ARCOM

Association of Researchers in Construction Management

ARCOM Doctoral Workshop

Facilities, Refurbishment and Maintenance Management

Division of Built Environment
Faculty of Development and Society
Sheffield Hallam University, UK

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Workshop Convener: Professor Paul Stephenson

Workshop Chairpersons: Professor Paul Stephenson
         Professor Charles Egbu

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12.00 – 12.30	Strategic Facilities Management in Higher Education Institution	Md Yusof Hamid, University of Salford
12.30 – 13.00	Facilities Management of Knowledge in PFI'S Projects	M. Mustapa, Loughborough University
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Introduction

Mature economies often have large stocks of existing buildings needing different types of intervention so as to increase their economic, social and environmental value. The value of the works on existing buildings represents about 50% of the total value of construction works in most mature economies. Similarly, there are those that argue that the management (operationalised within refurbishment, modernisation and maintenance activities) of existing buildings, especially old and complex ones, call for skills and knowledge which are often not utilised in new build works. Similarly, some contend that the level of risk and uncertainty is higher than in comparable size new build projects. Same is also said of health and safety incidences. Facilities management (FM) which is carried out on existing buildings is also vital. FM, which can be seen as the process by which an organisation ensures that its buildings, systems and services support core operations and processes, as well as contribute to achieving its strategic objectives in changing conditions, can be considered from the "Hard" and "Soft" perspectives.

Research into the areas of facilities, refurbishment and maintenance management are therefore important to academics and practitioners alike. Research findings that contribute to the understanding of theoretical issues, in addition to having practical significance, will play a major role in the future advancement of this important industrial sector.

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Charles Egbu
Paul Stephenson

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Strategic Facilities Management in Higher Education Institution

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ABSRACT

This research presents a preliminary study on the strategic facilities management in higher education institutions focusing on operation and maintenance issues. It was conducted a literature review of published and unpublished articles, books, conference proceedings, university reports, magazines and website documents focusing on facilities management and higher education institutions. The current changing paradigms, trends, and economic conditions in higher education institutions need a serious thinking on how to manage and maintain university facilities. The strategic facilities management role in higher education institution is important to achieve university aim and objectives and will create added value to facilities management profession.

Keywords – facilities management, higher education, operation & maintenance

1. Introduction

In recent years, there has been a dramatic growth in facilities management profession in many sectors. So far, however, there has been little discussion about facilities management contribution in higher education sector. Many organisation still view the provision, operation and maintenance of facilities as a technical rather than strategic function with a vague relationship to core business objectives (Lim 1997). In year 2000, Higher Education Funding Council for England (HEFCE) produced a national report entitled 'Facilities management improving the support services in higher education' which produce practical outcomes for handling management issues of concern to higher education institutions. The study also concerned with the arrangements for managing key support service activities such as learning resources, student recruitment, administration and pastoral care, personnel, finance, property management, estate infrastructure, IT and communication services, public affairs, research and development, liaison and other support services, campus support services, health and safety and other trading activities. The report provided examples of good practice in facilities management drawn from higher education sector. However, there are still needs to identify certain issues which are likely to be of strategic, tactical and operational importance to Higher Education Institutions. The purpose of this paper is to review the issues of strategic facilities management for operation & maintenance in higher education sector. This paper has been divided into three parts. The first part deals with the definition and roles of facilities management. Part 2 will focus on the issue and development of today higher education focusing more on physical aspect and their needs. The last part of this paper begins by laying out the theoretical dimensions of the research, and looks at how facilities management profession being adopted into higher education institution. As a conclusion, this paper will look into the gap and possible future research on strategic facilities management in higher education sector.

2. Definition and Role of Facilities Management

While a variety of definitions of the term facilities management have been suggested, this paper will use the definition suggested by BS EN 15221-1:2006 which define facilities management as integration of processes within an organisation to maintain and develop the agreed services which support and improve the effectiveness of its primary activities (BSI 2007). Facilities management act as a support function (Alexander 1996) to the organisation, buts its role in the maintenance of building facilities and property management are also critical and demanding (Barret 1995; Underwood and Alshawi 2000). According to (Hamid 2005) the discussion of strategic facilities management will cover a combination of the following aspects :-

- Facilities management from design and construction-related activities
- Facilities management as a function to support the core objectives of an organisation

Facilities management defined as strategically integrated approach to operating, maintaining, improving and adapting the buildings and supporting services of an organisation in order to create an environment that strongly supports the primary objectives of that organisation (Barret 1995) (Barret and Baldry 2003). Even within the same business sector, each organization is likely to have different needs in facilities and FM function. The characteristics or nature of the organization reflect its business objectives, organization process and organizational culture. They influenced the organization's need and management method of its facilities (Atkin and Brooks 2000). According to (Kincaid 1994), the integration of facilities management as an effective function of an organisation can be achieved by recognizing three key characteristics :-

- Facility management is a support role within an organisation, or a support service to an organisation
- Facilities management must link strategically, tactically and operationally to other support activities and primary activities to create value.
- Within facilities management, managers must be equipped with a knowledge of facilities and management to carry out their integrated support role.

At a strategic level, in order to achieve the objectives of the organisation in long term facilities manager need to define facilities management strategy in compliance with the organisation's strategy. Facilities management has to evolve to a higher strategic level if the client/ business is to extract the best value from it (Grimshaw 1999; Nutt 1999; Price and Akhlagi 1999). For the purpose of this paper, facilities management will develop through the processes within an organisation to contribute the changing strategic thinking of university leaders in dealing with operation and maintenance of university building. Facilities management will look building and asset as investment rather than liability to the organisation in achieving their mission and objectives.

3. Higher Education Scenario

Higher education is going through a period of uncommon change. Changes occurring in higher education because of higher public expectations over what universities should be delivering, increasing parental concern about quality of education, greater emphasis on college ratings, demographic changes in student population and higher costs (Comm 2003). Rising costs and declining funding have resulted in increased tuition at most institutions. The Council of Higher Education Management Association (CHEMA) in 2006 produce a report ' The future of Higher Education: A view from CHEMA' forecast in the next ten years, higher education will face more competition, have sufficient funds to meet strategic objectives, face pressure to reduce tuition whilst the needs to improve the quality of education (Goldstein 2006). Daigneau, 2006 has identified the changing agents and element of changes that influence the functions and processes of higher education in the future. Table 1 below summarised the change agents and the element of changes.

Table 1 – Higher education change agents and element of changes

Changes Agents	Elements of Changes
SOCIETY	Changing Student Demographics Homogeneus - Mixed
ECONOMICS	Access and Efficiency Demand growth
TECHNOLOGY	IT – Instructions to learning Costly research facilities
GOVERNMENT	Accountability Controls resource allocation and program decisions
ENVIRONMENT	Reuse, recycle and reduce Sustainable University

Source : (Daigneau 2006)

3.1 Society and Economics

Over the past century there has been a dramatic increase in student population over the university around the world. Many governments are facing similar issues relating higher education at the start of the 21st century. The issues related on how to have a successful and modernized higher education system, the right size of higher education system, providing the right numbers of graduates to meet the needs of the economy and society more widely etc. The major forces for this expansion and diversity include :- (Johnstone, Arora et al. 1998)
- the expansion of basic and secondary education which creates a strong potential demand for the tertiary level.
- the rate of growth in the proportion of the above cohort that elects tertiary education. i.e. demand from labour market, fair rates of return, tradition and urbanization.
- to meet the growing and complex demands of the modern world.
- the increasing incentives being provided by governments globally in order for students to have equal access to tertiary education.

- the expansion of the amount of the times spent in tertiary education per participant.

Example of expansion and diversification of higher education sector:-

- The UK Government is committed to increasing participation towards 50% of those aged 18-30 by 2010. (Dfes 2003)
- Substantial population growth in the northern part of the catchments area in Queensland, Australia. (Crump 2002)
- The Malaysia Government is committed to increasing participation of tertiary education by 2010. (Razak 2006)
- Participation rates of those 18 to 21 years will continue to rise in Canada Universities projected until 2008. (Davenport 1999)

Radical change (restructuring) in higher education has taken place for different reasons in various countries such as financial constraint i.e. increasing student numbers during the 1990s and public sector funding pressure have inevitably posed problems for HEIs management and this has resulted in very real pressure on many academic staff, merge institutions (i.e. UMIST merge with University of Manchester), consolidate tertiary education and promote inter-institutional economies scale. Restructuring of Mara University of Technology, Malaysia come into place during 2004 with fewer faculty, new faculty structured, change university governance and focusing more into niche program.

