

PRACTICES AND PERFORMANCE OF OUTSOURCED OPERATION AND MAINTENANCE IN COMMERCIAL BUILDINGS

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Abstract

There has been an increasing trend in the outsourcing of operation and maintenance (O&M) services for buildings in Hong Kong. Engaging a 'specialist' to do the job should, in theory, yield better services to end-users at lower costs but the contrary has been noted in various cases. There are, as yet, little in-depth investigations reported in the published literature about what would make an outsourcing O&M contract a success or failure.

This paper reports the preliminary findings of an ongoing research, which attempts to: identify the factors that determine contract performance and cost, formulate guidelines to help building owners decide whether to outsource O&M services, and highlight issues that require attention in outsourcing. A key part of the research is a survey, which has recently been completed. It involved face-to-face interviews with building owners, building management companies and O&M contractors. The survey result reveals the practices in the industry, including the outsourcing arrangements, scope of work, cost, and contract work management and supervision. The paper summarizes the key survey findings and conclusions drawn from preliminary analysis of the results.

Keywords: Commercial Building; Operation and Maintenance; Outsourcing; Performance; Practice.

INTRODUCTION

Operation and maintenance (O&M) for buildings has long been regarded as routine and ancillary; few studies have been done on the appropriateness of current practices to enhance performance. Traditionally, O&M works are done primarily in-house with some specialist work outsourced. In the late 90s, the Asian financial turmoil triggered building owners in both the public (ETWB, 2003) and private (e.g. the HSBC (HK IMAIL, 2002)) sectors to outsource more O&M works in order to meet immediate cost reduction targets. Recent research unveiled some areas that require improvement, e.g. the knowledge and skills of practitioners (Lai et al., 2004a) and definition of contractual responsibilities (Lai et al., 2004b). Notwithstanding these, O&M outsourcing is expected to grow if contractors can deliver quality services at lower costs than in-house O&M (Yik & Lai, 2004), which in turn hinges on how well the contract works are managed and the contract performance measured and monitored.

Outsourcing of support services has both merits and demerits (Campbell, 1995; Bragg 1998; Dunn, 2003). A particular mode of outsourcing may work perfectly well in one circumstance but fail in another. The scale of building and complexity of O&M work, end user requirements and O&M service standards, competence of the contractor, coordination between the in-house team and the contractor, the prevalent O&M practices and the service culture are all being influential factors. On the basis of information collected through in-depth face-to-face interviews, this paper reports the common practices and performance of outsourced O&M work for some commercial buildings in Hong Kong, including the common scope of O&M contract work, contract management structures, means for communicating O&M information, and costs for operating and maintaining air-conditioning installations.

THE SURVEY STUDY

The Pilot and Detailed Questionnaire Surveys

To ensure the survey work on this unexplored topic will yield meaningful results, a pilot survey was carried out prior to the full-scale survey with a focused group that comprised one representative from a building owner, another one from a building management company and the third from an O&M contractor. Drawing on the feedback and experience gained, the questionnaire was refined. Face-to-face interviews were preferred to simply sending out the questionnaire to participants to enable confidence building (Fowler, 2002) and hence to facilitate obtaining sensitive, yet essential information; although it sacrifices anonymity of the interviewees (Welman, 2001; Sekeran, 2003).

The detailed questionnaire comprised two parts, each containing four sections. The questions in the first part enquired into general personal information about the participants and background information about their company and building and maintenance practice. Those in the second part focused on detailed information about O&M contracts handled by the participants. Twenty four face-to-face personal interviews were conducted but the results of two had to be discarded due to lack of sufficient knowledge of the interviewees to enable them to provide some essential information about the building under investigation.

Demography of the Samples

The majority of the interviewees were experienced practitioners; with around half having attained undergraduate qualification and worked at managerial level or above. Twenty-six O&M contracts pertaining to twenty selected commercial buildings (6 'office'; 13 'office-retail' and 1 'hotel') were sampled. The aggregate gross floor areas (GFA) of the buildings are: 711,631m² (office); 122,588m² (retail); 23,098m² (hotel) and 67,039m² (car park). The age of the buildings ranged from 6 to 32 years; three wholly occupied by the landlord while the rest were variously occupied by the landlord, multiple-owners and tenants. Table 1 summarises the number of buildings in the sample with outsourced O&M work for various types of services installations, in whole or in part. Among these buildings the two highest counts are respectively for air-conditioning installations, which demand labour-intensive O&M work, and for lifts and escalators, which involve servicing and repair of proprietary components and need to be conducted in compliance with onerous statutory requirements (Lai & Yik, 2004).

