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Criticism of Correlated Issues in Managing Hotel Maintenance for Smarter Cities

CHAN K, HKSAR, CHINA

KEYWORDS

Smarter cities, skill transformation, financial control, competitive advantages, outsourcing strategies.

ABSTRACT

Through this research, the existing hotel maintenance practices of Hong Kong would be explored, covering the maintenance performances assessment, considerations for outsourcing, and attitude towards multi-skilling; with respect to the maintenance management decision making criterion, and considering the extent of outsourcing and deploying multi-skilling for current in-house work force. There seems a dilemma on the extent of outsourcing, direct staffing, and transformation to multi-skilling, or even in-sourcing. 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. The variables, interrelations, barriers, important factors in formulating outsourcing strategies and tactics will be examined; by means of quantitative approach, with primary and secondary data. Statistical analysis will be implemented to verify the correlations and reliability between the crucial factors identified; in order to further enhance better professional contractual and cost management. With these data and analysis, it's hoped to formulate some general outsourcing strategies, guidelines and practices to enhance better maintenance management in the hotel sector.

Criticism of Correlated Issues in Managing Maintenance for Smarter Cities

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BACKGROUND

Maintenance is the effort in connection with different technical and administrative actions to keep a physical asset in, or restore it to, a condition where it can perform a required function. 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 the required quality services. Senior Management have to manage effectively/efficiently these “infrastructure” like air-conditioning, mechanical ventilation, fire services, lift/escalators, plumbing/drainage, lighting, laundry and catering installations for hotels; to deliver quality services and mitigate any breakdowns. Moreover, the costing framework would also reveal inefficiencies in a maintenance system, and would identify the need for updating maintenance time standards, material requirements and planning activities.

Traditionally, organizations may be particularly impacted by a lack of resources. In such case, the best alternative is to acquire the needed resources from a contractor. The key driver for many outsourcing decisions is the reduction in the cost of labour, materials, and parts (Gonzalez, Llopis & Gasco, 2011). Better knowledge about major cost drivers would enable organizations to optimize the utilization of resources in their Planned Maintenance (PM) activities. The workforce is a focus on the product produced by individuals and teams rather than a focus on tasks. Alternatively, corrective maintenance is often dominated by unplanned events, i.e. functional failure, malfunction, or breakdown of equipment (Wang et al., 2011) which should be avoided.

Generally, 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. Outsourcing is a widely researched topic in strategic management, supply chain management, services, manufacturing and operations management (Weerakkody & Irani, 2012;

Perunovic, Christoffersen & Mefford, 2012; Cagliano et al., 2012). The purpose of such a strategy is to improve productivity, increase revenues; lower operating costs, and reduce risks. While outsourcing is gaining popularity, the number of reported cases of failure is also increasing (Zutshi et al., 2012; Booi, Chen, & Wilding, 2011; Lee, Yeung, & Hong, 2012).

Outsourcing allows an organization to expand its capabilities, performances and competitiveness without the need to expand its workforce (Su & Gargeya, 2012). It is stated that factors to be considered when organizations contemplate on outsourcing decisions include the relative costs of performing the function, how core is the function to the organization, the long-term strategy, and the environmental factors. There may be several of these contractual agreements operating in parallel for a range of functions from a diversity of external supply organizations.

The best benefits of outsourcing are in reducing the labour and operating cost, and gaining a competitive advantage. Proper tools can also reduce the time needed to accomplish a service. For the hotel industry, there is limited prior research concerned with maintenance outsourcing in the hotel sector. Thus, understanding hotels' motivation for outsourcing is important, as organisation is as important as technology, cost, and demand in determining success.

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 labour 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; and (6) outsource some functions e.g. maintenance works. Out-tasking is a common practice in facilities management (FM); whilst its usage outnumbers that of outsourcing.