3.2 The Impact of Technology

An important reform concern that many developing nations are facing today is the impact of technology, and whether they can be redesigned and be made more cost effective with technology (Johnstone, Arora et al. 1998). Information technology will increasingly be woven into the fabric of the university, with facilities designed to be "smart." (APPA 2006). Online distance education is becoming a driving force in the market. A focus on innovative education strategies is becoming increasingly important however, traditional residential education is still in demand. The primary issues of higher education institutions is to refit their existing space within the main campus in a way that allows flexibility in the future and allows the university to respond quickly and cost effectively to opportunities. In example, large area of campuses needs refurbishment to overcome functional inadequacies. This not unexpected given the stage of the life cycle of these buildings. In example, IT development in higher education sectors required upgrading in power, air conditioning system, cabling etc. IT labs itself double a classroom size in order to get flexibility in classrooms.

3.4 Government and Higher Education Governance

Higher educations are legally independent. Their governing bodies are responsible for ensuring the effective management of the institution and for planning its future development. Higher education governance will responsible for all the affairs of the university or college. Leadership, governance and management in higher education sector have become hot topics. Strong leadership will be essential to keep sustainable development buoyant and its successful implementation will depend on good governance and effective management systems (Parkin, Johnstone et al. 2004). Universities are being made to operate like business organisations. The corporation of public universities involve changes in the governance structure, the diversification of

revenue and the institutionalisation of corporate managerial practice. Example the changing pattern of government and governance of UK universities (Scott 1995; Bargh, Bocock et al. 2000) is attached per Appendix 1.

3.5   Environmental Issues

Sustainable development is one of the biggest challenges of the 21st century. *Association of University Leaders for Sustainable Future (ULSF)* indicates ways in which universities can be involved in sustainable development such as management, planning, development, education, research, operations, community service, purchasing, transportation, design, new construction, renovation and retrofit (ULSF 1999). United Nations Educational, Scientific and Cultural Organisation (UNESCO) stated that higher education has a vital role to play in shaping the way in which future generations learn to cope with the complexities of sustainable development. Higher Education Partnership for Sustainability (HEPS) which consists of 18 universities and Higher Education colleges which funded by HFCE to create a strategic approach to sustainable development, which would be strengthened by the support of the others partners and go on to promote sector wide-change (Parkin, Johnstone et al. 2004). However there are still barrier and gap of achieving this sustainable university. Some of the barrier being identified are sustainability is too abstract, too broad, no personnel, lack of resources and funding, theme has no scientific basis, lack of coordination and integration between the administrative and academic sides (Filho 2000; Comm 2003; Velaquez, Munguia et al. 2005). APPA recent studies in 2006 has identified the top ten critical facilities issue for higher education facilities in US facing facilities manager such as resource scarcity and affordability, performance measurement and accountability, customer service, information technology, developing the laboratory and classroom of the future, facility reinvestment and total cost of ownership, workforce issues, sustainability, energy resource management and safety, security, and business continuity.

All of the issues identified in this paper are pushing higher education sector to change however, change is difficult in the traditional academy. Facilities management profession need to understand this change and building a capacity for change to help universities succeed in today's competitive environment.

4. Issues of Strategic Facilities Management

The key facilities issues for the future in all sectors of the economy are increasing adaptability to changing business needs, providing a healthy workplace for creative people, assimilating the potential of new technologies and ensuring full use of diminishing resources while minimizing environmental impact (Alexander 2003). The aim of strategic facilities management is to achieve strategic fit between core business needs and the provision of facilities management (Barret and Baldry 2003). Facilities manager need to prepare for change and ensure success of the organisation. Higher Education Funding Council for England has adopting a facilities management approach for support services, to integrate strategic, tactical and operational management objectives of the higher education institutions (HEFCE and SHEFC 2000). The facilities management department must understand the impact of their decision in terms of today's and tomorrow's context will related to the achievement of university mission and objectives. The facilities management profession should

understand the nature and culture of the university organisation, understand the complete functioning of higher education, its economics, its processes and its purposes. As example some of the differences between university organisation and business market are shown on the Table 2 below.

Table 2 – Strategic comparison of business to university

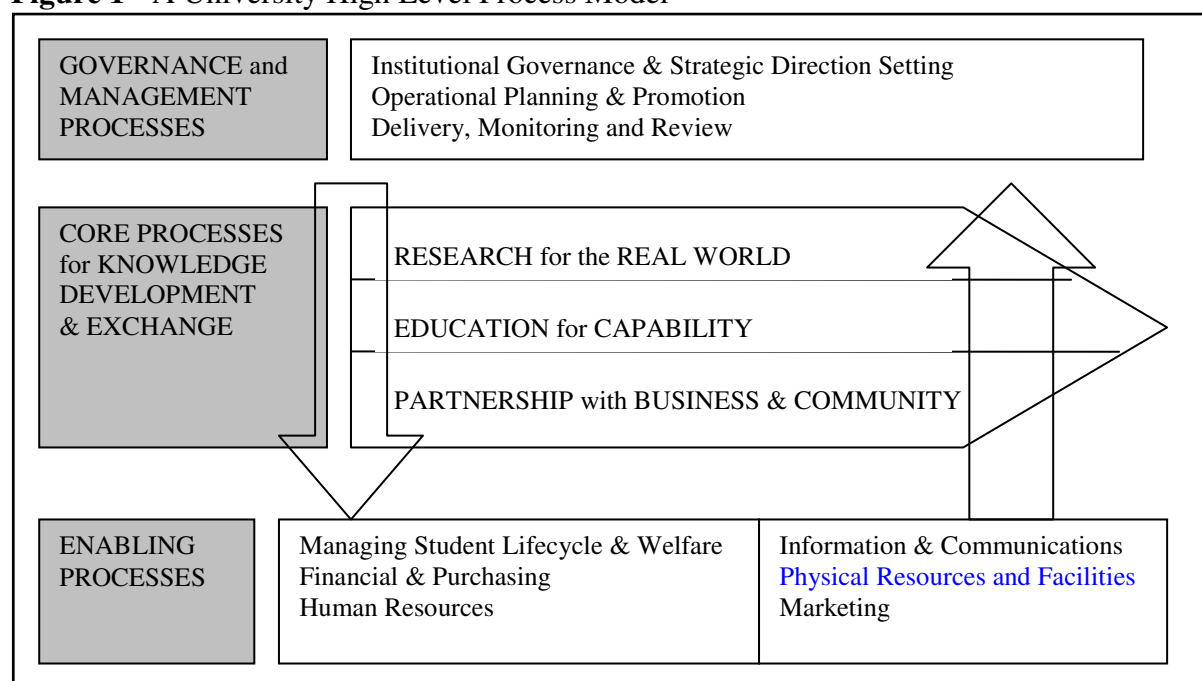|	University	Business
Mission	Knowledge dissemination, knowledge generation, social value	Innovation, market share, shareholder value
Core activities	Teaching and curriculum, community service, research	Manufacturing/ service, distribution, research and development
Support activities	Facilities management, procurement, waste management	Facilities management, procurement, waste management
Specific practices	Not for profit, decentralized decision authority, limited financial accountability and reporting, 'Flat organization'	For profit, centralized decision authority, extensive financial accountability and reporting, hierarchical organization

Source : (Walton and Galea 2005)

This research will highlight a few issues raise on strategic facilities management concerning operation and maintenance such as government and university governance, issues of facilities attract students, changing customer expectation of today higher education and the sustainable university for the future.