Table 1: O&M Work Outsourced for the Sample Buildings

Services requiring O&M work	Outsourced	No. building(s) without the installation
Electrical	14	0
Generator	18	1
Air-conditioning	19	0
Building management system	12	4
Fire services	18	0
Lift and escalator	19	0
Plumbing and drainage	11	0
SMATV and CABD system	14	2
Security and access system	14	0
Boiler installation	2	16

FINDINGS AND DISCUSSIONS

Outsourcing modes and scopes

Two extremes of outsourcing modes and scopes for O&M work were observed: one Grade C¹ office building with gross floor area (GFA) less than 3,000m² had all the preventive O&M works entirely carried out by in-house staff (but those required by legislations to be undertaken by

¹ Grade A – Buildings with effective central air-conditioning; good lift services and professional management available.
Grade C – Building without central air-conditioning; barely adequate lift services and minimal management available. See RVD (2004) for detailed classification.

competent or registered professionals were outsourced) whereas one Grade A office building with GFA exceeding 70,000 m² had outsourced all its O&M works (Figure 1).

For the rest of the surveyed buildings, one or a combination of partial, selective and bundled outsourcing (Figure 2) was common. Most building owners outsourced the works that have to meet statutory requirements and works that demand large manpower or specialist skills leaving the in-house workforce with the non-statutory and less labour-intensive preventive works. Unlike among public-sector buildings where District Term Maintenance Contracts (HKHA, 2004) are widely used, no cross-boundary outsourcing (Figure 3) was found in the sample. This may be ascribed to the fact that the surveyed private commercial buildings are either owned by single owners who possess a limited number of buildings, which makes economies of scale unavailable; or jointly owned by multiple-owners, which renders costly transactions for apportioning O&M expenses unjustifiable.

