
- How are the service provider selected?
- What are the involvements of your staff when a piece of work is being executed in your unit?
- Who certify levels of completions?

ICT Tools

- What are the various FM software being used by PIMD and for what services?
- What is the quality of ICT support to the academic and administrative units of the Faculty/School?
- What are some logistic problems being experienced with our ICT support and how are they being handled?

Assessment 1: Capital projects

- Is there any structure within CDP to measure the level of performance?
- Is there any feedback system to measure the level of customer satisfaction of CDP's services?
- How would you assess the performance of CDP on the following items:
    - What are the Key Performance Indicators being used by CDP and in what areas?
    - What is the level of consultation with customers before and during project execution?
    - What is the quality of CDP's project management and reporting system?
    - What is the quality of the completed project and how does it meet the academic needs?
    - Are the projects delivered within budget?
    - Are the projects delivered within time schedule?

Assessment 2: Operation and manitenance

- How would you assess the performance of PIMD on the following items:
    - What are the Key Performance Indicators being used by PIMD and in what areas?
    - What is the level of consultation with customers generally?
    - The allocation and management of lecture and research space
    - What is the functional level of the facilities in the lecture/research venues?
    - What is the response rate of PIMD to customers' requests?

10. Typical questions: Laboratories/Workshop managers

1. How do you communicate your request for repairs, renovation, alteration or modification to PIMD?
2. What are your roles during execution of the request?

3. What are the processes of certifying completed work?
4. What are your assessment of PIMD's performance in terms of:
    1. Just-in-time response
    2. Quality of work
    3. Communication with client
5. Do you have any reference to PIMD in the maintenance of your laboratory?
6. Do you have the necessary operation manuals for your equipments?
7. What maintenance system do you practice: Breakdown, Schedule or Planned maintenance?

APPENDIX B: WORK REQUEST FROM HILLMAN BUILDING

University of the Witwatersrand
Hillman Building - Work requests issued January 2010
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2010/05/07

Assigned Work Orc	Requestec by	Date Work Requested	Work Description	Problem Location	Service Contractor	Total Cost	Departmer Code	Work Req Status
65234	Wills L	2010/01/06	General plumbing maintenance. Please attend to a roof leaking into the passage near H207	Passage near H207	KEVINS	R766.08	4111105	Completec
65235	Wills L	2010/01/06	Electrical maintenance. The light bulb in H201 needs replacing.	H201	RIBACH	R225.31	4111105	Completec
65236	Wills L	2010/01/06	Emergency work. Please investigate power supply - There is a major problem with the electrical supply to the boiler room. There are contractors that need to work in the area.	Boiler Room	RIBACH	R219.05	4111105	Completec
65279	Wills L	2010/01/07	General plumbing maintenance. To drain the water for the electrician to be able to find the electrical fault. NB. Contact JP on 083 266 2880 on completion of this work. Reported to Kevin at 09:40 Please also ask the plumber to contact me on 083 266 2880 on completion of his work.	Boiler Room	KEVINS	R2,681.28	4111105	Completec
65398	TENNER D	2010/01/08	Electrical maintenance. Call out 30.12.2009. Icam doors on west side are not working.	West Side	RIBACH	R741.46	4111105	Completec
65426	ENDERSB	2010/01/08	General plumbing maintenance. To clear the blocked drain in the Hillman Building courtyard. Please request a full report on work instruction as to there findings and result, this work to be a priority.	Courtyard	SAJET	R3,762.00	4111105	Completec
65596	Wills L	2010/01/11	General plumbing maintenance. There is a urinal in H101 that is leaking.	H101	KEVINS	R478.80	4111105	Completec
66478	Wills L	2010/01/19	General plumbing maintenance. The urinal in H109 is leaking.	H109	KEVINS	R478.80	4111105	Completec
66480	Wills L	2010/01/19	Electrical maintenance. There is a problem with the wall plug in H237, please check and rectify. Urgent please.	H237	MJL	R179.55	4111105	Completec

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Assigned Work Orc	Requestec by	Date Work Requested	Work Description	Problem Location	Service Contractor	Total Cost	Departmer Code	Work Req Status
66481	Wills L	2010/01/19	Electrical maintenance.There are no lights in the Humidity Room. Please see Peter Graham or Lazhar in H305. THIS IS URGENT PLEASE	H305	MJL	R481.42	4111105	Completed
66579	Pillay D	2010/01/20	Electrical maintenance. One plug in the Civil Engineering lab is not working as a result one computer is not working, please check and rectify. As requested by Anele Ngonyama 0733929849		MJL	R473.10	4111105	Completed
66800	Wills L	2010/01/21	Work over R2000.00 not to be carried out without an approved quotation. General plumbing maintenance. The storm water drain outside the Hillman Building next to the garage is blocked. Water flooding into the garage.	External	LINPRO	R957.60	4111105	Completed
67175	Wills L	2010/01/26	Glass replacement.Quotation only. Do not commence work.1 only Diameter 495mm x 3mm glass with a 8mm hole in the centre.	hydrolics lab	ISIZWE	R136.80	4111105	Completed
67247	Wills L	2010/01/27	Work over R2000.00 not to be carried out without an approved quotation. Globe replacement. There is a light bulb in H9 that needs replacing.	H9	MJL	R154.07	4111105	Completed
67391	Swart M	2010/01/27	Electrical maintenance. To tidy electrical cable near fire exit - west side. For the approved quotation ref.no.1205 dated 26.01.2010 Total Cost of R1,350.90 VAT inclusive	West Side	MJL	R1,350.90	4111105	Completed
67472	Wills L	2010/01/28	Work over R2000.00 not to be carried out without an approved quotation. Globe replacement. The light bulb in the copying room between H104 and H105 is blown. The key to the room is available from H107.	H104	MJL	R174.59	4111105	Completed
16						R13,260.81	Overall Total Overall Count	