4.1 Government and University Governance

Characteristics of four university models (McNay 1995) range from collegium, bureaucracy, corporation and enterprise has clearly shown the different between these four models. As many university move towards enterprise model where competitive has become one of dominant value with students status identify as customers there are a need to change the way university think about their current development. As example, University of Salford declare the university as *'enterprise university'* but operation and maintenance process are still under bureaucracy model. The process and decisions about operation and maintenance are still within committees and administrative briefings rather than project teams. The educational facilities professional must connect the goals of the operation with the educational goals and aspirations of the institution. Figure 1 shows three different process of the university high level process model.

Figure 1 - A University High Level Process Model

GOVERNANCE and MANAGEMENT PROCESSES	Institutional Governance & Strategic Direction Setting Operational Planning & Promotion Delivery, Monitoring and Review	
CORE PROCESSES for KNOWLEDGE DEVELOPMENT & EXCHANGE	RESEARCH for the REAL WORLD EDUCATION for CAPABILITY PARTNERSHIP with BUSINESS & COMMUNITY	
ENABLING PROCESSES	Managing Student Lifecycle & Welfare Financial & Purchasing Human Resources	Information & Communications Physical Resources and Facilities Marketing

Source : Alexander, K. 2007, Director of CFM University of Salford

4.2 Facilities Attract Students

Facilities are not a primary motivator in student's decision to pursue higher education (Price 2003; Daigneau 2006). The fact is that the top reason for their selection is the educational programs. This statement support by APPA, based on their recent study on 'The impact of facilities on student recruitment and retention' in US (Cain and Reynolds 2006; Cain and Reynolds 2006). A good clean, well-lighted classroom with comfortable chairs, good audiovisual, comfortable temperatures and ventilation is fully satisfactory to meet educational needs. University should think to build a building that can easily maintain and operates well and efficiently support with latest equipment. However, competition between universities for students has increased dramatically in the past decade, with the trend expected to continue. One effect of increased competition is an emphasis on high-profile facilities and high-intensity research labs. With the changing stakeholder expectation, university should think how to tackle the different group of customers, how to attract and secure research funding within the university. University Manchester as example have make a move to built World Class laboratory to parallel with the demand of new technologies, support research activities and secure the confidence of research funded. Deputy principal of Anniesland College, Brian Hughes in supporting the decision for a new £50 million campus to be built on the site of Anniesland College in the West End stated that 'in preparing our business case we had to demonstrate the buildings needed to be replaced and not just re-clad. The new college will make a big difference to staff, students and local community'. The present college in Hatfield Drive, which has around 300 staff and up to 10,000 students each year, was built in the 1960's. The buildings are in poor condition pretty much throughout and suffer from water ingress (2007).

4.3 Client Satisfaction

Higher education stakeholders in the UK consist of political fiduciary, sponsors, professional, staff, students, parents, funding agency, business community and others agency (HEFCE 2000). APPA, 2006 has identified higher education changing stakeholder expectations from various types such as student expectation, parents, community and states. Higher education institutions need to establish appropriate methodologies and process to identify and respond to client and industry need including measure client and industry satisfaction, minimise attrition rates and establish seamless pathways between education sectors.

4.4 Sustainable University

The *University Charter for Sustainable Development* is an instrument created by Copernicus, an inter-university co-operation programme on the environment, established by the Association of European Universities (CRE). The Charter expresses a collective commitment on behalf of a large number of universities. It represents an effort to mobilize the resources of institutions of higher education to further concept and objective or sustainable development. Table 3 identify sustainability enhance facilities management presented by Keith Alexander titled 'The univer-city as a sustainable place' where facilities management need to lead on sustainability issues and promote facilities contribution.

Table 3 - Sustainability Enhances Facilities Management – World Class FM

Organisational value	Excellence	Innovation	Sustainability
Organisational excellence – Redefine industry expectations	Service Excellence	Innovation Network	Corporate citizen
Ensuring the best support is produced	Service Quality	Innovation Chain	Socially responsible
Supporting an organisation to perform better	Service Performance	Knowledge collaboration	Balanced performance
Enabling an organisation to perform better	Service delivery	Knowledge exchange	Environmentally aware
Minimum failure	Service design	Information transfer	Compliant

Source : Alexander, K. 2007, Director of CFM University of Salford

The issue of utilisation rate of higher education facilities whether high or low need an attention from the facilities management perspective. Community based facilities management through an idea of sharing workplace within the community is the ideal concept to think.

5. Conclusion

The study concluded that there is a need for research on the practicality of facilities management in higher education and suggest a different way to demonstrate the strategic facilities management in managing university estate. The choices a facilities professional makes today often affects a higher education institution for years and decades to come. And that in turn affects the capacity of higher education to successfully fulfil its mission of education and research. This paper has been reviewed the importance of strategic facilities management in higher education context in

facing change and challenge of modern university in this millennium. This required a depth understanding of the relationship between facilities and the core business of the university to provide university as a sustainable place.

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Appendix 1

The Government and management of UK universities (Scott 1995; Bargh, Bocock et al. 2000)

Phase Period	Civic late nineteenth to early twentieth centuries	Danish 1920s to early 1960s	Democratic Late 1960s to 1970s	Managerial 1980 to date
Old universities				
Characteristics	• Dominance of lay patrons and governing council	• Elite collegiality; vice-chancellor and senior professors • Pre-eminence of academic senate; supervisory lay council • Minimal; lightest of light touch • Subordinate	• Democratic collegiality • Extension of democracy to staff and student rank and file • Consensus	• Reordering of internal authority • Senior management influence increases; effective (if not formal) power of organs academic self-government decreases
Management	• Non-issue			• Heads of department as line managers; formation of senior management teams (SMTs)
Administration	• Skeletal		• Professionalised: Conference of Universities Administrators (CUA)	• Managerial cadre (including planning strategy)
Role of vice-chancellor	Chancellor substitute Ceremonial figurehead	Charismatic leader Institution leader	Chief executive crisis manager; political lobbyist; returns officer, efficiency champions; fund raiser	
Phase period	Municipal Pre-1989	Transitional 1970s t0 1989	Corporate 1989 to date	
New universities				
Characteristics	- Local authority institution - No form of institutional democracy - Undeveloped Bureaucratic hierarchy, regulatory - Key functions the responsibility of local authorities	i. establishment of academic boards in HEIs ii. Gradual devolution of local authority responsibilities iii. Creation of national policy environment via National Advisory Board	- Polytechnics established as free-standing institution (1989); creation of unified university system(1992); establishment of new, smaller governing bodies with majority of independent members (a closed corporation) - Fully-fledged; pre-eminence of SMT (senior management team overshadows academic board - Professionalised and formalised; takeover of local authority residual responsibilities (***industrial relations, estate management, strategic planning***)	
Management				
Administration				

FACILITIES MANAGEMENT KNOWLEDGE IN PFI'S PROJECTS

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The paper draws on an exploratory study of facilities management (FM) service providers of major Private Finance Initiative (PFI) projects. The aim of the study is to investigate current issues and challenges and the areas of knowledge applied during the operation and maintenance stage of PFI's project cycle. This will lead to an identification of the gaps in knowledge and practice. Initial results reveal FM's knowledge facilitates the effectiveness of managing services with regards to better understanding and integrating approaches from both operational and management level. However, there are considerable challenges in disseminating FM knowledge to the operational level teams. Thus, the need for a review of the FM's approach on operational strategies is necessary. A discussion is included on the future research direction for the development of a FM's knowledge framework to meet the needs of PFI project.

Keywords: FM practice, knowledge dissemination, operational strategies, PFI.

INTRODUCTION

The implementation of facilities management in construction business can be seen as a key function in managing the buildings and infrastructure, support services and working environment to support the core business of the organisation in both the long and short term. (Chotipanich, 2000). With the emergence of the Public Finance Initiative (PFI) procurement system, the private sector has a primary role in delivering services upon entire contract of the facilities.

Facilities management in PFI contracts involved the planning, designing and managing facilities and their systems and equipment to enhance the organisation's ability without compromising their performance set by the Client and project stakeholders'. The successful delivery of services through PFI contracts depends on a number of factors and issues inherent in its practice. Thus, in managing on-going PFI projects over a 20 or 30 years period, requires effort from the management level to highlight the issues and challenges at strategic and operational stage. This provides a significant challenge for facilities management team to consider their existing approach.

