Achieving Innovative Procurement for Construction Maintenance

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Abstract

In this study, the existing hotel maintenance procurement practices of Hong Kong would be revamped, with reference to the maintenance management decision making criterion, and considering the extent of outsourcing and deploying multi-skilling for current in-house work force. Under what criterion and level is in-house work, outsourcing, staff retraining or further training have been major concerns of the senior management, especially the one mastering financial control. There appear no definite rules and guides in governing this issue. However, mitigating cost with higher quality output in fulfilling customers' satisfaction are the critical actions in managing a hotel effectively, especially in a highly demanding and competitive business environment. Through a quantitative methodology with questionnaire data collection and statistical analysis, it is expected to formulate some inter-relationship among the crucial factors to form a basis of better procurement/outsourcing strategies, guidelines and practices for the industry.

Keywords

Competitiveness, financial control, multi-skilling, outsourcing, procurement.

Construction Maintenance Strategies

In today's business environment, the tolerable error margin is narrower and organizations can no longer afford such mistakes and remain competitive or get funded (Cokins, 1998). Appropriate maintenance strategy and program appears critical, especially facing global competition and stringent cost control to minimize expenditure under a "lean & mean" situation whilst sustaining required quality services. The strategy espoused by an organization may focus on cost leadership, differentiation, or other intents which form the basis of the competitive edge (Porter, 1980); whereas the key performance indicators for maintenance management identified by Hinks and McNay (1999) would be adopted.

Moreover, various support activities within Preventive Maintenance (PM), and maintenance jobs consume the resources of these activities differently. Such differentiation has to be captured in building up a PM job cost. The costing framework would also reveal inefficiencies in a maintenance system, and would require updating maintenance time standards, material requirements and planning activities. In hotels, the energy use is affected by weather conditions, number of guestroom and occupancy rate, number of food covers served, and the operating efficiency of plants and equipment (Lee et al., 2000). It is a "bottom-to-top" process with the front-line operator involvement (Campbell, 1995) in general maintenance to protect his own equipment, as autonomous activities, such as lubrication, cleaning, inspection and minor component replacement. Traditionally, through outsourcing, the organization can devote its scarce resources to developing its core competencies in a bid to sustain competitive advantages (Tsang, 2002). The client is demanding more for less with the removal of risk. The interpreted advantages of the outsourcing strategy identify that this is entirely feasible, with a host of other added benefits. The senior management of most companies cannot ignore an ever-changing business climate, indeed corporations globally are turning to more fluid organizational forms by aligning their business units with the company's core strengths (Drucker, 1988). Outsourcing of services enables a company's resources and capabilities to be improved by achieving better quality services and a better performance. The purpose of such a strategy is to improve productivity, increase revenues; lower operating costs, and reduce risks. However, outsourcing the services of an entire function might cost more to the company and might be harmful from a strategic perspective (Dubbs, 1992). While outsourcing is gaining popularity, the number of reported cases of failure is also increasing (Copeland, 2001; Crocker, 1999; James, 2000; Van der Werf, 2000). It should be careful to determine the decision making criteria upon each outsourcing.

It is suggested that hospitality enterprises should adopt the following strategies: (1) Pass on the increased costs to their consumers by raising the prices. (2) Reduce their total labor force by adopting labor saving devices and technologies. (3) Hire fewer but more qualified and productive employees. (4) Substitute full-time with part-time employees to eliminate expensive fringe benefits. (5) Reduce the fringe benefits of all full-time