University of the Witwatersrand
Hillman Building - Work requests issued February 2010
Page 1
2010/05/07

Assigned Work Orc	Requestec by	Date Work Requested	Work Description	Problem Location	Service Contractor (	Total Cost	Departmer Code	Work Req Status
68065	Wills L	2010/02/03	Electrical maintenance.Work over R2000.00 not to be carried out without an approved quotation.There is an exposed electrical cable that is dangerous, it needs to replaced and rerouted Urgent please.		RIBACH	R212.04	4111105	Completed
68066	Wills L	2010/02/03	Quotation only. Do not commence work.To have 3 fluorescent light fittings installed in our Steel Sore.	Steel store	PIMDAREAM	R0.00	8221101	Issued and
68908	Wills L	2010/02/10	General air conditioning and refrigeration maintenance. Contractor to complete document F0005 attached to work order for air conditioner repairs. There is an air-con in H207 that is leaking water onto the computers.		PERFECTAII	R547.20	4111105	Completed
68909	Wills L	2010/02/10	Electrical maintenance. In the PG Computer Lab, One of the electrical power plugs is not working, please test all power plugs. PG Computer Lab, H207A.	H207A	MJL	R473.10	4111105	Completed
68910	Wills L	2010/02/10	Electrical maintenance. A treble Testing Machine is not holding power, Please send a competent electrician to attend to the problem, as per Les Wills. NB. A tutorial that will be demonstrated on this machine soon and needs to be treated as urgent. Please refer to Ken Harman in H13C.	Treble Machine	MJL	R538.65	4111105	Completed
69220	Wills L	2010/02/15	Electrical maintenance.Work over R2000.00 not to be carried out without an approved quotation.Could the lights in H7 be repaired/replaced.	Room H7	RIBACH	R619.47	4111105	Completed

ARCHIBUS

Assigned Work Orc	Requestec by	Date Work Requested	Work Description	Problem Location	Service Contractor (	Total Cost	Departmer Code	Work Req Status
69522	Wills L	2010/02/17	Electrical maintenance.Work over R2000.00 not to be carried out without an approved quotation.To get a hot water supply to the sink just outside of H217		RIBACH	R0.00	4111105	Issued and
69700	Wills L	2010/02/18	General plumbing maintenance.Work over R2000.00 not to be carried out without an approved quotation.To get hot water supply to the sink just outside of H217.		KEVINS	R0.00	4111105	Completed
70199	Wills L	2010/02/23	Blinds,curtains,wallpaper, carpets.Work over R2000.00 not to be carried out without an approved quotation.We need to have adjustments made to the curtain rails in all the Lecture Rooms so that they do not block the cameras.	Various	PAGENT	R695.14	4111105	Completed
70610	Wills L	2010/02/25	Work over R2000.00 not to be carried out without an approved quotation. General plumbing maintenance. There is a lot of water accumulating on the roof largely due to blocked full bore pipes. What needs to be done is All the full bore pipes need to be properly cleaned out. We also need to know where the full bore pipes lead to, as we want to collect the rain water for a project.		KEVINS	R1,723.68	4111105	Completed
70697	Tshabalala	2010/02/26	General plumbing maintenance.Work over R2000.00 not to be carried out without an approved quotation.Repair blocked toilet in ladies toilet on 2nd floor.	ladies toilet	LINPRO	R383.04	4111105	Completed
11						R5,192.32	Overall Total Overall Count	

ARCHIBUS

University of the Witwatersrand
Hillman Building - Work requests issued March 2010
Page 1
2010/05/07

Assigned Work Orc	Requestec by	Date Work Requested	Work Description	Problem Location	Service Contractor (	Total Cost	Departmer Code	Work Req Status
70802	Wills L	2010/03/01	General plumbing maintenance.Work over R2000.00 not to be carried out without an approved quotation.The tap on the roof near our satellite dish to be reconnected please.Please see Wayne in H13C		KEVINS	R1,458.06	4111105	Completec
70813	Wills L	2010/03/01	Electrical maintenance.Work over R2000.00 not to be carried out without an approved quotation.To replace the light bulb in H109	H109	RIBACH	R185.20	4111105	Completec
71042	Wills L	2010/03/02	Quotation only. Do not commence work.For sanding and sealing of the floors in H209.	Room H209	PIMDAREAM	R0.00	8221101	Issued anc