Based on the issue as previously stated, this research aims to identify areas of knowledge applied during the operation and maintenance stage of PFI project. Accordingly, this paper provides an opportunity to address the initial findings from an exploratory study on practical problems and challenges in FM current practice during

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the operation of PFI facilities. It provides an initial insight into the industry and practitioners with view to providing a clear focus for continuing research.

OPERATION AND MAINTENANCE IN PFI'S PROJECT

Facilities management covers an extremely wide field of activities (Nutt, 1999), and is responsible for the provision of many varied services (Barrett, 1995). FM encompasses workplace, facility, support services, property, corporate real estate, and infrastructure. According to Nutt (2004) the essence of FM is the management of infrastructure resources and services to support and sustain the operational strategy of an organisation over time.

FM is also recognised as an organisation-specific function that is based on a real business need (Owen, 1999). Hinks (2002) acknowledged that the FM function can differ for the same organisation when it operates in different business scenarios due to scope and responsibility. Further, the physical features of the facility also cause differences in approach and methods to FM and should be a primary concern of the facility manager. Thus, the approach and methods should be reviewed, selected and operated in an efficient manner which addresses the needs of the businesses (McGregor, 2000).

Under PFI contract, facilities management responsible for delivering services and operates facilities over an agreed time span with the FM organisations are liable to meeting standard performance outlined by the project stakeholders. In addition, FM approaches in PFI encompasses the support requirement, operational performance and property strategy.

Whilst, the primary purpose of FM is operational function, the strategic function and issues of FM should be addressed by the organisation. Therefore, the facilities management team has to shift and adapt a different management approach as their practiced in non-PFI contract. Operational functions support the routine and regular needs of the organisation, whereas the strategic function covers several issues such as property asset portfolio management, strategic property decision, and facility planning and development with regards to policy and strategic plan of the organisation.

In most of PFI schemes, delivery of PFI projects involve a bid, design, built, finance and operate of facilities. Nutt (2000) noticed that FM served the organisation differently at different stages in its life-cycle. He added that the involvement of facilities management not only take place in the operational stage, but apparently are considered at all stage, as early as at bidding stage. Later, Nutt emphasised that in PFI projects, operation and maintenance tasks bring an impact and risk to the project due to its long term contract.

RESEARCH OBJECTIVE AND METHODOLOGY

The research undertaken for this study is part of an on-going doctoral study that aims to identify areas of knowledge applied during the operation stage of PFI project. The justification for undertaking this research was based on the need to improve facilities management knowledge processes, predominantly in PFI contract scheme. This was expected to lead to improvement and address gaps and opportunity on PFI-FM's knowledge practice.

The objectives of the research are outlined below:
1. To understand and examine industrial practice in PFI-FM with a view to ascertain the underlying problems, challenges and potential areas necessary for improvement.

2. To review the implementation of facilities manager's knowledge at operational level and strategic managerial level in brings its impact to effective task of services delivery.

3. To investigate the integration of knowledge management approach with facilities management at operational and strategic level.

4. To develop and evaluate a framework to enable organisations to be effectively manage the services delivery and performance.

This paper addresses the first objective only. By improving the facilities management knowledge during the operational stage in PFI projects, the resultant effect on the project performance through efficient services delivery will be notable.

The semi structured interview
In order to establish and to gather as much information regarding current practices, semi structured interviews were used as the primary source of data collection. According to Nachmias and Nachmias (1996), an interview method is a suitable means as data collection where questions are designed to elicit answers pertinent to the research.

Semi-structured interviews were chosen as they provide a thorough, focused and trustworthy means of information gathering, face to face with the interviewee (Mitchell, 1998). It is noted by Guba and Lincoln (1981) that the semi-structured interview offered a means to extend and amplify meanings that might be lost through other techniques of data collection. Further, the semi-structured interview is an ideal method to continually check the credibility of the information collected by constantly questioning the interpretation (Kvale, 1989).

Accordingly, the data from the fieldwork study was collected through semi-structured interviews, focusing on facilities management challenges and current practices. The selection of the interviewees and their mailing list was primarily obtained from British Institute of Facilities Management (BIFM) database. BIFM is the UK's leading professional body in facilities management. As the research project originated in the FM-PFI environment, the considerations are made to those person involved in this particular area in the database.

Fifteen respondents were identified to take part in this initial study. All of them were contacted through post to request their assistance in this study. As a follow up, reminders by telephone and e-mail were made. However, amongst the group of fifteen, only four were willing to be interviewed. Table 1 displays the profiles of respondents.

A series of semi-structured interviews were conducted with stakeholders in key PFI projects. Four interviews were conducted with all of them are from senior ranks, suggesting all of them had considerable practical experience in PFI contract, both technical and managerial level. Their experience in the industry ranges from ten years to over twenty-five years.

Table 1: Respondents' detail

Project Scope	Interviewees	PFI Unit
School - PFI	Project Director	Services Provider Team
Healthcare - PFI	Estates Facilities General Manager	Services Provider Team
Healthcare - PFI	Resident General Manager	Services Provider Team
Healthcare - PFI	Monitoring Officer / Asst. General Manager	Project Company (Special Purpose Vehicles - SPV)

The interviews were used to find out:

- Respondent's task and responsibilities;
- Organisational information;
- Practice and challenges in PFI contract environment; and
- Information used in managing their facilities.

No other personal details were collected because within the objectives of the study there was no intention to relate the data to individuals, but to take their output as a whole. All interviews were recorded to allow for the verification and transcription for subsequent analysis. All interviews were conducted face to face on the interviewee's own premises. The length of interview lasted pproximately one hour.

KEY PRELIMARY FINDINGS

An analysis of the interviews produced several findings and some gaps and areas for further research, which have been discussed in this section. Further, the effects of PFI on facilities management were generalised.

Effect of PFI on facilities management practice

The findings from the interviews suggests that understanding the impact of PFI contracts lead to better understanding of facilities management approach, particularly in implementation of operation and maintenance. However, the understanding of impact upon similarities and differences in managing the facilities are also acknowledged by all respondents.

In any construction project, including PFI schemes, different projects have different contract specifications and differences in usability impact of its facilities. This occurs because PFI projects are unique and large, in terms of value and its complexity. Conversely, even organisations in the same sector have different needs and approaches in managing its facilities (Atkins and Brooks, 2000; Schindler, 1998).

Further, it is clearly stated by one of the respondent that inability to understand the contract will result in the failure in services performance. He also added that this situation largely happens at operational level where the team involved are not commercially aware of the business needs. PFI shifts the normal practice of existing facilities management approach towards new PFI-FM approach. These new approaches are geared to produce a high level of services performance as stipulated in the contract. Therefore, thorough considerations from both operational and strategic

level are needed. At the strategic level, one respondent considers the essential key to managing of facilities management is through the quality of project management.

All respondents acknowledged a number of challenges affect the FM practice, mostly on the changing nature of facility in the future. It includes changes in technological and functional demands and also changes in legislative issues imposed by local authority or governing bodies. Thus, enormous consideration needs to be given to long-term management at the strategic and procurement stages.

As stated by one respondent, the successful delivery of services through a PFI scheme depends on a number of factors, including clarity at contract stage. This shows that PFI directly affects the facilities management practice since the beginning of the contract. Consequently, the companies have to take the challenges in defining and providing the maintaining and operating services in order to cope with its facilities' performance. These can be done by the use of FM knowledge. FM knowledge is becoming a significant challenge in order to cope these current demands both for operational and strategic level.

CHALLENGES ENVISAGED AND EXPERIENCED IN DELIVERING SERVICES

The challenges facing FM service provider in the PFI environment are multiple. These include meeting services performance, changes of services requirement, communication and knowledge retention.

Meeting services performance

In PFI's project, meeting demanding performance requirements and managing stakeholder expectations are two key challenges in managing and operating facilities. During the interviews, all service providers' representative confirm that view. Two respondent interviewed stated that it is difficult to meet the standards requirement and expectation from the stakeholder if they need to manage and operate the services in unsupported facilities environment. One of them draws an example from his previous experience in managing PFI refurbished hospital. In the particular project, new facilities and demolition works are carried in the same site. Whilst demolishing work carried out in a block of accommodation, all patients were required to move to temporary building. Therefore, as the service provider in charge of both hard and soft FM, keeping services at a high standard for the building that not fit for purposes, posed challenges and require high attention.