There have been attempts to adopt strategies for sustaining competitive advantages, such as downsizing and laying off employees, partnering external agents with expertise to operate certain

functions through franchising, contracting out or easing arrangements (Espino-Rodriguez, Lai & Baum, 2012; Kim, 2011; Gonzalez, Llopis & Gasco, 2011). 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.

Further, a major challenge of outsourcing is managing the risk of service agents' opportunism, i.e. self-interest seeking with guile. Even when an outsourcing decision is driven by cost saving, the importance of monitoring opportunism should not be overlooked (Edwards, Crosling & Edwards, 2010). When cost efficiency is an issue, the sourcing decision can be guided by application of the transaction cost theory (Handley & Benton, 2012; Lai, Tian & Huo, 2012; Yang, Wacker & Sheu, 2012). It is quite sure that suppliers/services providers are tempting to deliver the minimum required to generate the maximum profit whilst aiming to safeguard contract retention.

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, (2) strategy, (3) institutional environment and (4) social embeddedness (Lee & Choi, 2011; Ndubisi, 2011).

METHODOLOGY

A questionnaire is designed and posted to collect feedback from the randomly selected 375 major hotel operators primarily through the in-house maintenance teams to project a better idea of current hotel maintenance strategies and practices. These questionnaires are to be answered and returned by a stamped envelope to the researcher within 3 weeks for conducting further analysis. If required, follow up telephone calls and/or interviews would be conducted, with the prior agreement of the respondents. The questionnaire will cover the current maintenance practices regarding 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 using students’ t test with paired sample analysis will be conducted to further identify the significance and correlation between the relevant critical factors, difficulties in launching multi-skilling, and decision making considerations for in-house or outsourcing; so as to establish effective maintenance strategies for the hotel industry in future.

FINDINGS & ANALYSIS

120 out of 375 questionnaires (32 % response rate) have been validly received for analysis, findings of which are categorized under the following headings:

1. FOR 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	

VAR00001 Health and safety	0	8	14	47	51	4.15
VAR00002 Energy consumption	0	8	14	51	47	4.12
VAR00003 Guest expectation	0	12	12	47	49	4.12
VAR00004 Degree of influence on business activities	0	14	20	41	45	3.95
VAR00005 Environmental Impact	4	6	35	40	35	3.85
VAR00006 Hotel policy, objectives and targets	6	4	32	41	37	3.85
VAR00007 Maintenance resources	4	8	32	41	35	3.80
VAR00008 Legal requirements	6	8	32	42	32	3.71
VAR00009 Reliability of system	4	8	35	41	32	3.76
VAR00010 Criticality of system	0	20	32	39	29	3.63
VAR00011 System life cycle	3	18	32	38	29	3.61
VAR00012 Annual budget	6	12	35	38	29	3.61
VAR00013 Feedback from other department heads	8	14	35	39	24	3.44
VAR00014 Manufacturers recommendations	14	12	32	35	26	3.39
VAR00015 Equipment history records	8	24	36	32	20	3.27

Table 1 Factors for Maintenance Decision

Pursuant to the statistical analysis, there are no significant differences between each group of the two variables (as $P > .05$, i.e. the respective paired-samples are correlated and complimentary) in maintenance decision; and therefore the null hypothesis is to be accepted. Leaving either one factor alone in maintenance decision is unwise. 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			

VAR00001- <i>health & safety, and</i> VAR00002- <i>energy consumption</i>	0.03	0.17145	0.01714	-0.00402	0.06402	1.75	119	0.083
VAR00010 - <i>criticality of system, and</i> VAR00011- <i>system life cycle</i>	0.02	0.14071	0.01407	-0.00792	0.04792	1.421	119	0.158
VAR00005 - <i>environmental impact, and</i> VAR00006- <i>hotel policies, objectives & targets</i>	-0.02	0.24536	0.02454	-0.06868	0.02868	-0.815	119	0.417
VAR00008 - <i>legal requirements, and</i> VAR00010- <i>criticality of system</i>	0.08	0.41875	0.04188	-0.00309	0.16309	1.91	119	0.059
VAR00013 - <i>equipment history records, and</i> VAR00014- <i>manufacturer's recommendations</i>	0.07	0.40837	0.04084	-0.01103	0.15103	1.714	119	0.09
VAR00010- <i>criticality of system, and</i> VAR00012- <i>annual budget</i>	0.03	0.26419	0.02642	-0.02242	0.08242	1.136	119	0.259
VAR00005 - <i>environmental impact, and</i> VAR00007- <i>maintenance resources</i>	0.02	0.31718	0.03172	-0.04294	0.08294	0.631	119	0.53

