

---

## Original Article

# Strategic and operational factors' influence on the management of building maintenance operation processes in sports and leisure facilities, Hong Kong

Received (in revised form): 17<sup>th</sup> November 2008

## Hackman Hon Yin Lee

is Chartered Surveyor (UK), Registered Professional Surveyor (HK), Certified Facility Manager (USA) and Registered International Engineering Technologist (HK) with over 20 years of experience in the field of operation and maintenance of building services engineering systems, building maintenance and facilities management. Recently, he obtained a doctoral degree from the University of South Australia and his completed research work examines the gaps between top management and maintenance personnel in the management of building maintenance operation processes for sports and leisure facilities, a Hong Kong perspective with suggested ways to improve its operational efficiency.

## David Scott

is Professor Department of Civil Engineering. His principal areas of teaching and research include management of construction, construction project management, construction IT, engineering economics. David Scott originally studied, trained in UK but has worked in Africa, Asia and Australasia for 25 years before coming to Curtin. His main areas of research interest have changed and developed over the years but have always focussed around construction management and engineering economics. His areas of special interest have ranged from resource planning to appropriate technology, from partnering to alternative evaluation techniques, from computer applications to project management information systems. Currently his research centres on IT applications in construction and Internet-based teaching and learning.

**ABSTRACT** The main objective of this paper is to examine strategic and operational factors influencing the management of building maintenance operation processes in sports and leisure facilities. These factors are developed from the identification of four main aspects in building maintenance management: building maintenance policy and strategy, strategic management, facility management and performance management. The management of building maintenance operation processes is the key for providing better built environment to building customers and users. It is particularly important in managing hospitality facilities such as sports and leisure facilities. However, maintenance is not in a high priority list in most of the organisations. This barrier contributes to the gaps between top management at the strategic level and maintenance personnel at the operational level. Building maintenance is changing pace with the development of facility management, which has impacts on the planning to

**Correspondence:** Hackman  
Hon Yin Lee, Flat A, 33/F, Block 12,  
Tierra Verde, Tsing Yi,  
New Territories, Hong Kong

implementation of maintenance operation processes and building performance. The information related to the strategic and operational factors is essential before an in-depth study is undertaken about the improvement of the gaps between top management at the strategic level and maintenance personnel at the operational level for building operation efficiency.

*Journal of Retail & Leisure Property* (2009) 8, 25–37.

doi:10.1057/rfp.2008.29; published online 14 January 2009

**Keywords:** building maintenance operation processes; maintenance policy and strategy; strategic management; facility management; performance management

## INTRODUCTION

In Hong Kong, construction of new residential complex with the provisions of sports and leisure facilities is a trend brought about by popular demand. For large-scale residential projects, large clubhouse facilities are built with various types of provisions including sports, food/beverage and banqueting facilities. One of the reasons for the trend of having such facilities is the promotion from the HK government for the green perspective with an exemption from the calculation of gross floor area (PNAP 229, 2000). Moreover, the modern lease controlling residential development normally includes a clause allowing for sports and recreational facilities to be provided. However, the size of sports and leisure facilities cannot exceed 5 per cent of the gross area of the residential portions. For a lease without a clause allowing recreational facilities, lease modification has to be applied for approval from the Lands Department (Practice Notes, 2000).

Sports and leisure facilities are categorised as one among the hospitality types. These building users require high level of services and attention because their expectation is usually high. According to Chan *et al* (2001), hospitality facilities are more complicated in construction and installation, which leads to higher maintenance cost. These types of facilities are of similar nature to hotel and are categorised as ‘dynamic’ facilities. The maintenance requirements are comparatively demanding. It is important to have a well-developed maintenance practice to support this business operation. Because there is a link between improving maintenance effectiveness and the management approaches, the top management always wants to know more about the effectiveness of maintenance performance. Chan *et al* (2001) also identify that maintenance services are not noticeable and are always overlooked by the management. Much of the manpower is wasted in performing the corrective maintenance works. This deficiency implies that planned preventive maintenance is inadequate and as a result staffs are distracted from implementing preventive measures.