employees. (6) Outsource some functions e.g. maintenance works. Facilities Management/Manager (FM) would normally resume the entire maintenance works of an hotel. Out-tasking is a common practice in the field of facilities management; its usage outnumbers that of outsourcing (Kleeman, 1994). When applied to asset maintenance, one has to be aware of the pros and cons of outsourcing (Dubbs, 1992; Embleton and Wright, 1998; Hubbard, 1993; Kleeman, 1994). Though FMs want outsourcers to perform well, there are substantial outsourced contractor failed to achieve the desired performance. FMs require professional negotiation, financial and interpersonal skills to implement outsourcing to vendors or service providers. Sourcing strategies for maintenance are usually: (1) in-sourcing, (2) out-tasking, (3) outsourcing for cost saving, and (4) outsourcing for capability. As each of these strategies possesses merits/demerits under various circumstances, a framework for selection and decision criteria should be established. For instance, at the "work transaction" stage, an out-task job order is triggered by a maintenance need when it is more economical to hire a contractor to deliver the service. Moreover, to enable a more complete understanding of outsourcing in the hotel industry, other variables worthy of consideration would include (1) the issue of trust (Zaheer and Venkatraman, 1995; Nooteboom et al., 1997; Seal and Vincent-Jones, 1997; Das and Teng, 1998, 2001), (2) strategy (Langfield-Smith, 1997; Williamson, 1999; Nickerson et al., 2001), (3) institutional environment (Roberts and Greenwood, 1997), and (4) social embeddedness (Granovetter and Swedberg, 2001).

Methodology

A questionnaire is designed to collect information from hotel operators primarily through the maintenance teams to project a better idea of current hotel maintenance strategies and practices. The questionnaire would cover the current maintenance practices regrading multi-skilling, in-house and outsourcing labour force; and also self-assessed questions to evaluate the respective hotel's strength and weakness in maintenance. A Likert five point numeric scale has been adopted to help analyse maintenance practices, with "1" for strongly disagree or insignificant and "5" for strongly agree or significant. With the data collected, statistical analysis will be conducted to further identify the critical factors in

establishing effective maintenance strategies.

Findings and Analysis

1. Maintenance decisions

In Table 1 below, the average scores indicate the extent of significance of some key factors concerned by the management prior to the development of maintenance strategy and program. According to the findings, health and safety, energy consumption and guest expectation are the main considerations for maintenance decision-making and they are equally significant with an average score ranging from 4.15 to 4.12. Health and safety have become a fundamental requirement for business success; both depend on good maintenance practices to avoid hazards in the buildings or workplaces. There are stringent regulations in the Hotel License imposed by the Hong Kong SAR Government in terms of Fire Regulations, Building Regulations, Environmental Regulations and Standard Requirements of Restaurant Licenses. As the hotel business is an international business where patrons are coming from all over the world, any consequences of mishap in health and safety will ruin a hotel's reputation worldwide.

Description (Variables in statistical analysis)		Response No. for each scale					Average Score
		1	2	3	4	5	
1.	Health and safety	0	7	12	39	42	4.15
2.	Energy consumption	0	7	12	42	39	4.12
3.	Guest expectation	0	10	10	39	41	4.12
4.	Degree of influence on business activities	0	12	17	34	37	3.95
5.	Environmental Impact	3	5	29	34	29	3.85
6.	Hotel policy, objectives and targets	5	3	27	34	31	3.85
7.	Maintenance resources	3	7	27	34	29	3.80
8.	Legal requirements	5	7	27	34	27	3.71
9.	Reliability of system	3	7	29	34	27	3.76
10.	Criticality of system	0	17	27	32	24	3.63
11.	System life cycle	2	15	27	32	24	3.61
12.	Annual budget	5	10	29	32	24	3.61
13.	Feedback from other department heads	7	12	29	32	20	3.44
14.	manufacturers recommendations	12	10	27	29	22	3.39
15.	Equipment history records	7	20	29	27	17	3.27

Table 1 Factors for Maintenance Decision

The statistical analysis of paired-samples all reveals that no significant difference exists between the two variables being considered (as P > .05) in the factors for maintenance decision, and therefore the null hypothesis is to be accepted. The paired-samples are listed in ascending order of significance levels, as tabulated below:

Paired-samples	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
VAR00014 - VAR00015	0.12	0.64008	0.06401	-0.007	0.247	1.875	99	0.064
VAR00001 - VAR00002	0.03	0.17145	0.01714	-0.00402	0.06402	1.75	99	0.083
VAR00005 - VAR00009	0.06	0.37118	0.03712	-0.01365	0.13365	1.616	99	0.109
VAR00010 - VAR00011	0.02	0.14071	0.01407	-0.00792	0.04792	1.421	99	0.158
VAR00006 - VAR00007	0.04	0.4	0.04	-0.03937	0.11937	1	99	0.32
VAR00005 - VAR00006	-0.02	0.24536	0.02454	-0.06868	0.02868	-0.815	99	0.417
VAR00011 - VAR00012	0.01	0.36223	0.03622	-0.06187	0.08187	0.276	99	0.783