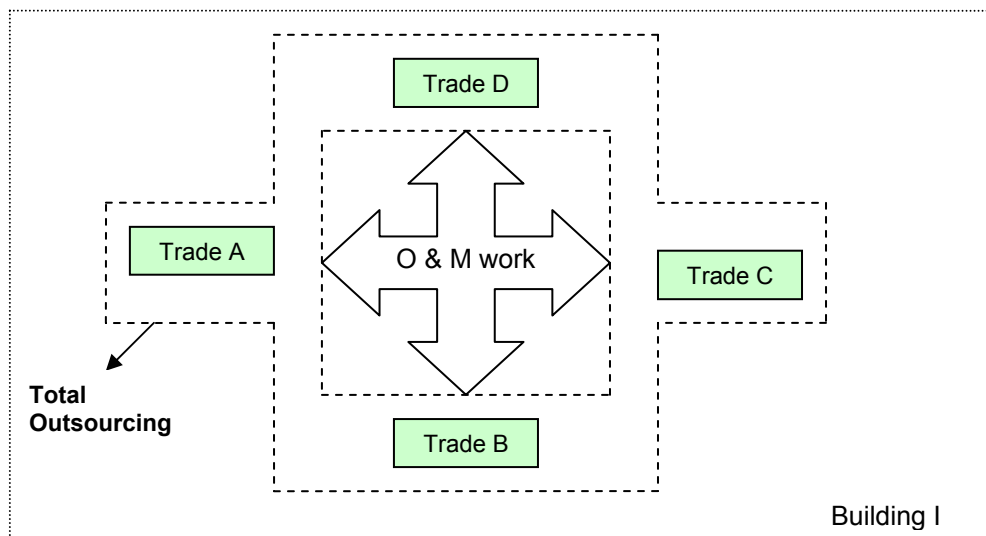


Figure 1: Total Outsourcing

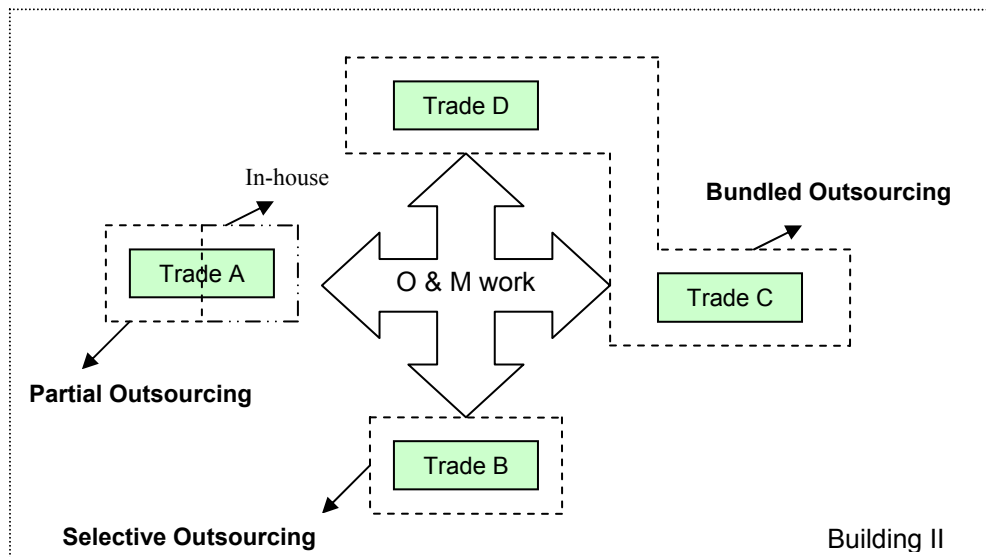


Figure 2: Partial, Selective and Bundled Outsourcing

All the surveyed contracts made use of either “centralized” or “partially grouped” contract management structure where a manager looks after all or a mix of O&M trades. None of them adopted a “dispersed” management structure under which the contracts are managed by individual personnel (Atkin & Brooks, 2000). This implies that the sample contained no

organizationally immature companies and the absence of cross-boundary outsourcing did not justify the existence of single-discipline contract managers.