Grimm (1994) observes that different types of facilities are based on different supporting functions. However, activities related to operation and maintenance and cleaning are not attractive. One of the core functions in hospitality building is to provide facilities for the satisfaction of guests



(Loosemore and Hsin, 2001). In this connection, maintenance personnel responsible for these facilities are required to develop key performance indicators for monitoring. The suggestions are based on response time, down time, request for repairs, quality of lighting, lifetime of light, temperature of swimming pool water, chemical balance of water and cleanliness of water. It is important to understand customer needs by measuring the customer service performance for operational processes improvement. Benchmarks are established for sports facilities describing the process improvement with consistent policies and procedures, frequent communication, managing maintenance resources, problem solving and attempts to remove barriers, prompt handling of customer feedback and continuous improvement.

Lee and Scott (2008) identify maintenance policy and strategy, strategic management, facility management and performance management as the four main aspects influencing the management of building maintenance operation processes. Sports and leisure facilities are becoming popular common facilities annexed to residential building complex in Hong Kong. The construction of these facilities is also a marketing strategy to attract more people to buy and rent, but property developers and property management organisations are more concerned about these facilities' maintenance performance as it reflects their organisational images as well as competitive advantages. Understanding the characteristics and considerations related to these four aspects are essential for the management of building maintenance operation for sports and leisure facilities.

## MAIN ASPECTS IN THE BUILDING MAINTENANCE OPERATION PROCESSES

According to the British Standard 3811, 'building maintenance' is defined as the work undertaken to keep, restore or improve every part of a building, its services and surrounds. It is expected to restore the building to its original design level and not to fall below the acceptable level. It may be more than 'to extend the life cycle of building' (Zavadskas *et al*, 1998). Building maintenance is necessary even if building is large or small, simple or complex. However, it is suggested to have maintenance-free building or adapt approaches with deferred maintenance strategy to buildings (El-Haram and Horner, 2002; Wood, 2003a). Over the past, building maintenance has been given a very low priority and building maintenance performance has been criticised as inefficient and unsatisfactory (Lam, 2000). Owing to the lack of proper maintenance plans, buildings themselves pose a danger to the general public and there are increasing problems of building dilapidation and building safety (Chan and Law, 2002; Yiu, 2002). Moreover, there are a lot of criticisms, in particular, for the slow responsiveness, inefficiency and poor quality of building maintenance (Cheng, 1999).

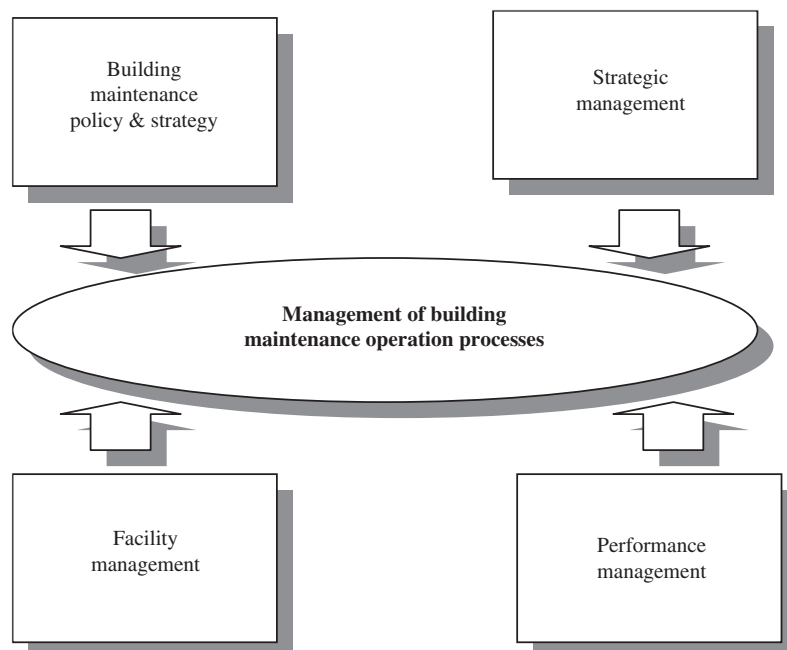
The nature of building maintenance is described as a 'Cinderella', 'not sexy', 'not attractive' and 'unproductive' activity (Seeley, 1976; Jones and Collis, 1996; Wood, 1999, 2003a). As a result, maintenance activity has not been recognised in every aspect in an organisation. Building

maintenance is categorised as an operational process and is divided into different stages of strategic functions including determining maintenance policy and objectives, deciding and preparing maintenance programmes and obtaining maintenance funds (Coetzee, 1999). It also requires operational functions including getting the work done, controlling progress of work, monitoring budget expenditure and monitoring the programmes. Although maintenance is apparently a technical operation, it requires integration of different technical and managerial inputs from planning to implementation of maintenance activities (Coetzee, 1999; Wood, 1999; Alani *et al.*, 2002; Tse, 2002).