On the whole, PFI procurement is based on meeting the output specification. Thus performance mechanisms as outlined in the contract should lead to service providers deliver the services at their best level. As mentioned by managers interviewed, the rigorous performance review done by the project company considered delivering services according to specification without compromising the standards. Thus, performances penalties are then become operational issues to the delivery of services by the service providers.

From another view of service providers interviewed, this is an issue and challenges to them as performance reviews system do not provide incentives. Penalties are given if failure occurs, however no rewards are given for operating the facilities in a successful way. Hence, it is proposed by one of the respondent that more qualitative

assessment of performance with the option of contract negotiation in the operational phase is needed to address this challenge.

Communication as means of quality improvement

In a view of all respondents experienced in managing the health project, acknowledged that there is constant changes in legislation and requirements imposed by legislative authority. As a result, it may affect FM service providers in delivering the services in relation to proposed changes due to FM service providers are not directly linked to any contractual relationship with the authority. Thus, all FM service providers' representative believes that it is a challenge and gap exists for them at the moment. The services provider's representative added that there is difficulty to obtain any information from the project company.

Thus, the services provider's managers acknowledge that improvements in communications and relationships had been needed. They also agree that the FM service providers should be involved at project company level in relation with service performance improvement.

Ensuring gets right input in design process

In terms of service delivery, the quality of the finished building may affect the quality of services performance. Whilst FM involvement at the initial stage aims to contribute proper consideration of the operation of new facilities, there is still a gap to address where finance becomes a constraint. According to the general manager from service provider involved in design stage, there is little input taken into consideration during designing the facilities. In addition, the facilities manager has to justify the significance of their input towards the cost savings in the future.

Knowledge retention

There is evidence that high levels of staff turnover relate to knowledge retention. Therefore, the questions on how organisation retains the knowledge workers were asked to all respondents. Succession planning and staff continuity are those two elements highlighted by two managers interviewed. They strongly believe that valuable knowledge from their staff should not disappear from the project throughout the operational stage of the contract. Through proper succession planning, a level of knowledge content by individual are not only retained but could be enhanced. However, since all PFI projects managed by respondents are in earlier stage of operation, it cannot be generalised that knowledge lost due to staff turnover as a significant challenges to them at the moment.

IMPORTANT AREAS AND FACILITIES MANAGEMENT KNOWLEDGE

As mentioned earlier, under PFI-FM practice, the objectives of the business are focused on performance of services delivery. Failure to deliver the services as stipulated in contract brings a performance penalty to the service provider. Consequently, this affects the organisation's profitability.

Table 2 summarises the areas requiring attention in the PFI-FM environment. It shows each respondent identified similar area that needs attention with regards to the technical, contract, commercial and communication areas. All these key areas

transcend knowledge required by facilities managers throughout the life of facilities they managed.

Table 2: Summary of the most important areas require attention in facilities management.

Area	Respondent A	Respondent B	Respondent C	Respondent D
Technical	*	*		*
Process / Organisation structure				*
Business strategy / Commercial	*	*	*	
Financial	*	*		
Information Technology	*	*		
Communication	*		*	*
Others (please state if any) - Contract - Services Risks		* *	*	*

(Note: The above areas were derived from transcriptions of the interviews)

It observed that the crucial knowledge of the operational and maintenance project is varied and crucial throughout the life of facilities. At the initial stages of operation, it requires facility manager to effectively plan, organise, monitor and control the tasks. In that, the project manager needs to rely and apply the knowledge and skills they possess.

Each project phase involves different tasks, different knowledge and skills required by facilities manager. In terms of commencing and delivering new services, there was a general view by all respondents that specified knowledge and information was required. Contract documents, method statements and specifications are those primary sources required by service provider in acquiring the knowledge in PFI schemes. In assessing the justification of this selection, one of the respondents informed that by referring to the documents gives them a clear understanding on what standards to achieve.

He added that in the PFI-FM context, it is all about 'know-how' knowledge. By referring the contract document, it helps both operational team and management team to draw a clear understanding the content and awareness of their business scope. In the contract document, it also communicate the required services to deliver, mode of software intending to use, indicates numbers of operational staff required for each tasks, tasks to be done and level of services performance needed. It is highlighted by the managers' interviewed that by ignoring the contract, leads to a lack of understanding on operational scope. Thus, it is the main responsibility of the management team to communicate and interpret the required services output to the operational team.

To summary, the service provider's manager believes that the skills and knowledge required to ensure the effective services delivery include technical aspects, relationship management, knowledge of the business, communication approach and ability to focus on high level outcomes.

DISCUSSION

From the literature and interviews undertaken, it was discovered that facilities management is about supporting the business of an organisation and using its essential requirements as a driver for facilities improvement. Generally in PFI projects, service providers need to perform the required services without compromising the standards as signed in the contract. In managing the services over a long time period, there are inevitable challenges in facilities management practice. However, most of the projects managed by all respondents are still in the relatively early phases of their operations. Thus, a number of challenges found are only specific to the PFI-FM practice.

Apart from the challenges outlined, FM's knowledge facilitates the effectiveness of managing services with regards to the better understanding and integrated approach from both operational and managerial strategy. Contractual matters, business and commercial operation and technical capabilities are those areas of knowledge that require attention by both managerial and operational level. By applying that, it facilitates the effectiveness of managing services with regards to better understanding and integrated approach in its practice.

Further, it also recognised that through long term services arrangement, good relationships with the project stakeholder, design and build team and project company are necessary. These may not be best addressed through the contract. Instead, good knowledge transfer, understanding the impact of performance and trust between the parties need attention. To achieve this, good communications systems and relation with FM supply chain are needed. Effective communication then helps organisation to understand each other's requirements and working practices, which can lead to fewer misunderstanding.

TOWARDS AN EFFECTIVE FM PRACTICE

A limitation of the current practices in implementation of communication and level of knowledge required by operational and managerial level are highlighted in the discussion. In practice, there are many challenges and issues involved. Most of the challenges require attention and strategic decision making by the management team. Consequently, the decision and content of information made should be disseminated to the operational level. However, there are considerable challenges in disseminating those information and knowledge to the operational level teams. The main challenges identified are lack of understanding the business need which is derived from emerging practice of PFI in traditional facilities management approach. Moreover, lack of communication between operational team and managerial level contributes to the problem. Thus, the need for a review of the FM's approach on operational strategies is necessary and will be addressed through the on-going research. This can be done through assessing and establishing effective communication requirements, tools and as well as examining the structure of organisation.

CONCLUSIONS

This research constitutes a preliminary attempt at gaining an understanding of the facilities management practice in PFI contracts. It also draws attention to the knowledge of facilities services' providers during operational stages of PFI project. The data presented here have practical relevance as its taken from current practices and approaches. To sum up, the results revealed that numerous challenges faced by

the FM management level at operation and maintenance stage in PFI's project. The result also identifies areas require further research. These deal with issues such as improvement on current PFI procurement contract, company's facilities management (FM) approach on operational strategies and facilities management's supply chain.

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OPTIMIZATION OF TURNAROUND MAINTENANCE PROJECT IMPLEMENTATION

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Due to age, operating/environmental conditions, statutory requirements, etc there comes a time when the entire facility of Process industries had to be shutdown for necessary repairs, maintenance and project works. Shutdown maintenance (also known as Turnaround maintenance; TAM) projects have been experiencing failures due mainly to the assumption by organisations that TAM projects are same as Engineering, Procurement and Construction (EPC) projects. This research aims at determining the factors responsible for the failures of TAM implementation projects and to create a framework to guide against them. It will also establish the key management skills required to ensure TAM project success. Field surveys, questionnaires and case studies approaches are planned to evaluate and validate the above research aims. It is envisaged that the research when completed will solve the problem of TAM failures in Process industries.