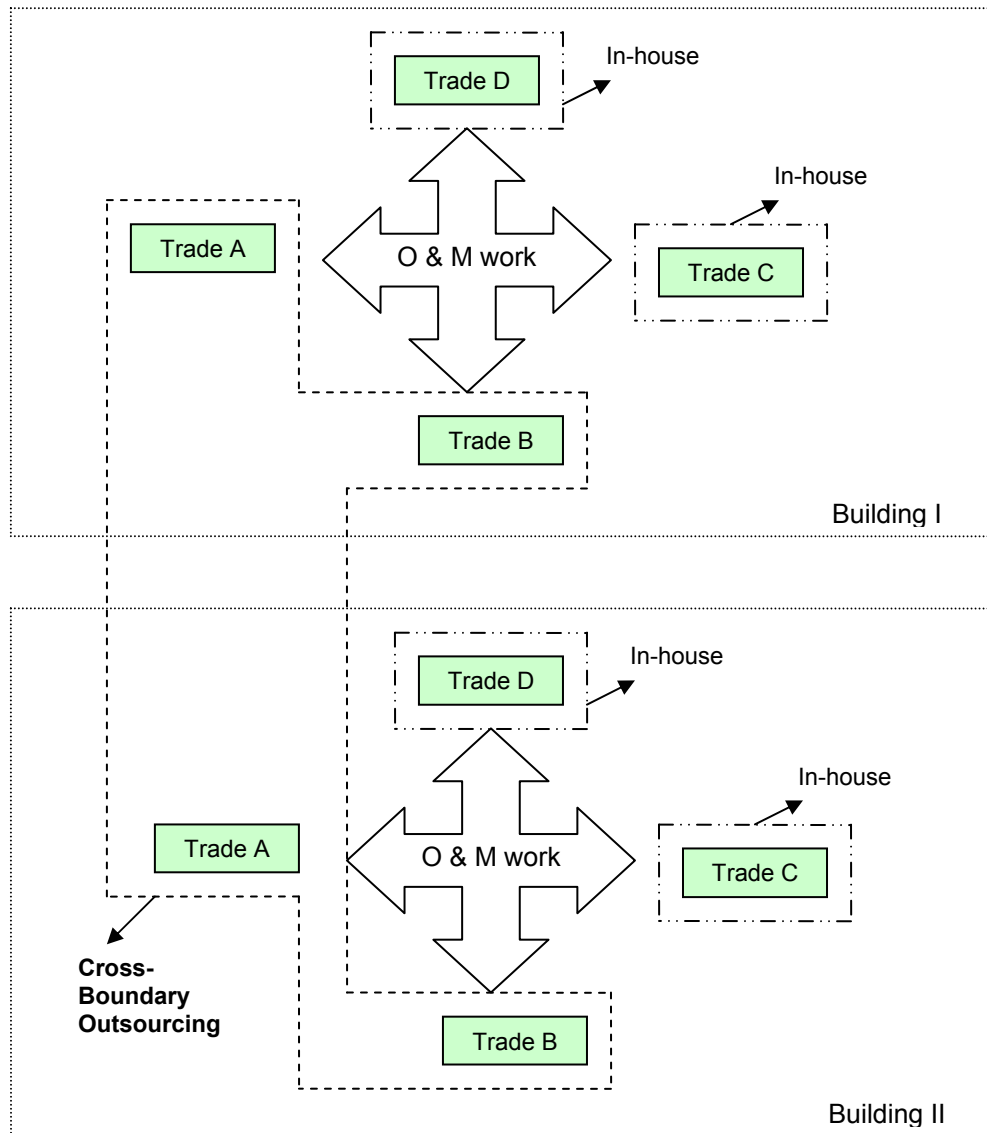


Figure 3: Cross-Boundary Outsourcing

In contrast with the total outsourcing modality where all the O&M works would be executed by a contractor and its subcontractors, building management service may be provided by engaging a *managing agent* who, being an external organization or individual, manages the client organisation's own employees (Atkin & Brooks, 2000). Although this latter arrangement is popular with some overseas government departments (Williams, 2002), it was not found in the sampled private commercial buildings. Except in the two extreme cases as mentioned above (i.e. either total in-house execution or total outsourcing), a *managing contractor* was commonly employed to manage a range of O&M trades via subcontracts. In addition, it was common that the managing contractor has to coordinate and monitor some specialist contractors' work (e.g. O&M for lifts and escalators, illustrated as Trade C in Figure 4) although there was no direct contractual relationship between them.

Communication of O&M Information

A pre-requisite of quality maintenance work is effective communication between the client and the O&M management team, and between this team and the workforce (Nanayakkara & Smith, 1997). Among 75 types of management skills and knowledge, 'communication' (oral or written) was ranked only second to 'leadership' in general construction, and was perceived by senior

managers as the topmost important skill/knowledge in refurbishment work (Egbu, 1999). Generally, communication of O&M information can be identified at two interfaces of three strata. For instance, a request for maintenance may be raised by the building users to the O&M management team; who in turn would inform the O&M contractor to execute work if it lies within their scope, or otherwise command the in-house labour to do so.

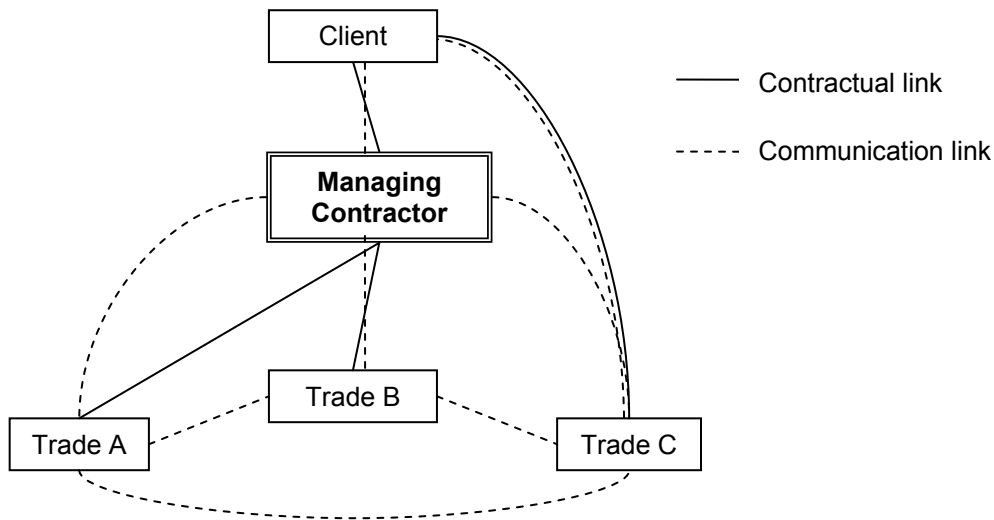


Figure 4: Contractual and Communication Links in a Management Contract

The practices of communicating O&M information correlate very well between the “User – Management” and “Management – Contractor” interfaces (Figure 5). Interestingly they are comparable to the benchmarks reported by IFMA (2001): “Fill out paper request” (38%); “Use a call center” (70%). However, it was less common in sending O&M request electronically (compared with 68% in IFMA, 2001) despite economical information technology has been available for some time.