In the past, top management was not interested in understanding building maintenance performance as well as maintenance process. However, with economic downturn in the last decade, every business is faced with challenges to minimise operation cost. This is unavoidable for building maintenance. Top management responsible for the management of a building facility is always looking for ways to optimise its maintenance operation costs. The recent trend of perception on building asset is categorised as infrastructure to support organisational business (Collins, 1993; Tranfield and Denyer, 2004). Top management at the strategic level is now focusing more on building performance as it has direct impacts on their building customers, and also influences the benefits of organisation.

There are difficulties in managing building maintenance strategically and operationally because both building customers and top management have higher expectations on building performance. Common problems and deficiencies are due to the lack of building maintenance objectives, which are not properly coordinated and not matching with organisational directions (Madu, 2000). There is an argument of budget constraint from the operational side, which is a common deficiency in the field of maintenance (Shen, 1997; El-Haram and Horner, 2002; Tse, 2002). The problems between strategic and operational levels have caused chaos of maintenance resources (Then, 1996; Coetzee, 1999). Moreover, maintenance personnel are too focused on technical responsibilities but without understanding the organisational issues such as the links between maintenance and business objectives (Shen, 1997). The focus on technical issues minimises maintenance personnel's managerial inputs and neglects the needs of building facility and its users and ultimately these problems contribute to higher maintenance cost.

Building maintenance has also been challenged with respect to the organisational structure and the capability of maintenance organisation. Built environment is a major consideration for the development of facility management. The relationship between building customers and the building facilities' performance is becoming more important. However, there is lack of insight about the reasons for the establishment of the relationship between facilities and users' satisfaction (Wood, 2003b). Maintenance is no longer a stand-alone activity as facility management is a strategic issue and influences organisational aspect of a maintenance organisation. A close relationship between top management at strategic level and maintenance personnel at operational level is important for the best performance of facility management. Moreover, there is inadequate



**Figure 1:** Main aspects influencing the building maintenance operation processes.

understanding of the relationship between management of building facilities and business objectives at the organisational level (Lo *et al*, 2000; Loosemore and Hsin, 2001).

In summary, there are four main aspects that are essential in managing building maintenance operation processes. They are the maintenance policy and strategy, strategic management of building maintenance, impacts on building maintenance due to facility management and building performance management. In this connection, study of these main aspects provides more insights about the factors contributing to the gaps between the top management at strategic level and building maintenance personnel at operational levels for better improvements of organisational effectiveness. Figure 1 shows the main aspects influencing the building maintenance operation processes.

### **CHARACTERISTICS OF BUILDING MAINTENANCE POLICY AND STRATEGY**

The basic theories in building maintenance management, including building maintenance definitions, categories of maintenance types, components of maintenance policy, maintenance procedures, maintenance programming and scheduling, are developed (Seeley, 1976; Lee, 1987; Spedding, 1987; Barrett, 1995; Chanter and Swallow, 1996; Horner *et al*, 1997). However, as time changes, studying these basic theories is inadequate because building maintenance is not a stand-alone activity and has to match with organisational goals and objectives. Maintenance policy is described as a written document, which provides a management framework to ensure that the building assets are maintained appropriately



to support the organisation's strategic objectives. In general, a maintenance policy is a written document in agreement with the top management at the strategic level, specifying and agreeing all maintenance strategies and activities.

During the process of formulating the maintenance policy, the following three components are considered essential: maintenance strategy, maintenance standard and maintenance resources. Maintenance is a broad term, which describes maintenance responsibilities and specifies maintenance requirements. The main objective is to ensure the building assets are adequately maintained and perform effectively and efficiently. Maintenance standard is an agreed acceptable standard. The resource is allocated from the balances between building facilities cost and the maintenance resources. However, maintenance standard is difficult to agree and is perceived differently because types of the buildings and the available resources among organisations are different. There is no unique maintenance strategy suitable for all types of buildings due to different characteristics, such as design, purposes, forms of construction, uses, building services systems, expectation and the perception of the customers. Hospitality facilities require high level of customer services and eventually require higher maintenance costs than residential and industrial buildings (Chan *et al*, 2001).