Keywords: project implementation, shutdown maintenance, turnaround maintenance

1. INTRODUCTION

To achieve corporate performance - whether measured in terms of shareholders value, revenue growth, profitability or customer satisfaction - companies must maximize the performance of fixed, or capital assets that have a direct and significant impact on achieving corporate objectives (Duffuaa & Daya, 2004).These fixed assets (plant, equipment, machinery, etc) deteriorate due to their use and exposure to environmental conditions. If these process conditions are allowed to continue unchecked, this facility become unserviceable and brings them to a standstill. Industries therefore device different maintenance strategies to ensure efficient performance of their facility. One of these maintenance strategies is Shutdown (also known as Turnaround) maintenance.

Duffuaa et al 2004 defined Turnaround maintenance as a periodic maintenance in which plants are shutdown to allow for inspections, repairs, replacements and overhauls that can
be carried out only when the assets (plant facilities) are taken off service. Wikipedia, the free encyclopaedia; defined Turnaround in chemical manufacturing and petroleum refining, as a scheduled large-scale maintenance activity wherein an entire process unit is taken off stream for an extended period for comprehensive revamp and renewal.
In other words, Turnaround is a planned periodic shutdown or outage of a plant to perform maintenance, overhaul and repair operations and to inspect, test and replace process materials and equipment and project jobs which can only be done while the facility is shutdown.

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By statutory requirement some equipment in most process plants need to be inspected and some safety units tested and certified periodically. These equipment are mainly pressure units such as Boilers, Heat exchangers, piping, reactors, compressed air receivers etc and even storage tanks. This regulatory requirement is usually administered by a local authorised inspector who may stipulate an internal inspection frequency as a condition of maintaining the operating permit (Mclay, 2003).The turnaround maintenance is usually planned around this exercise. In glass manufacturing and other similar plants however the turnaround is planned around the re-lining of the furnace refractory and refuelling in the case of Nuclear power plants.

According to Duffuaa, et al, (1999) and Lenahan (1999), during turnaround maintenance, the following types of work are performed
- work on an equipment which cannot be done unless the whole plant is shutdown;
- work which can be done while the equipment is in operation but requires a lengthy period of maintenance work and a large number of maintenance personnel;
- defects that are pointed out during operation, but could not be repaired, are maintained during turnaround maintenance.

Other jobs done during this period includes; electrical power distribution system inspections, re-calibration of controls and pneumatic systems for optimum performance and projects. The project jobs are usually in the form of Plant upgrades; tie-ins of new facilities or lines, modification jobs, etc.

TAM projects are the most expensive and time consuming maintenance projects because during this period there is loss in production and the cost of the turnaround itself.

The positive impacts are obvious; though they are often overlooked. These positive impacts according to Mclay, (2003) are:
- Increase in equipment asset reliability
- Continued production integrity
- A reduction in the risk of unscheduled outages or catastrophic failure.

McQuillan, et al, (2003); explained that turnarounds are an accepted feature in operation in Process plants; stating that the impact of turnarounds on the overall plant reliability can be expressed in the equation:

$$\text{Plant 'unavailability'} = \text{breakdown outage} + \frac{\text{shutdown duration}}{\text{Shutdown interval}}$$

The equation implies that Plant 'unavailability' is the breakdown outage and the ratio of shutdown duration to shutdown interval.

From the above equation and definition (McQuillan et al, 2003) it can be seen that there is a benefit from optimizing the work done during a turnaround to:
- Reduce the probability of breakdowns between turnarounds
- Protect future process performance at design throughput/energy efficiency(the above equation is written on the assumption that the plant can run at full rate during an operational campaign)
- Increase the interval between shutdowns
- Reduce the duration of each shutdown.

Continuously postponing turnarounds will eventually result in a failure and safety incidents. Such unplanned shutdowns would take more time to repair and will be extremely expensive (Bijvank, 2004). To avoid such scenario, turnarounds are usually scheduled in advance.

2. TURNAROUND MAINTENANCE MANAGEMENT

Project management strategy is usually used to manage and coordinate Turnaround maintenance management. Project Management is defined in several ways, in this work the more generalised definitions will be considered:

Project Management is the art of directing and coordinating resources throughout the life of a project, by using modern techniques to achieve predetermined objectives of scope, cost, time, quality and participants expectation.(Fellow, et al; 2002 and Griffith & Watson; 2004).

According to Wikipedia, Project management is the discipline of organizing and managing resources in such a way that these resources deliver all the work required to complete the project within defined scope, quality, time and cost; a project is a temporary and one-time endeavour undertaken to create a unique product or service, that brings about beneficial change or added value.

From the above definitions, it means that apart from the scope, time, cost, safety and quality, the project must also satisfy some performance expectations: beneficial change/added value (participants expectations) and this varies from one project to another.
In Turnaround projects, the participants' expectation includes;
- Bringing the plant to their original health
- Making plant safe to operate till the next outage.
- Improving efficiency and throughput of plant by suitable modification.
- Reducing routine maintenance costs.
- Increasing reliability/availability of equipment during operation.

The above expectations have to be achieved on time, within cost, scope and meet all the quality requirements in a safe manner for a Turnaround project to be considered successful. (Motylenski, 2003) stated that a successful turnaround is characterised by ten factors:
- Absence of personnel injuries.
- No facility incidents
- No environmental impact
- Schedule objective is met or exceeded.
- Target cost is not exceeded.
- Facilities are successfully commissioned.
- Equipment will meet planned run length and operating conditions.
- Workforce performed outstandingly.
- No contract claim
- Improved contractor and vendor relationship.

In reality, failures of Turnarounds is common in industries and most organisations are now resorting to comparative performance metrics to gauge the success or otherwise of a Turnaround. Some metrics according to Oliver (2003) includes; duration, total cost, turnaround costs, safety, start-up incidents, unscheduled downtimes, environmental incidents and savings etc. Ertl, (2005) identified some differences

between EPC project and Turnaround projects   Organisations should be conscious of the obvious difference in order to be successful.

Taking scope management for instance, the scope of work is dynamic in Turnaround unlike EPC projects. This is because the entire scope is partially known until the Turnaround execution (Oliver, 2001 and Ertl, 2005). Though considerable improvements (especially in the area of risk-based inspections) for predicting the condition of equipment, there remains elements of discovery when the equipment is opened and cleaned for inspection. This dynamism is one of the major traits to Turnaround management towards success or failure of the turnaround. If Turnaround Management team does not have adequate skills to handle this with their attendant issues like changes in cost, time, materials, spares, personnel etc, the TAM is bound to fail.

Other scope-related problems arise because of multiple sources of work items such as capital projects, process needs, inspection requirements, operational needs and maintenance. For a Turnaround to be successful, these work items should be integrated to form an integrated plan and scope (Oliver, 2003; Williams, 2004; Motylenski, 2003).   Clark et al, (2003) maintained that if this is not done, significant sum of money will be wasted on TAM through; redundant scope, labour inefficiencies, multiple mobilisations and demobilisations and schedule issues.

Ertl(2005), identified specific management methodology like; Scope, Time, cost, Quality Human Resources, Communication and Risk management as very essential to the success of a TAM project. This implies that inadequacies in any of these areas mentioned
can lead to TAM failure.

Krings (2004), Mclay (2003), Oliver (2002) and Williams (2004) suggest that for a successful TAM, the organisation should set up a long range business plan to establish long-term plan to control schedules and budgets for the TAM. This should be integrated into the overall corporate plan (Oliver, 2002). Without long-range plans, (Krings, 2004), major repairs and inspections often do not get adequate attention until it is too late to properly prepare for their executions.
Duffuaa et al (2004), Gupta et al (1997) and Oliver, (2001), insist that the most suitable people should be selected with great care to forge the strongest possible organisation (management or core team) for controlling the event. According to Mclay (2003), the TAM team should represent all areas of responsibility: administration, operations, engineering, and maintenance; health, safety, and environment (HSE); quality assurance (QA); procurement, planning, and scheduling; and turnaround supervision. In addition the contractor representatives should also be included in this TAM team (Lenahan, 1999.)