Table 2 Paired-samples analysis - Factors for Maintenance Decision

VAR00014 - VAR00015 reflects that *manufacturer's recommendations* closely connect to *equipment history records* in maintenance decision making. VAR0001 - VAR0002 reflects that *health & safety* closely connect to *energy consumption* in maintenance decision making. VAR0005 - VAR0009 reflects that *environmental impact* closely connects to *reliability of system* in maintenance decision making. VAR00010 - VAR00011 reflects that *criticality of system* closely connect to *system life cycle* in maintenance decision making. VAR0006 - VAR0007 reflects that *hotel policies, objectives & targets* closely connect to *maintenance resources* in maintenance decision making. VAR0005 - VAR0006 reflects that *environmental impact* closely connects to *hotel policies, objectives & targets* in maintenance decision making. VAR00011 - VAR00012 reflects that *system life cycle* closely connect to *annual budget* in maintenance decision making.

2. **In-house or outsourcing maintenance**

Maintenance could be performed by in-house direct labour force or outsourced contractors, or a combined proportion of both, though there seems no general guideline of such proportion. The survey results of "Factors for considering in-house or outsourcing

maintenance" are reflected in Table 3 below.

Description (Variables in statistical analysis)		Response No. for each scale					Average Score
		1	2	3	4	5	
16.	Practical skills of in-house maintenance personnel	0	0	20	39	41	4.22
17.	Expertise from outsourcing	0	0	20	39	41	4.22
18.	Time constraints	0	5	12	42	41	4.20
19.	Legal requirements	0	5	15	41	39	4.15
20.	Availability of in-house labor force	0	5	29	32	34	3.95
21.	Transfer risk via outsourcing	0	5	29	32	34	3.95
22.	Use of special tools and testing instruments	0	5	29	32	34	3.95
23.	Degree of system complexity	0	5	29	34	32	3.88
24.	Financial constrains	0	7	29	32	32	3.88
25.	Technical support from manufacturers or suppliers	0	7	32	32	29	3.83
26.	Use of proprietary units or parts	3	7	31	32	27	3.73
27.	Historical information	5	22	27	27	19	3.34

Table 3 Factors for considering in-house or outsourcing maintenance

The major considerations are Practical skills of in-house maintenance personnel (4.22), Expertise from outsourcing (4.22), Time constraints (4.20), and Legal requirements (4.15). It seems apparent that Senior management has to strike a balance among these crucial factors to achieve the optimal benefits and/or sustainable competitive advantage for the hotel organization as a whole. For more expertised maintenance works where in-house staff could not perform, would have to be outsourced (e.g. maintenance for generator, chiller, boiler). For more immediate attention is required in certain maintenance, in-house staff would be prioritized (and/or trained to perform e.g. when downtime happens in food/beverage services/equipments). In some cases like licensing or renewal of license e.g. lift/escalator installations (relevant registered lift contractor & registered lift engineer should be employed to pursue the Form 11 certificate to be issued by EMSD in HKSAR), fire protection systems (relevant registered FSI contractor should be employed to do annual check up as required by FSD in HKSAR); there is no choice but to outsource (a hotel operator could not afford to keep such personnel just for these annual exercises). Moreover, Senior management has to carefully compare the actual time (including waiting time and operation time) rendered by an outsourced contractor with that of in-house staff. The degree of skillfulness possessed by a specialized contractor is often better (in terms of technical knowledge, skill, equipment, speed,

flexible manpower shuffling etc) than in-house staff, even the latter would be trained. The next tier of vital factors are Availability of in-house labor force (3.95), Transfer risk via outsourcing (3.95), Use of special tools and testing instruments, (3.95), Degree of system complexity (3.88), Financial constrains (3.88), and Technical support from manufacturers or suppliers (3.83); which are self-explanatory. The last tier of vital factors is Use of proprietary units or parts (3.73) and Historical information (3.34). The statistical analysis of paired-samples all reveals that no significant difference exists between the two variables being considered (as P > .05) in judging for in-house or outsourcing, and therefore the null hypothesis is to be accepted. The paired-samples are listed in ascending order of significance levels, as tabulated below:

	Paired Differences					t	df	Sig. (2-tailed)
Paired-samples	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
VAR00021 - VAR00023	0.02	0.14071	0.01407	-0.00792	0.04792	1.421	99	0.158
VAR00016 - VAR00018	0.01	0.30134	0.03013	-0.04979	0.06979	0.332	99	0.741

Table 4 Paired-samples analysis – Factors for considering in-house or outsourcing

VAR00021 - VAR00023 reflects that *transfer risk via outsourcing* closely connect to *degree of system complexity* in consideration for in-house or outsourcing. VAR00016 - VAR00018 reflects that *practical skills of in-house maintenance personnel* closely connect to *time constraints* in consideration for in-house or outsourcing.

3. Multi-skilling

Multi-skilling is a form of working arrangement to enhance engineering staff's competency through proper training. Multi-skilled training offers staff the ability to individually undertake a wider range of tasks, and increase the flexibility of allocating day-to-day maintenance duties. This would better escalate staff's ability, enhance the overall quality and reduce staffing costs ultimately. Mono-skilled staff/technicians are normally less capable of achieving multi tasks owing to inadequate knowledge/skill. To convert them to multi-skilled technicians would require both internal and external trainings. They are not eager to accept changes, as they have to pay more effort to learn, and subsequently increase their workload. As shown in Table 5, front-line maintenance technicians' dissatisfaction at doing more tasks (3.49), time constraint on providing

adequate internal training (3.46), and shortage of manpower to promote and monitor multi-skilling (3.29) are crucial factors to implement such scheme; while financial constraints on supporting the plan of multi-skilling (2.73) appears not very significant.

Description (Variables in statistical analysis)		Response No. for each scale					Average Score
		1	2	3	4	5	
27.	Front-line maintenance technicians' dissatisfaction at doing more tasks	5	20	22	29	24	3.49
28.	Time constraint on providing adequate internal training	10	10	27	31	22	3.46
29.	Shortage of manpower to promote and monitor multi-skilling	7	12	39	27	15	3.29
30.	Financial constraints on supporting the plan of multi-skilling	12	29	39	12	8	2.73

Table 5 Barriers to deployment of multi-skilling

The statistical analysis of paired-samples all reveals that no significant difference exists between the two variables being considered (as $P > .05$) in judging the barriers to deployment of multi-skilling for in-house staff, and therefore the null hypothesis is to be accepted. The paired-samples are tabulated in Table 6 below.

Paired-samples	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
VAR00028 - VAR00029	0.02	0.56818	0.05682	-0.09274	0.13274	0.352	99	0.726

Table 6 Paired-samples analysis – Barriers to deployment of multi-skilling

VAR00028 - VAR00029 reflects that frontline maintenance technicians' dissatisfaction at doing more tasks closely connect to time constraints on providing adequate internal training in judging the barriers to deployment of multi-skilling for in-house staff.

4. Maintenance decision vs. in-house or outsourcing

Senior management has to consider appropriate optimization of maintenance costs and resources allocation among in-house, in-house plus multi-skilling training, and outsourcing. More knowledge about maintenance cost distributions (routine, corrective, preventive, emergency) would enable hotel operators to optimize resources. Preventive Maintenance would be more emphasized than Corrective Maintenance, to project a better control and reduce system failures, and thus have a better control over maintenance expenditure. In some cases, hiring few more-qualified/productive/multi-skilled labour on part-time basis would help reduce maintenance costs and improve effectiveness and efficiencies; instead of purely relying upon long established in-house full-time employees.

Outsourcing some maintenance works that demand higher expertise, updated knowledge and advanced equipments could be considered. It is anticipated that further influence regarding incentive, momentum, and pressure may be imposed to in-house staff for improvement. The statistical analysis of paired-samples all reveals that no significant exists difference between the two variables being considered (as P > .05) in maintenance decision making and judging for in-house or outsourcing, and therefore the null hypothesis is to be accepted. The paired-samples are tabulated in Table 7 below.