According to Oberg (2002), maintenance policy cannot operate effectively and efficiently without sufficient maintenance resources. The allocation of maintenance resource requires strategic directions and decisions. Maintenance personnel at the operational level monitor and control the maintenance budget by measuring building/facility performance with a balance between the facility cost and service quality. The maintenance objectives, however, may not be achieved without defining and implementing the requisite operational processes. Maintenance policy enables maintenance personnel to define where the maintenance strategy is and how to deal with maintenance response strategically and operationally. Maintenance activities cannot achieve best performance without a defined maintenance policy. Maintenance policy helps to manage maintenance resources more effectively. Maintenance efficiency can be improved by applying technologies such as an automatic intelligent scheduler. On the contrary, there is a trend to rely too much on using technology but without matching the organisational strategy (Madu, 2000; Tse, 2002).

## **STRATEGIC MANAGEMENT INFLUENCING BUILDING MAINTENANCE**

The main goal of strategic management is to increase the organisation's competitive advantages by focusing on the development of market strategies such as stability strategy, retrenchment strategy, combination strategy, differentiation strategy, cost leadership strategy and focus strategy (Collins, 1993). Strategic management is important to every business because of the instability of business environment (Collins, 1993; Lasher, 2002; Drejer, 2004). According to Langford and Male (1991), strategy is a set of rules for guiding decisions about organisational behaviour to achieve business objectives.



More recently, it is recognised that managing infrastructural assets including building maintenance are critical at the strategic level. Building maintenance requires strategic directions and has a close relationship with maintenance policy for determining maintenance strategy. Maintenance personnel follow the management strategic directions in planning maintenance activities. According to Tranfield and Denyer (2004) and Osgood (2004), managing infrastructural assets, including real estate, building facility, is becoming more important at the strategic level because it supports organisational objectives.

According to Madu (2000), strategic management not only is the top management issue but also requires developing organisational policy with the involvement of every employee. This explains why there exists a gap between the organisational level and its sub business units. Such gaps make barriers to maximise organisations' revenue. Zavadskas *et al* (1998) suggest that strategy for building lifetime efficiency is based on the integration of functional considerations, cost optimisation and the application of results. However, the processes require strategic and operational analysis and decisions.

## **BUILDING MAINTENANCE IN THE CONTEXT OF FACILITY MANAGEMENT**

British Institute of Facilities Management (BIFM) identifies a list of competencies related to facility management, which include

- managing people-to-people relationship;
- managing premises for physical plants, buildings;
- managing environmental services such as HVAC system, fire services installation, electrical, lifts, telecommunication systems, and so on;
- managing the working environment, internal and external environment.

According to the International Facility Management Association (IFMA), the definition of facility management is 'The practice of coordinating the physical workplace with the people and work of an organisation: (it) integrates the principles of business administration, architecture, and the behavioral and engineering science'.

Chan (1997) identifies that the main areas of concern for facility management functions are organisation, people and building facilities. Facility management is a developing discipline in the building industry. It involves various types of disciplines and recent studies discuss its very broad definitions (Pitt and Hinks, 2001; Best *et al*, 2003; Chotipanich, 2004). Although the scopes of facility management are very broad, it is more than the building operations and maintenance. Nutt (2004) defines facility management as the management of infrastructure resources and services to support and sustain the operational strategy of an organisation and thus, building operation and maintenance is within the facility management functions.

Jones (1996) is of the opinion that there are two main driving forces in developing facility management: reducing related facility cost and



improving productivity. On the contrary, Amaratunga *et al* (2000) argue that facility management is not only for minimising running costs and maximising space but also for focusing on the building assets for people, considerations on operational processes and business performance. Owing to the changes from building and facility management aspect, it is suggested to move towards strategic and knowledge-based management. However, facility management is not only concerned with optimising cost. Satisfying building customers is becoming the ultimate goal of facility management. Facility management involves several strategic issues by incorporating strategic approach at the top management and operational strategy at operational levels.