Table 2 Paired-samples analysis - Factors for Maintenance Decision

- VAR0001 - VAR0002 reflects that *health & safety* closely connect to *energy consumption* in maintenance decision making.
- VAR00010 - VAR00011 reflects that *criticality of system* closely connects to *system life cycle* in maintenance decision making.
- VAR00005 - VAR00006 reflects that *environmental impact* closely connects to *hotel policies, objectives & targets* in maintenance decision making.

- VAR00008 - VAR00010 reflects that *legal requirements* closely connect to *criticality of system* in maintenance decision making.
- VAR00013 - VAR00014 reflects that *equipment history records* closely connect to *manufacturer's recommendations* in maintenance decision making.
- VAR00010 - VAR00012 reflects that *criticality of system* closely connect to *annual budget* in maintenance decision making.
- VAR00005 - VAR00007 reflects that *environmental impact* closely connects to *maintenance resources* in maintenance decision making.

2. FOR IN-HOUSE OR OUTSOURCING MAINTENANCE

Maintenance could be performed by in-house direct labour force or outsourced contractors, or a fair combination 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	
VAR00016 Practical skills of in-house maintenance personnel	0	0	24	47	49	4.22
VAR00017 Expertise from outsourcing	0	0	24	47	49	4.22
VAR00018 Time constraints	0	6	14	51	49	4.20
VAR00019 Legal requirements	0	6	18	49	47	4.15
VAR00020 Availability of in-house labor force	0	6	35	38	41	3.95
VAR00021 Transfer risk via outsourcing	0	6	35	38	41	3.95
VAR00022 Use of special tools and testing instruments	0	6	35	38	41	3.95
VAR00023 Degree of system complexity	0	6	35	41	38	3.88
VAR00024 Financial constrains	0	8	35	39	38	3.88
VAR00025 Technical support from manufacturers or suppliers	0	8	39	38	35	3.83

VAR00026 Use of proprietary units or parts	4	8	37	39	32	3.73
VAR00027 Historical information	6	26	33	32	23	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).

Pursuant to the statistical analysis, there are no significant differences between each group of the two variables (as $P > .05$, i.e. the respective paired-samples are correlated and complimentary) in considering in-house or outsourcing maintenance; and therefore the null hypothesis is to be accepted. Leaving either one factor alone in considering in-house or outsourcing maintenance is unwise. 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				
VAR00021 - <i>transfer risk via outsourcing, and VAR00023- degree of system complexity</i>	0.02	0.14071	0.01407	-0.00792	0.04792	1.421	119	0.158
VAR00022 - <i>use of special tools & testing instruments closely, and VAR00023- degree of system complexity</i>	0.02	0.14071	0.01407	-0.00792	0.04792	1.421	119	0.158

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.
- VAR00022 - VAR00023 reflects that *use of special tools & testing instruments closely* connect to *degree of system complexity* in consideration for in-house or outsourcing.

3. FOR 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 below, 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	
VAR00028 Front-line maintenance technicians' dissatisfaction at doing more tasks	6	24	26	35	29	3.49
VAR00029 Time constraint on providing adequate internal training	12	12	32	38	26	3.46
VAR00030 Shortage of manpower to promote and monitor multi-skilling	8	14	48	32	18	3.29
VAR00031 Financial constraints on supporting the plan of multi-skilling	14	35	47	14	10	2.73

Table 5 Barriers to deployment of multi-skilling

Pursuant to the statistical analysis, there are no significant differences between each group of the two variables (as $P > .05$, i.e. the respective paired-samples are correlated and complimentary) in judging the barriers to deployment of multi-skilling for in-house staff, and therefore the null hypothesis is to be accepted. Leaving either one factor alone in judging the barriers to deployment of multi-skilling for in-house staff is unwise.