Assigned Work Orc	Requestec by	Date Work Requested	Work Description	Problem Location	Service Contractor (	Total Cost	Departmer Code	Work Req Status
71256	Wills L	2010/03/03	Electrical maintenance.Work over R2000.00 not to be carried out without an approved quotation.Repair lights in H6A.	H6A	MJL	R527.02	4111105	Completec
71392	Wills L	2010/03/04	Work over R2000.00 not to be carried out without an approved quotation. General air conditioning and refrigeration maintenance. Contractor to complete document F0005 attached to work order for air conditioner repairs. There is an air-con unit in H105 that is leaking water back into the office because it is inclined in the wrong direction, and in turn leaking onto the wall plugs. What is to be done is that the air-con unit needs to be removed, and replaced with it having a slight incline outwards from the office. Please ensure that the joint faces are sealed up.	H105	PERFECTAII	R1,208.40	4111105	Completec
71709	Wills L	2010/03/08	Ground maintenance.Work over R2000.00 not to be carried out without an approved quotation.Empty skip at Hillman building.AKF 00115182211015123020 IR NO 091775.	External	VEOLIA	R0.00	8221101	Issued anc

Assigned Work Orc	Requestec by	Date Work Requested	Work Description	Problem Location	Service Contractor (	Total Cost	Departmer Code	Work Req Status
72299	Wills L	2010/03/15	Electrical maintenance.Work over R2000.00 not to be carried out without an approved quotation.Repair/replace lights in lecture rooms H7 and H112.		MJL	R2,205.22	4111105	Completec
72492	Wills L	2010/03/17	General plumbing maintenance.Work over R2000.00 not to be carried out without an approved quotation.The urinal in H212 is blocked.	H212	KEVINS	R574.56	4111105	Completec
72578	ENDERSB	2010/03/18	General plumbing maintenance.Work over R2000.00 not to be carried out without an approved quotation.To repair sand and seal the floor in room 209, Hillman Building. The work will be as per quotation No: 2601 for R2,500.00 Inc vat and the cost centre will be: 001.151.8221101.512280 This work to begin on the 29th March,	Room 209	UNIQUE	R2,500.00	8221101	Completec
72562	Wills L	2010/03/18	Electrical maintenance.Work over R2000.00 not to be carried out without an approved quotation.Please replace the lights on the following Rooms 23A,23B and 228	Room	MJL	R1,688.57	4111105	Completec
72679	Wills L	2010/03/19	Quotation only. Do not commence work. Please advise on the blackboard in H111, it is almost unusable, please advise on renovating it.	H111	PIMDAREAN	R0.00	4111105	Issued anc
73111	FELLOWS	2010/03/25	General air conditioning and refrigeration maintenance. Contractor to complete document F0005 attached to work order for air conditioner repairs.Work over R2000.00 not to be carried out without an approved quotation.Please repaire the aircon is leaking at Room 3104	Room 3104	PERFECTAII	R792.30	4111105	Completec

Assigned Work Orc	Requestec by	Date Work Requested	Work Description	Problem Location	Service Contractor (	Total Cost	Departmer Code	Work Req Status
73103	Costopoulc	2010/03/25	Electrical maintenance.Work over R2000.00 not to be carried out without an approved quotation.Please required for the Eletrician to check as if the switch the light thus a strong smelling of burning on switch at Lectures Room 112 .Pls contact Wayne Ext 77109 and he'll be available from 10:15	Room 112	MJL	R389.08	4111105	Completec
73638	Strydom J	2010/03/31	Scheduled Preventative Maintenance. March 2010 - Annual Boiler Service Hamworthy boilers for central heating. Qty 4.	Boiler room	CBKHEATIN	R0.00	4111105	Issued anc
						R11,528.41	Overall Total	
14							Overall Count	

APPENDIX C. PUBLICATIONS FROM THE RESEARCH.

a. Ogbeifun, E. and Fitchet, A (2009). *The development of the Mapungubwe Interpretation Centre: The contribution of the construction industry.* The 6th Postgraduate Conference, Construction Industry Development Board, Johannesburg.

b. Ogbeifun, E. and Fitchet, A. (2009). *Progressive implementation of construction processes: A tool for effective training of artisans on-site.* 3rd International Conference of Built Environment in Developing Countries, Malaysia.

c. Ogbeifun, E. and Fitchett, A. (2010). *Comprehensive reporting: An invaluable tool for project management*. International Conference on Man, Technological Advancement and Sustainable Environment. Federal University of Technology, Akure, Nigeria.

d. Ogbeifun, E. and Fitchett, A. (2010). *Managing retrenchment and outsourcing: An experiment in the University of the Witwatersrand*. 4th International Conference of Built Environment in Developing Countries, Malaysia.