## **PERFORMANCE MANAGEMENT AND BUILDING MAINTENANCE**

Organisations are always looking for ways to improve business performance. Measuring performance is becoming essential and it has been developed for helping organisations to increase competitiveness and profitability. It is more essential to identify organisation's strengths and weaknesses. Arguments exist on the methodology for performance measurement and require identifying performance management strategies to achieve goals and objectives (Coetzee, 1999; Amaratunga and Baldry, 2002; Tangen, 2003). One of the purposes of performance management is to assist top management to identify the trends in the industry and take necessary steps for improving organisational capability.

Building performance is one of the key issues in the context of facility management for contributing to business (Amaratunga *et al*, 2000). Performance of a building can be an indication of two main scopes related to health and efficiency. There are numbers of factors related to building performance, facility efficiency, hygiene standard, indoor air quality, energy efficiency, lighting standard, thermal comfort, safety and information technology. There are challenges for methods measuring the performance of buildings. There is a direct link between facility management and performance management. Without understanding this, the performance of buildings cannot be measured and improvement on building performance cannot be identified. In the context of facility management, performance of building maintenance is not an individual activity and falls into the function of facility management.

## **STRATEGIC AND OPERATIONAL FACTORS DEVELOPED FROM THE MAIN ASPECTS INFLUENCING BUILDING MAINTENANCE OPERATION PROCESSES**

In order to have a better understanding of various factors developed from the main aspects influencing building maintenance operation processes, it is recommended to analyse and categorise those factors into strategic and operational levels. These factors are considered useful for further analysis about the gaps between the top management and maintenance personnel. The summary of the strategic and operational factors developed from the four main aspects is shown in Table 1.



**Table I:** Summary of the strategic and operational factors developed from the four main aspects

<i>Main aspects</i>	<i>Characteristics and considerations</i>	<i>Factors related to strategic or operational levels</i>
Maintenance policy and strategy	<ul style="list-style-type: none"> <li>• It is not a stand-alone activity and has to match with organisational goals and objectives.</li> <li>• Maintenance standard could not be easily agreed.</li> <li>• It is perceived differently and depends on types of buildings and available resources.</li> <li>• Hospitality facilities require high level of customer services with higher maintenance costs.</li> <li>• Allocation of maintenance resources.</li> <li>• It is essential to define maintenance policy.</li> <li>• The efficiency of the maintenance can be applied with technology.</li> </ul>	<ul style="list-style-type: none"> <li>• Strategic and operational</li> <li>• Strategic and operational</li> <li>• Strategic and operational</li> <li>• Strategic and operational</li> <li>• Operational</li> <li>• Operational</li> </ul>
Strategic management	<ul style="list-style-type: none"> <li>• Strategic direction is essential.</li> <li>• It has a closed relationship with maintenance policy for maintenance strategy.</li> <li>• It supports organisational objectives.</li> <li>• It not only deals with the top management issues but also needs every employee involvement.</li> <li>• Integration of functional considerations, cost optimisation and result application.</li> </ul>	<ul style="list-style-type: none"> <li>• Strategic</li> <li>• Operational</li> <li>• Operational</li> <li>• Strategic and operational</li> <li>• Strategic and operational</li> </ul>
Facility management	<ul style="list-style-type: none"> <li>• Facility management has very broad scopes but covers building maintenance operation.</li> <li>• It has to optimise facility cost, space and satisfy customers.</li> <li>• It moves towards strategic and knowledge-based management.</li> <li>• It involves strategic issues by incorporating a strategic approach at the top management and operational strategy at tactical and operational levels.</li> </ul>	<ul style="list-style-type: none"> <li>• Strategic and operational</li> <li>• Operational</li> <li>• Strategic</li> <li>• Strategic and operational</li> </ul>
Performance management	<ul style="list-style-type: none"> <li>• It is more important to identify an organisation's strengths and weaknesses.</li> <li>• Arguments exist on the methodology for performance measurement and require identifying strategies to achieve goals and objectives.</li> <li>• Can be an indication of two main scopes related to health and efficiency.</li> <li>• There are challenges for measuring methods of the performance in buildings.</li> <li>• If the performance of buildings is not known, improvement on building performance cannot be identified</li> </ul>	<ul style="list-style-type: none"> <li>• Strategic</li> <li>• Operational</li> <li>• Operational</li> <li>• Operational</li> <li>• Operational</li> </ul>

Building maintenance is a routine operational process and is not attractive in general but requires proper planning and implementation. Building maintenance supports organisation's core business. There are four main areas to focus: maintenance policy and strategy, strategic management, facility management and performance management. All these areas are related. Strategic planning and the relationships between strategic and operational levels are important. Strategic directions dominate the choice of maintenance policy and strategy. There is a close relationship between strategic management and maintenance policy. However, there are problems existing between the two levels of strategies: misalignment of top management at the strategic level and maintenance personnel at the operational level. They influence the choice of maintenance policy and strategy. There are gaps between organisational



and maintenance objectives. Although building maintenance is not a core activity, these gaps do not help to achieve the common goals.