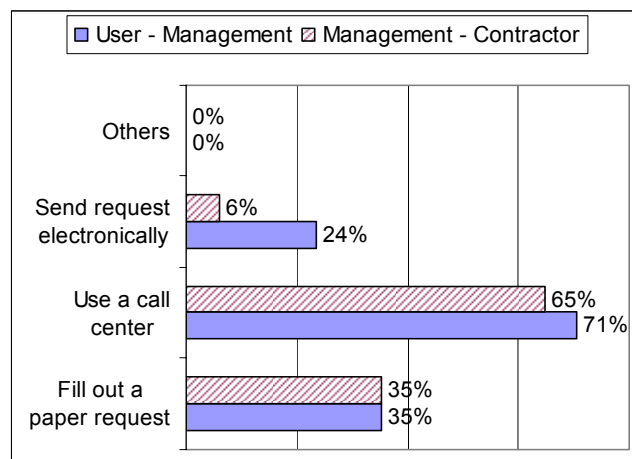


Figure 5: Means for Communicating O&M Information

Computerized maintenance management system (CMMS) can facilitate effective communication and tracking of O&M activities (Sullivan et al., 2002). In contrast with the common practice (64%) in North America (IFMA, 2001), only 24% of the surveyed companies made use of CMMS, notwithstanding the most experienced user has already been using it for 14 years. The summary in Table 2 further categorizes the practices adopted by the companies for communicating O&M activities. Different from the practices revealed by IFMA (2001), it is evident that the O&M practitioners in Hong Kong relied heavily on ‘manual-tracking’, which may contribute significantly to the deferred maintenance backlogs experienced by 56% of the interviewees in the preceding 12 months.

Proper tracking of productivity data would allow effective assessment of O&M performance (Wireman, 1998) while sharing such data among members of the service production team is crucial to attaining total quality (Grigg, 1996). Similar to the IFMA (2001)'s findings, maintenance productivity data were seldom shared with the customers (18%) and contractors (24%). The limited extent of sharing, which was mainly among the senior management (41%) and managerial staff (53%) in addition to the staff who undertake the work (53%), shows a distinct difference from the practice common in manufacturing and process industries (e.g. Pintelon & Van Puyvelde, 1997; Arts, et al., 1998), although there has been an increasing concern in hospitality buildings in Hong Kong (e.g. Chan et al., 2001).

Table 2: Practices for Communicating and Tracking O&M Activities

Activities	CMMS	Manually	Not tracked	Unknown
Repair work requests	24%	76%	0%	0%
Preventive work requests	18%	71%	6%	5%
Project work requests	12%	82%	0%	6%
Contractor work requests	12%	76%	6%	6%
Repair parts and supply costs	18%	76%	0%	6%
Maintenance tool records	12%	71%	12%	5%
Daily rounds activities	24%	71%	0%	5%
Building and equipment records	18%	76%	0%	6%
Periodic activity reports	6%	76%	6%	12%

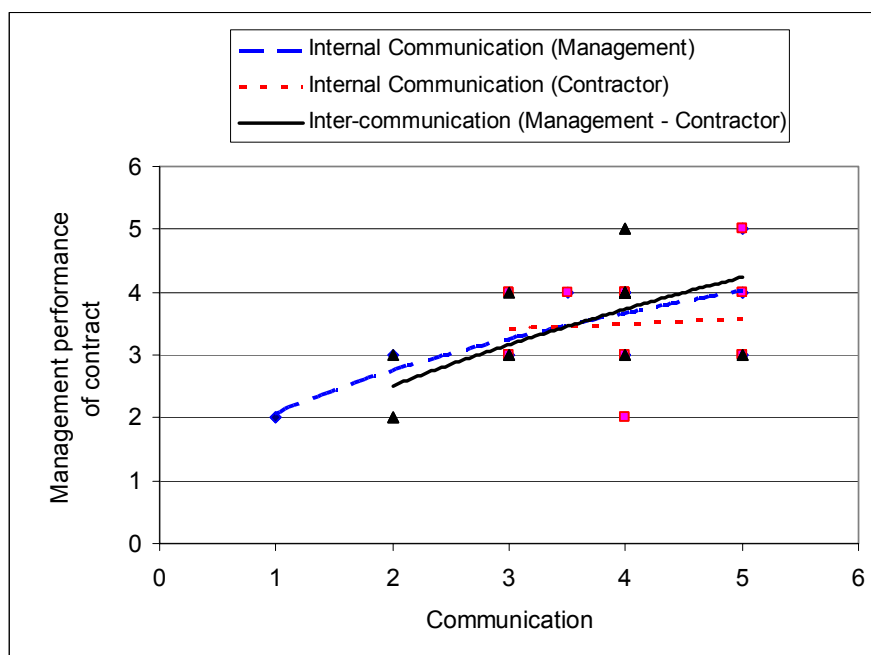


Figure 6: Management Performance of Contract and Communications among O&M Personnel