Materials procurement is another area of concern. Materials here refer to the entire process of bidding, purchasing, delivering and storing supplies needed for the turnaround. The received item must be of good quality and conforms to all pre-determine specifications at a competitive price. Materials can account for 25-35% of a total TAM cost. Therefore, effectiveness of this activity is vital to achieve a successful Turnaround (Motylenski, 2003).

Adequate systems should be put in place to ensure the safety of the personnel in the plant during the TAM execution. Safety trainings and awareness programme should be organized to all turnaround teams especially the Contract workers. Safety policy statement, safety communication networks and safety working routine must be established to ensure safety of the personnel. Safety working routine consists of the following elements (Duffuaa et al, 2004); work permit; work environment; the worker; the task specification; material and substances; and tools and equipment.

Not including support services such as safety training and management, industrial hygiene monitoring, lead and asbestos testing, and environmental monitoring as part of a turnaround can have a serious impact on scheduled activities as unanticipated delays push the completion date out further and further (Cam's article, 2003). In the domain of nuclear power plants; risk and safety management are sine qua non conditions and therefore the planning and scheduling system has to enforce safety constraints guaranteeing that the state of the plant is safe at any time during the outage (Gomes, et al 1997). These and other variables are critical to the success/failure of TAM. This research work will carryout a thorough investigation to identify every variable that will assist in solving this failure syndrome.

3. NEED FOR THE RESEARCH

The importance of successful Turnaround implementation can not be overemphasised; unsuccessful implementation affects the economy adversely. In some third world countries, like Nigeria, inability to carryout successful Turnarounds in their refineries is one of the causes of petroleum products scarcity despite being a major OPEC oil producer. 'Catastrophic failure' which may arise from inadequate Turnaround (or no Turnaround/ scheduled maintenance at all) in the power sector can be a major disaster in the developed countries (2003 London Blackout). Snow (2007) reports that oil prices can be affected by shutdown maintenance of a major oil refinery. This means that TAM activities impacts negatively on the economy of a nation.

To the organisation, failures of TAM management can result in loss of revenue, cash, and market share, increased routine maintenance costs, reduced reliability/availability of equipment etc. Despite the research work in recent times in this area, organisations are still finding it very difficult to carry out these projects successfully. Turnaround failures (budgets blown by millions of dollars, target dates missed by days) are still as prevalent as ever. The common mistake is simply that some organisations still classify Turnarounds as just 'other projects'. It is true that they have many things in common with all projects but there are a lot of characteristics that sets them apart. (Oliver, 2001; Ertl, 2005)
Krings (2001) explained that effective shutdown management is critical to the operation of process plants, for without well-planned and executed shutdowns, equipment reliability suffers; organisation pays the price in poor quality and loss of production.

The successful accomplishment of TAM in terms of quality and cost is vital to the profitability of the company and to its competitive advantage, if not well planned and managed can result in excessive costs, business losses and so on (Duffuaa et al, 2004; Bijvank, 2004). Much effort has gone into the efficient planning and delivery of work

involved in Turnaround, but relatively little guidance exists for determining what work is worth doing in the first place, and how this should be clustered into appropriate packages to share shutdown opportunities. A surprising number of organisations (particularly in the utilities and service areas of operation) still do not even know how much a shutdown costs them (John Woodhouse, 2000).

It may be argued that a lot of work has been done to identify critical success factors for project implementation in other areas like EPC, Software, etc. Dvir, et al (1998), in their finding proved that project success factors are indeed contingent upon specific type of project and that the list of project success factors is far from being universal. In view of the above, there is need to carry out a detailed research work to identify the factors and other variables that are critical to the successful implementation of TAM projects. The work will also ascertain on how to optimise the mix of all the variables.

4. AIMS AND OBJECTIVES OF THE RESEARCH

The aims of this research work are to determine the factors responsible for the failures of TAM implementation projects and to create a framework to guide against such failures. Also this work will establish the key management skills to ensure TAM project success.
To achieve the above aims, the objectives below are set for this research:
- To critically evaluate the success of TAM projects.
- To establish critical success factors and their impact on the success or failure of TAM projects.
- To investigate and ascertain the awareness level of the TAM team on the outcome of the project.
- To investigate and evaluate the management skills required for a successful TAM.
- To develop and validate an operation framework for TAM projects.

5. SCOPE OF STUDY

The scope of this research will be on the Turnaround Maintenance implementation of engineering facilities in the UK (1996 - 2006). The work will concentrate on major industrial concerns.

6. RESEARCH APPROACH   - METHODOLOGY

- Comprehensive Literature Review to obtain existing/current facts related to the topic.
- Field Survey to obtain data and information that will enhance the structuring of the questionnaires.
- Information from 1 & 2 above will be used in the identification of the factors (variables) to develop the research hypothesis and design.
- Investigate and identify the research approach, establish the research structure and the instruments to test the hypothesis.
- Conduct a Pilot study to test the research design and sample design to access its suitability.
- Administration of questionnaires.

- Case studies and stimulated TAM studies.
- Analysis of data, from field survey, questionnaires and case studies by using the appropriate statistical tools and testing of the hypothesis.
- Reports of findings
- Development and validation of TAM framework
- Conclusions and recommendations

7. SUMMARY

The research work is still at its preliminary stage. The findings in the literature reviewed so far shows that the outcome (success or failure) of TAM projects is highly influenced by some variables (factors) internal and external to the Organisation as well as the management skills required to handle the TAM process.
On completion of this research these factors will be determined as well as the management skills required towards achieving TAM success. A framework will hence be developed to guide process industries against TAM failures.

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Maintenance Policy Implementation – Prioritised Decision Making Processes

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Abstract

A nation's infrastructure enhances the quality of life as well as enables the development of a flexible, competitive and growing economy. At the inception of Zambia's independence in 1964, the nation sought to build its national infrastructure through aggressive national development programmes. Public and community facilities together with an attractive road network were put in place. However, due to the support of the liberation struggle of much of Southern Africa, public resources were diverted rendering much of the infrastructure derelict in the late 70's to the early 90's. British colonial rule had left some 'semblance' legacy of a policy for maintenance that later years of local empowerment failed to harness in their quest for freedom. The coming of the millennium brought changes particularly in the political arena that has helped usher in concern for public as well as communal infrastructure. With the country attaining the HIPC completion point, there have been large in-flows of revenue to the government as a result of savings from debt payments. Apart from health issues, the large burden of funds goes to improving the existing infrastructure. Priority is therefore a matter of urgency. Apart from government departments, such as the Buildings Department, that are tasked with the upkeep of its infrastructure, it has also gone ahead to set up agencies that are targeting other infrastructure. This has seen the birth of such bodies as the Road Development Agency (RDA). However, there have been dislocations in evaluating the general maintenance policy implementations particularly in seeing how they affect decisions which may be deemed to be priorities. Using the existing mechanism for infrastructure maintenance, the study seeks to explore prioritised decision making processes especially in the light of mechanisms that are now viewed as income generating.

Key Words: Maintenance, Maintenance policy, Policy implementation

Introduction

The deterioration of a nation's infrastructure raises much concern not just to politicians but to its own nationals. In many cases, deterioration is the main cause of facilities not being used at optimum efficiency due to inadequate levels of capital funding, inappropriate policy making and management and ineffective coordination both within and between governments. In other cases, management of the infrastructure is fraught with considering the demand for, and supply of, physical infrastructure. The emanating challenges evince in a variety of issues with respects to the standards to be set for various components and the extent to which cross-subsidisation can be justified for reasons other than social equity. The need for better coordination between spheres of government, improved techniques for asset management and application of advance technology to not only reduce construction costs but as well as prolong the useful life of assets is a matter of importance.

The National Infrastructure – Historical and Current Position

The Building Infrastructure

The national infrastructure in Zambia for a long time was neglected. This resulted in rapid deterioration of the fabric and finishes of the buildings. In the past, the Ministry of Works and Supply through the Public Works Department (PWD) was involved in all the processes of constructing government buildings which also included post occupancy maintenance. About the mid 70's, government policy changed to allow for private sector participation in the design and construction of its buildings. Government continued to maintain the buildings through the PWD at provincial and district levels.