Facility management is a strategic issue and is also considered one of the important aspects in making strategic directions on building maintenance. It concerns both efficiency and quality of services. It also has impacts on customer satisfaction. Facility performance is a key element to attract and satisfy building users. There is also a close relationship between facility management and performance management. Facility management influences building maintenance strategy. It is not just to optimise running operation cost, but also considers the use of balance of facility cost for achieving the required quality. There is a link between performance management and building maintenance. From the initial investigation, these four correlated main aspects in the field of building maintenance are recommended.

Building maintenance is an operation process and involves maintenance policy and strategy, strategic management, facility management and performance management. There is no unique approach in formulating maintenance policy and strategy as it varies among different organisations with different maintenance perceptions and resources. Arguments exist between the organisational and operational levels in the allocation of maintenance resources. Despite the broad functions of facility management, it influences maintenance strategy and building performance. Building maintenance is still given low priority although building maintenance is required to support organisational business.

There is in general lack of understanding of the building maintenance objectives, which cause budget constraint and chaos in resource allocation. Strategic maintenance management has links with building maintenance, and facility management supports operational strategy, optimises operation cost and improves productivity. Performance management is a major consideration in the context of facility management and has direct links with process improvement. In conclusion, studying these four main aspects helps to obtain more insight about how the maintenance objectives match with business objectives, the consideration of the managerial inputs for maintenance decision making and the reasons for budget constraint and how the maintenance objectives are justified.

## **PHYSICAL ENVIRONMENTAL CONSIDERATIONS FOR SPORTS AND LEISURE FACILITIES**

Environmental considerations including maintenance standard, thermal comforts, indoor air quality, cleanliness and hygiene standard in water quality of swimming pool are important. For sports and leisure facilities with provision of food and beverage service, hygiene standard is in top priority. Maintenance activities for these items have direct impacts to the extent of maintenance requirements, which are essential services to building customers. People enjoy leisure time, expect better maintenance services with quick response. Demand for building maintenance services and facility performance is increasing. Chan *et al* (2001) echo the same and argue that this type of facilities has sensitive user requirements, which are related to the environmental factors. They influence the



customers directly. The requests are sometimes outside the scope of reasonable requirements because every customer may have different nature of requests. It requires managerial skills and inputs to deal with.

Wood (1999) emphasises more on the environmental consideration of a facility rather than the plant, in which building customers are not interested but expect high efficiency of performing building maintenance activities. Jagemann (2004) considers that the sports environment is a highly important area and the environmental criteria are one of the influential factors affecting the usage. Thus, it is suggested to consider facility operation process during the planning and maintenance stage, which increase the attractiveness of facility environment as a result. Perdue *et al* (2002) identify one of the competence areas is building and facility management, which are in a higher rank from a survey of the club management association members in the USA in 2002.

## CONCLUSIONS AND RECOMMENDATION

Strategic and operational factors in the main aspects influence building maintenance operation processes significantly. Moreover, maintenance policy and strategy are greatly influenced by the strategic directions from the top management. However, there are challenges from both the top management and maintenance personnel on maintenance efficiency and allocation of maintenance resources, respectively. As discussed earlier maintenance task is no longer an individual activity but depends very much on the facility management strategic directions. It has more expectation from the organisation and the customers.

In the context of facility management, cost, quality and process considerations influence building maintenance operation processes and have impacts on the choice of maintenance strategy. Performance management helps to improve building operational processes. Customers play very important roles in the identification of improvement opportunities. Organisational misalignment and mismatch can be identified through the process of integration of strategic and operational factors. The deficiencies can be discussed and summarised for the improvement in the efficiency of building maintenance operation processes. These improvement opportunities can be further analysed and rectified for implementation. This process is considered necessary before planning maintenance strategy. This is useful for further investigation of improvement in the gaps between top management and maintenance personnel in an organisation. Figure 2 shows the integration of influencing factors from the main aspects.