The respondents were asked to rate on a Likert scale of 1 (very poor) to 5 (very good) separately for the management performance of the contracts; and the achieved communication in three different aspects, namely inter-communication between the O&M management team and the contractor, internal communication among the O&M management team members and that within the contractor team. The results (Figure 6) demonstrate positive correlations between communication and management performance of contract.

Operation and Maintenance Costs

The in-depth interviews enquired into the values of the O&M contracts for air-conditioning installations, the most labour intensive type in buildings. The collected data cover mainly the routine operation and maintenance with little material resources involved. In addition to the average monthly salary of different ranks of in-house staff, the interviewees were also asked to indicate their input, in full-time equivalents (FTE), for both managing the outsourced air-conditioning O&M contract and accomplishing the work internally (Table 3). The average FTE of different ranks was calculated by equation (1) based on the full-time equivalent (FTE_j) and number (N_j) of in-house O&M staff at work level j (1: top management, 2: managerial, 3: supervisory and 4: operational) involved in the work; and N is the number of surveyed contracts with relevant information available. The monthly routine O&M cost of a particular trade was taken as the sum of the outsourcing contract sum (OC) and the in-house staff cost (IC). The latter was computed by equation (2) where S_j is the monthly salary of staff.

$$\overline{FTE}_j = \frac{N_j \times FTE_j}{N} \quad (1)$$

$$IC = \sum_{j=1}^4 N_j \times S_j \times FTE_j \quad (2)$$

Table 3: In-house Staff Salary and FTE for the Building Air-Conditioning O&M Work

Staff rank	Average monthly salary (HK\$)	Average FTE	Range of FTE
Top management	69,433 ($N = 9$)	0.014 ($N = 17$)	0 - 0.2
Managerial	40,528 ($N = 18$)	0.070 ($N = 17$)	0 - 0.5
Supervisory	22,063 ($N = 19$)	0.514 ($N = 17$)	0 - 2.0
Operational	11,773 ($N = 18$)	1.761 ($N = 17$)	0 - 9.0

It should be reasonable to expect that older buildings and hence more worn-out installations would require higher O&M expenditure to upkeep functionality and performance. However, the scatter plot of the survey results shown in Figure 7 does not support this expectation; there is no significant correlation between the normalised annual air-conditioning O&M costs (on per unit installed capacity basis, measured in ton of refrigeration (TR)) and the building age. The particular outlier aside, the O&M costs range from HK\$10/TR to HK\$60/TR and stay low for buildings aged between 20 and 30 years.

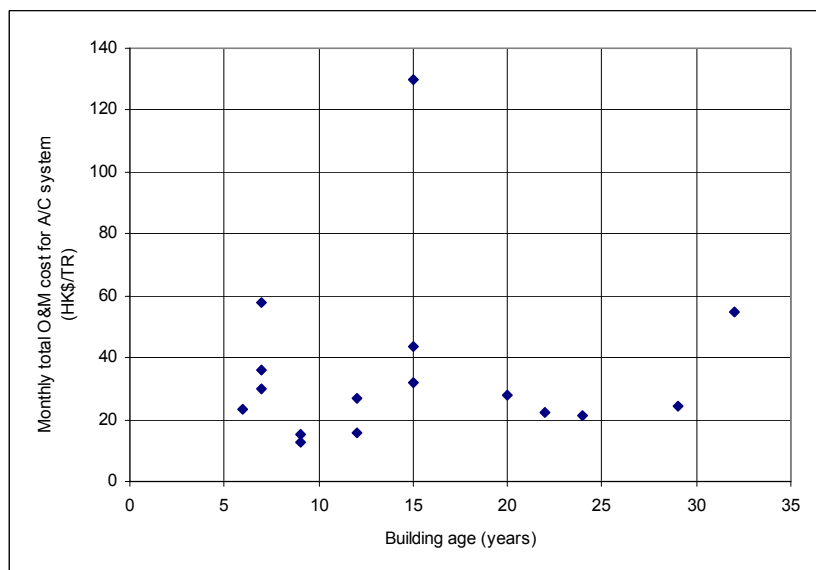


Figure 7: Air-conditioning O&M Costs and Building Age

As expenditure on operation and maintenance may also be regarded as an investment, less money would be spent on maintenance of buildings approaching the end of their economic life span for the lower return (Davies, 2000). The life span of air-conditioning equipment, however, can be significantly shorter than that of a building (CIBSE, 2000) and thus might be on list for replacement within the lifespan of the building. Once there is plan to replace equipment, less maintenance work for the equipment would be undertaken. After replacement, the new equipment would also demand less maintenance work. These are factors that may give rise to fluctuations in O&M costs during the life span of a building.