This policy was cost effective and good in that government through Government Stores purchased and stocked huge quantities of building materials for maintenance purposes. This ensured availability of materials when required. Harmony in the designing, specifying and use of materials helped in the sense that it was easy to come up with replacements in times of need. In addition to the above, government used to train artisans in doing construction and maintenance works who were stationed in strategic locations to respond to maintenance needs.

However, due to adverse economic factors, over the last decades, government could not continue to re-train its staff. Purchasing and stocking of building materials for maintenance purposes was discontinued and consequently affected the maintenance of government buildings. A recent survey of public buildings revealed that over 80% of them are in very deplorable states and are not functioning as originally intended. The deterioration of these buildings can be attributed to poor maintenance. The superficial maintenance that many buildings have been receiving has not helped the situation. In addition, unplanned incorporation of new technologies and equipment in old buildings in a bid to modernise them has contributed to the weakening of these structures.

The Road Infrastructure

Zambia has a total length of approximately 67,700km of road network of which 30,671 km is no gazetted while 37,000 is not. Of the total road length, only 18% (6,500 km) is paved while the rest is unpaved existing either as gravel or earth (MWS, 2003; UN, 1998). The original road infrastructure was developed during the first half of the century, mainly as a gateway to copper resources on the Copperbelt. Later, road and rail systems were extended to open up other parts of the country and establish better communication links with Zambia's neighbours, notable in the north and the east (Jhala, 1999).

However, since the construction boom of the 60's soon after independence, Zambia became indebted as a result of excessive reliance on copper exports and economic mismanagement which negatively affected expenditure on infrastructure maintenance (ibid). For example, in 1987, about 40% of the primary road network in Zambia was in good condition but by 1990, only 20% of the network was in good condition. The value of the work initially was estimated at US$ 2.3 billion but had during the years to 1990 declined by more than US$ 400 million, due to negligence of maintenance and it was estimated that about US$ 38 million was required annually to avoid further losses

(Jhala, 1998; NRB, 2002, www.nrb.org.zm). Subsequent support for maintenance during the years up to 1993 declined to only 15% of its requirements (Jhala, 1998).

This prompted reform in the road sector that was supported by the Word Bank (NRFA, 2005). Due to this, Zambia acceded to membership of the Road Maintenance Initiative (RMI) under the auspices of the Sub-Saharan Africa Transport Programme (SSATP). Under the programme, financial assistance to member countries was contingent upon the countries adhering to acceptable practices in road financing and management. The acceptable practices, which also formed part of the conditionalities for funding from the World Bank and other cooperating partners, included the establishment of a dedicated road fund with private sector participation; remittance of fuel levy direct into the road fund, bringing on board other road user funds into the road fund; and greater autonomy of the boards in the RMI (ibid).

An inter-Ministerial committee was assigned to manage the RMI in Zambia and it identified four key issues where policy changes were necessary and among these issues was the financing of road maintenance (collection and disbursement of road maintenance funds). Under this financing issue, it was recommended that a road user tariff was to be introduced to provide adequate and dedicated funds for road maintenance, with proceeds to be deposited in an autonomous road fund. It was further recommended that a board of management was established for administration of the road fund with members from key government ministries, chamber of commerce and from private sector road organisations.

Arising from the policy reforms new institutional structures were put in place and these were the establishment of the Road Fund (RF) and the National Roads Board (NRB). The Road Fund was established in 1993 under the Finance (control and management) Act with the fuel levy as its main instrument. The RF was established to provide a source of sustainable funding for the maintenance of the road network, linking revenue with road use through a levy on fuel. Upgrading and the construction of new roads fell outside the remit of the fund as these activities required funding from other sources (Government and Donors).

The NRB was established under the Roads and Traffic Act (Cap 766) in 1994 primarily to administer and manage the road fund. It was created through a statutory instrument issued by Ministry of Communications and Transport (MCT). In terms of road administration, the NRB played the role of funding agency established by government and interacted directly with government departments which played the role of implementing agencies. These were the Roads Department under the Ministry of Works and Supply (MWS) responsible for the construction, operation and maintenance of trunk and main roads. About 60% of the district roads (technically classified as D and RD) and the unclassified rural roads were under the jurisdiction of the district councils under the Department of Infrastructure Support Services (DISS) of the Ministry of Local Government and Housing (MLGH) (UN-CDF, 1998; NFRA, 2004). However, this system of administration created problems in terms of coordination and financing of roads in that in ROADSIP 1, there were 81 authorities that dealt with roads resulting in fragmentation with different players funding roads in isolation. Some of these roads could not be put on sustainable maintenance because their existence was not known to the funding agency. The main reason for this fragmentation was that Zambia did not have a Transport Policy in place by then (UN,

1998; Transport Policy, 2002; NFRA, 2004, www.nrfa.org.zm). In May 2000, the government of Zambia enacted the Transport Policy which gave birth to the creation of three agencies through Acts of Parliament. The Road Traffic Act No. 11 of 2002 created the Road Transport and Safety Agency (RTSA), the Public Roads Act No. 12 of 2002 created the Road Development Agency (RDA), which is now responsible for all roads in the country. The National Road Fund Act No. 13 created the National Road Fund Agency (NFRA) which is responsible for administering and managing all resources in the road sector through the Road Fund (NFRA, 2004).

Despite the elaborate processes of the road reforms in Zambia (the 1991 reforms resulting in the creation of the Road Fund and the NRB and the 2000 reforms resulting in the promulgation of the Transport Policy and the three Road Agencies), the financing arrangements in the sector still remain unsustainable. Delays in release of budgeted funds to the sector are the main source of concern particularly as they affect progress of new and rehabilitation works. Through its cash budgeting system, the Ministry of Finance and National Planning (MOFNP) only releases funds as per month's allocation and not as per budgeted allocation. In the same vein, the fuel levy which is the main source of local funding in the sector is not remitted directly to the RF as per acceptable practice of road financing contained in the RMI of the World Bank conditionality for external funding. The NRFA Annual Report (2004 indicates that only 56% of its funds was remitted to it in the 2003 while in 2005, it improved to 80%. In the year 2006, there has a marked decrease that brought support funds to almost 60%.

Theoretical Framework

British Standard 8210 defines maintenance policy as 'a strategy within which decisions on maintenance are taken' (1986). Implementation takes into account strategies that bring into reality decisions made. Prioritising maintenance brings into focus the equating of resources to maintenance needs (Then, 1989). The condition survey establishes these needs which would have to be categorised in various works for maintenance. Lee (1987) categorises planned maintenance into scheduled and contingency systems. Needs are categorised based on the measures of condition. Stevens and Then (1991) identify five measures of condition that range from 'Class' or 'Grade' 1 to 5 – on a scale of 'good' to 'dangerous' condition. The measures of condition give rise to measures of priority.

In general, measures for priority are implicitly linked to the condition measures by the element of time, since class 1 or 'Dangerous' condition rating would demand immediate action on health and safety criterion. In terms of building maintenance, there are three types of need and these often relate to the *'eye of the beholder'*. Then (1991) expresses priority in terms of:

Expressed Need   This need is normally identified by the building user: the tenant, in case of housing or head teacher, in the case of schools.

Perceived Need   This comes from an experienced person who visits the property and makes an assessment of the amount of work to be done or the action to be taken.

Comparative Need   Where senior officers decide which properties are to be included in a particular programme. Comparative need seeks to rank the properties within a particular condition grading – e.g. which 'condition 1' roofs should be included or left out of a particular condition maintenance programme. In other words, even when the condition survey has been carried out, it is necessary to prioritize the work. Decisions within this category are inevitably political in nature.

Each of these measures of priority due to measures of need have their own response times. In effect, the maintenance management system will be characterised by ensuring that a maintenance plan that is in place is monitored (Lee, 1987).

Expected Outcomes of the Research

The study will investigate decision making processes utilised in the management of Zambia's infrastructure. As the evidence in reports has shown, there is still a disparity in the implementation of policy owing to lack of a structure that prioritises needs particularly in view of the changed structure of the MWS. What structures must the ministry adopt at provincial, district and local levels?

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