In view of the physical environmental consideration and the maintenance requirements in sports and leisure facilities, the four main aspects are considered as the important elements for management of building maintenance operation processes. For the new residential development in Hong Kong, nearly 90 per cent of the development provides sports and leisure facilities. The maintenance strategy for the domestic parts is very typical and routine. For sports and leisure facilities, however, maintenance approach is different and non-typical in terms of design and nature of the construction. In this connection, the study focusing on sports and leisure



**Figure 2:** Integration of influencing factors from the main aspects.

facilities in residential development provides significant information for better management of maintenance activities. These were chosen as they represent a typical example of the mismatch of objectives. It is recommended to follow the above discussions for further in-depth investigation by looking into the following objectives:

- define and identify problems in the building maintenance operation processes;
- understand how the maintenance personnel plan/justify building maintenance objectives;
- identify the categories of challenges of maintenance strategy;
- identify the categories of impacts on building maintenance operation processes due to facility management;
- improvement of maintenance operation processes from building performance management;
- develop the ways for improvement of gaps between top management at strategic level and maintenance personnel at operational level.

## REFERENCES

- Alani, A.M., Tattersall, R.P. and Okoroh, M.I. (2002) Quantitative models for building repairs and maintenance: A comparative case-study. *Facilities* 20(5/6): 176–189.
- Amaratunga, D. and Baldry, D. (2002) Moving from performance measurement to performance management. *Facilities* 20(5/6): 217–223.
- Amaratunga, D., Baldry, D. and Sarshar, M. (2000) Assessment for facilities management – What next?. *Facilities* 18(1/2): 66–75.
- Barrett, P. (1995) *Facilities Management: Towards Better Practice*. Oxford, UK: Blackwell Science.
- Best, R., Langston, C. and De Valence, G. (2003) *Workplace Strategic and Facilities Management*. London: Butterworth-Heinemann.
- BIFM. (1999) *The BIFM Competences: British Institute of Facilities Management*. London: BIFM.
- Chan, J.K. and Law, L.W. (2002) The problems of advertising signs in Hong Kong. *The Journal of Building Surveying* 3(1): 18–28.
- Chan, K.T., Lee, R.H.K. and Burnett, J. (2001) Maintenance performance: A case study of hospitality engineering systems. *Facilities* 19(13/14): 494–503.
- Chan, M.W. (1997) *Facilities Management – Demystified*. Building Surveying Division Annual Conference, Hong Kong Institute of Surveyors, Hong Kong.
- Chanter, B. and Swallow, P. (1996) *‘Maintenance Organisation’ ‘Building Maintenance Management’*. London: Blackwell Science.
- Cheng, P.M. (1999) Towards a customer focused public housing maintenance. *The Journal of Building Surveying, HKIS* 1(1): 15–20.
- Chotipanich, S. (2004) Positioning facility management. *Facilities* 22(13/14): 364–372.
- Coetzee, J.L. (1999) A holistic approach to the maintenance ‘problem’. *Journal of Quality in Maintenance Engineering* 5(5): 276–280.
- Collins, R. (ed.) (1993) *‘Organization’ ‘Effective Management’*. New Zealand: CCCH International.
- Drejer, A. (2004) Back to basics and beyond, strategic management – An area where practice and theory are poorly related. *Management Decision* 42(3/4): 508–520.