On the other hand, the air-conditioning O&M costs show significant correlation with the air-conditioned area of the building and the air-conditioning plant capacity (Figures 8 and 9). This implies that in commercial buildings with larger air-conditioned areas and hence greater air-conditioning plants, higher demand of labour resource, be it in-house or outsourced, is required to operate and maintain the installations. In particular, it is noted that one Grade C building, which is equipped with split-type air-conditioning units, required little O&M expenses as no routine maintenance was done.

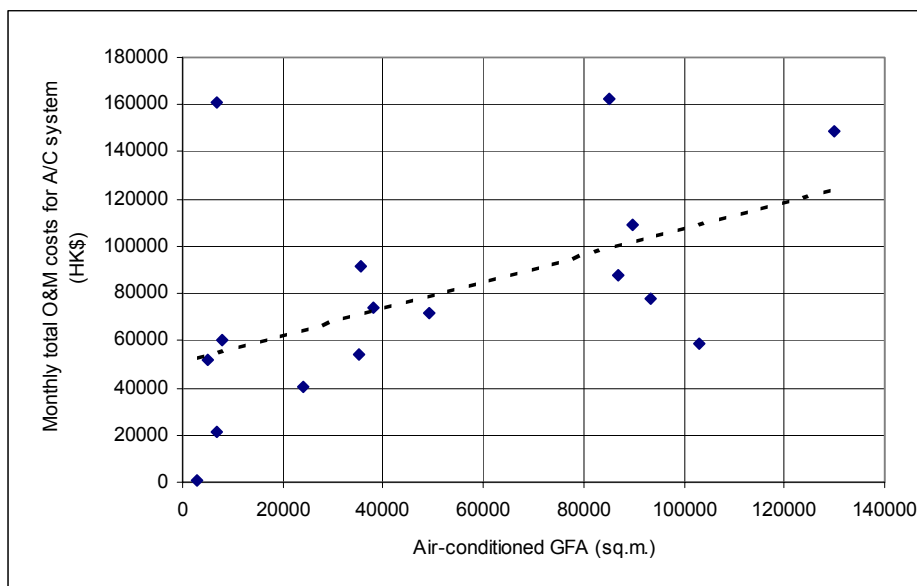


Figure 8: Air-conditioning O&M Costs and Conditioned Area

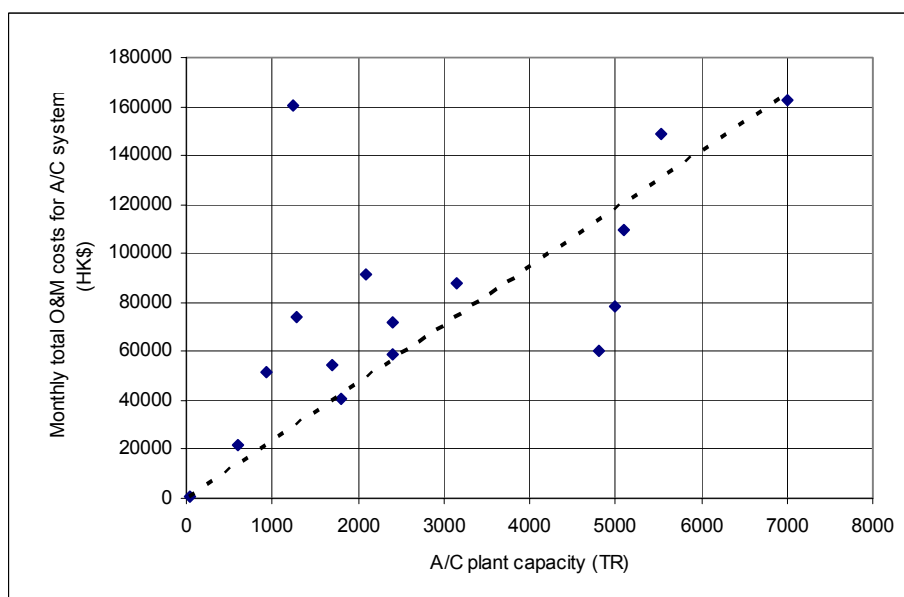


Figure 9: Air-conditioning O&M Costs and Plant Capacity

Further examination of the in-house and outsourced O&M costs for the air-conditioning systems (Figure 10) reveals some observations concurring largely with the prediction in Yik & Lai (2004). The outsourcing contract sums generally increase with the plant capacities at the lower range of plant size, which suggests that it is more economical if a larger amount of work is outsourced. For medium air-conditioning plants, in the 'total outsourcing' case the complete work was undertaken by a contractor under a packaged facilities management contract of which the portion of contract sum pertaining to operating and maintaining the air-conditioning system was unavailable but estimated as shown in the figure. Despite only relatively few data are available in the upper plant capacity range, the majority of the O&M works for such plants were found being performed predominantly in-house; which suggests that the large amount of work tends to fully utilize the in-house team and is therefore more economical to resource internally than to hire outsourcing contractor.