	Paired Differences					t	df	Sig. (2-tailed)
Paired-samples	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
VAR00004 - VAR00024	0.07	0.40837	0.04084	-0.01103	0.15103	1.714	99	0.09
VAR00001 - VAR00017	-0.05	0.29729	0.02973	-0.10899	0.00899	-1.682	99	0.096
VAR00009 - VAR00026	0.02	0.14071	0.01407	-0.00792	0.04792	1.421	99	0.158
VAR00007 - VAR00025	-0.04	0.3739	0.03739	-0.11419	0.03419	-1.07	99	0.287
VAR00001 - VAR00019	0.02	0.24536	0.02454	-0.02868	0.06868	0.815	99	0.417
VAR00005 - VAR00025	-0.02	0.28356	0.02836	-0.07626	0.03626	-0.705	99	0.482
VAR00004 - VAR00020	0.01	0.38912	0.03891	-0.06721	0.08721	0.257	99	0.798
VAR00004 - VAR00022	0.01	0.38912	0.03891	-0.06721	0.08721	0.257	99	0.798

Table 7 Paired-samples analysis – Maintenance decision vs. in-house or outsourcing

VAR00004 - VAR00024 reflects that *degree of influence on business activities* in maintenance management decision making closely connects to *financial constraints* in considering in-house or outsourcing. VAR00001 - VAR00017 reflects that *health & safety* in maintenance management decision making closely connects to *expertise from outsourcing* in considering in-house or outsourcing. VAR00009 - VAR00026 reflects that *reliability of system* in maintenance management decision making closely connects to *historical information* in considering in-house or outsourcing. VAR00007 - VAR00025 reflects that *maintenance resources* in maintenance management decision making closely connects to *technical support from manufacturers/suppliers* in considering in-house or outsourcing. VAR00003 - VAR00019 reflects that *guest expectation* in maintenance management decision making closely connects to *legal requirements* in considering in-house or outsourcing. VAR00004 - VAR00023 reflects that *degree of influence on business activities* in maintenance management decision making closely connects to *degree of system complexity* in considering in-house or outsourcing. VAR00002 -

VAR00019 reflects that *energy consumption* in maintenance management decision making closely connects to *legal requirements* in considering in-house or outsourcing. VAR00004 - VAR00021 reflects that *degree of influence on business activities* in maintenance management decision making closely connects to *transfer risk via outsourcing* in considering in-house or outsourcing.

5. **Maintenance decision vs. multi-skilling**

The statistical analysis of paired-samples all reveals that no significant difference exists between the two variables being considered (as P > .05) in maintenance decision making and judging the barriers to deployment of multi-skilling for in-house staff, and therefore the null hypothesis is to be accepted. The paired-samples are tabulated in Table 8 below.

Paired-samples	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
VAR00014 - VAR00030	0.08	0.54458	0.05446	-0.02806	0.18806	1.469	99	0.145
VAR00013 - VAR00029	0.01	0.30134	0.03013	-0.04979	0.06979	0.332	99	0.741

Table 8 Paired-samples analysis – Maintenance decision vs. deployment of multi-skilling

VAR00014 - VAR00030 reflects that *manufacturers recommendations* in maintenance management decision making closely connects to *shortage of manpower to promote & monitor multi-skilling* in judging the barriers to deployment of multi-skilling for in-house staff. VAR00013 - VAR00029 reflects that *feedback from other department heads* in maintenance management decision making closely connects to *time constraints on providing adequate internal training* in judging the barriers to deployment of multi-skilling for in-house staff.

Conclusion

The success of a hotel relies principally on satisfying customers' wants and expectation through quality of services (such as hospitality, guestroom, food/beverage, leisure facilities if any) and also cost control; which subsequently hooks upon proper hotel management and maintenance. In this research, there are 7 significantly correlated paired-samples in maintenance decision, 2 in in-house or outsourcing, 1 in multi-skilling;

whilst 8 significantly correlated paired-samples in maintenance decision vs. in-house or outsourcing, and 2 in maintenance decision vs. multi-skilling. It is expected that these crucial factors would help aid better strategies for hotel maintenance decision, consideration of in-house or outsource and deploying multi-skilling for the hotel industry. Further research could be explored if more data are available from hotel operators, which seem to be commercially sensitive.

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