- El-Haram, M.A. and Horner, M.W. (2002) Factors affecting housing maintenance cost. *Journal of Quality in Maintenance Engineering* 8(2): 115–123.
- Grimm, C.M. (1994) The Future of the Services Delivery Process. In: K. Alexander (ed.) *Facilities Management*. Glasgow: CFM, University of Strathclyde.
- Horner, R.M.W., El-Haram, M.A. and Munns, A.K. (1997) Building maintenance strategy: A new management approach. *Journal of Quality in Maintenance Engineering* 3(4): 273–280.
- IFMA. 'Definition of Facility Management', 'US Library of Congress'. USA: IFMA.
- Jagemann, H. (2004) Sports and the environment: Ways towards achieving the sustainable development of sports. *The Sports Journal* 7(1): 1–12.
- Jones, K. and Collis, S. (1996) Computerized maintenance management systems. *Property Management* 14(4): 33–37.
- Jones, O. (1996) *International Management: The Facility Management Challenge and Global Response*. BIFM Annual Conference, November.
- Lam, K.C. (2000) Planning and execution of business – Centered maintenance for perfect buildings. [http://www.cibse.org/pdfs/centered\\_maintenance.pdf](http://www.cibse.org/pdfs/centered_maintenance.pdf).
- Langford, D.A. and Male, S.P. (1991) *Strategic Management in Construction*. UK: Gower Publishing.
- Lasher, W.R. (2002) *Strategic Thinking for Smaller Business and Division*. London: Blackwell Science.
- Lee, H.Y.H. and Scott, D. (2008) Identification of main aspects in the management of building maintenance operation processes. 'Surveyors Times', *Hong Kong Institute of Surveyors* 17(6): 37–41.
- Lee, R. (1987) *Building Maintenance Management*. London: William Collins Sons.
- Lo, S.M., Lam, K.C. and Yuen, K.K. (2000) Views of building surveyors and building services engineers on priority setting of fire safety attributes for building maintenance. *Facilities* 18(13/14): 513–523.
- Loosemore, M. and Hsin, Y.Y. (2001) Customer-focused benchmarking for facilities management. *Facilities* 19(13/14): 464–476.
- Madu, C.N. (2000) Competing through maintenance strategies. *International Journal of Quality & Reliability Management* 17(9): 937–948.
- Nutt, B. (2004) *Infrastructure and Facilities: Forging Alignments Between Supply and Demand*. Conferences Proceeding of Future in Property and Facility Management II, A two-day International Conference, London: University College London.
- Oberg, C.P. (2002) Managing maintenance as a business. <http://www.maintenanceresources.com/ReferenceLibrary/ezine/epac.html>.
- Osgood Jr., R.T. (2004) Translating business strategy into facility action: The strategy alignment model. *Facility Management Journal*, March/April 31–35.
- Perdue, J., Ninemeier, J.D. and Woods, R.H. (2002) Comparison of present and future competencies required for club managers. *International Journal of Contemporary Hospitality Management* 14(3): 142–146.
- Pitt, M. and Hinks, J. (2001) Barriers to the operation of the facilities management: Property management interface. *Facilities* 19(7/8): 304–308.
- PNAP 229. (2000) Exclusion of Floor Areas for Residential Use. *Practice Note for Authorized Persons and Registered Structural Engineers*, September, Buildings Department, Hong Kong Government.
- Practice Note. (2000) *Recreational Facilities in Domestic Development*. Practice Note Issue no. 4/2000, Lands Administration Office, Lands Department, Hong Kong Government.
- Seeley, I.H. (1976) *Building Maintenance*. London: Macmillan.
- Shen, Q. (1997) A comparative study of priority setting methods for planned maintenance of public buildings. *Facilities* 15(12/13): 331–339.
- Spedding, A. (1987) *Building Maintenance Economics and Management*. London: E. & F. N. Spon.
- Tangen, S. (2003) An overview of frequently used performance measures. *Work Study* 52(7): 347–354.
- Then, D.S.S. (1996) A Conceptual Framework for Describing Built Assets Maintenance Standards. *Facilities* 14(7/8): 12–15.
- Tranfield, D. and Denyer, D. (2004) A framework for the strategic management of long term assets (SMoLTA). *Management Decision* 42(2): 277–291.
- Tse, P.W. (2002) Maintenance practices in Hong Kong and the use of the intelligent scheduler. *Journal of Quality in Maintenance Engineering* 8(4): 369–380.
- Wood, B. (1999) Intelligent building care. *Facilities* 17(5/6): 189–194.
- Wood, B. (2003a) Approaching the care-free building. *Facilities* 21(3/4): 74–79.
- Wood, B. (2003b) *Building Care*. Oxford, UK: Blackwell Science.
- Yiu, C.Y. (2002) Housing dilapidation in Hong Kong: A concern on the ageing trend. *The Journal of Building Surveying, HKIS* 3(1): 29–35.
- Zavadskas, E., Bejder, E. and Kaklauskas, A. (1998) Raising the efficiency of the building lifetime with special emphasis on maintenance. *Facilities* 16(11): 334–340.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.