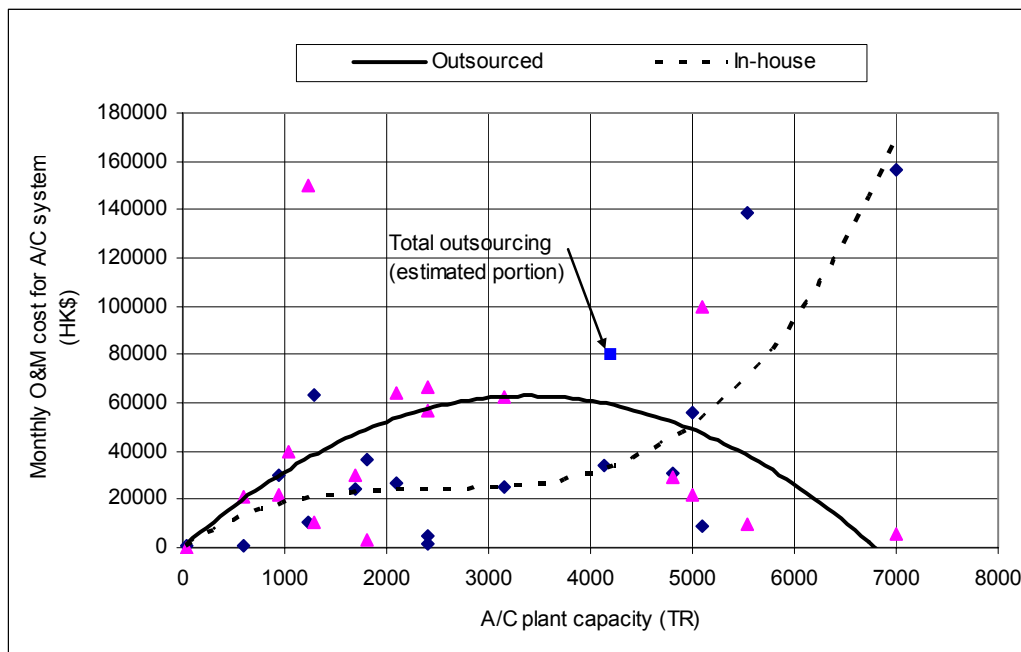


Figure 10: Outsourced and In-house Air-conditioning O&M Costs and Plant Capacity

CONCLUSIONS

The survey unveils that O&M works which require intensive labour resources, specialist knowledge or skills for dealing with proprietary components, or on which the statutory requirements have imposed strict control are commonly outsourced. Managing contractors are usually employed by building owners to mediate a range of specialist O&M trades but packaged contracts extending across building boundaries are rare in the private commercial sector, probably because economies of scale is absent.

It has not been a common practice in Hong Kong of communicating O&M information electronically and the use of CMMS stays embryonic. Nonetheless, good communication within the management team and the contractor team as well as between the two parties is important to the management performance of outsourced O&M service.

The costs for operating and maintaining air-conditioning installations in the commercial buildings have no apparent pattern over the age of buildings, but they generally increase with the extent of air-conditioned area and hence the plant capacity. The reliance on outsourced O&M increases from small to medium air-conditioning plants, while for larger plants the extent of outsourcing tends to revert to in-house provision.

The findings have uncovered some correlations between the practices and contract performance. Yet, more research is needed to verify the suggested causes and to investigate the full picture which is believed to be evolving dynamically.

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