Paired-samples	Paired Differences				t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			

VAR00028 - <i>frontline maintenance technicians' dissatisfaction at doing more tasks, and</i>								
VAR00029- <i>time constraints on providing adequate internal training</i>	0.02	0.56818	0.05682	-0.09274	0.13274	0.352	119	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. FOR 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/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.

Pursuant to the statistical analysis, there are no significant differences between each group of the two variables (as $P > .05$, i.e. the respective paired-samples are correlated and complimentary) in

maintenance decision making and judging for in-house or outsourcing, and therefore the null hypothesis is to be accepted. Leaving either one factor alone in maintenance decision making and judging for in-house or outsourcing is unwise. 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				
VAR00004 - <i>degree of influence on business activities, and</i> VAR00024- <i>financial constraints</i>	0.07	0.40837	0.04084	-0.01103	0.15103	1.714	119	0.09
VAR00009 - <i>reliability of system, and</i> VAR00026- <i>historical information</i>	0.02	0.14071	0.01407	-0.00792	0.04792	1.421	119	0.158
VAR00001 - <i>health & safety, and</i> VAR00019- <i>legal requirements</i>	0.02	0.24536	0.02454	-0.02868	0.06868	0.815	119	0.417
VAR00001 - <i>health & safety, and</i> VAR00016- <i>practical skills of in-house maintenance personnel</i>	-0.05	0.29729	0.02973	-0.10899	0.00899	-1.682	119	0.096
VAR00003 - <i>guest expectation, and</i> VAR00019- <i>legal requirements</i>	-0.03	0.26419	0.02642	-0.08242	0.02242	-1.136	119	0.259

VAR00004 - <i>degree of influence on business activities, and</i> VAR00023- <i>Degree of system complexity</i>	0.03	0.41329	0.04133	-0.05201	0.11201	0.726	119	0.47
VAR00004 - <i>degree of influence on business activities, and</i> VAR00021- <i>Transfer risk via outsourcing</i>	0.01	0.38912	0.03891	-0.06721	0.08721	0.257	119	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.
- VAR00009 - VAR00026 reflects that *reliability of system* in maintenance management decision making closely connects to *historical information* 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.
- VAR00001 - VAR00016 reflects that *health & safety* in maintenance decision making closely connects to *practical skills of in-house maintenance personnel* in considering in-house or outsourcing.
- VAR00001 - VAR00019 reflects that *health & safety* in maintenance 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 decision making closely connects to *Transfer risk via outsourcing* 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.

5. For maintenance decision vs. multi-skilling

Pursuant to the statistical analysis, there are no significant differences between each group of the two variables (as $P > .05$, i.e. the respective paired-samples are correlated and complimentary) 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. Leaving either one factor alone in maintenance decision making and judging the barriers to deployment of multi-skilling for in-house staff is unwise. 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				
VAR00013 - <i>feedback from other department heads, and</i> VAR00029- <i>time constraints on providing adequate internal training</i>	0.01	0.30134	0.03013	-0.04979	0.06979	0.332	119	0.741
VAR00014 - <i>manufacturers recommendations, and</i> VAR00029- <i>time constraints on providing adequate internal training</i>	-0.06	0.31205	0.0312	-0.12192	0.00192	-1.923	119	0.057
VAR00013 - <i>feedback from other department heads, and</i> VAR00028- <i>frontline maintenance technicians' dissatisfaction at doing more tasks</i>	-0.01	0.57726	0.05773	-0.12454	0.10454	-0.173	119	0.863

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

- 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.
- VAR00014 - VAR00029 reflects that *manufacturers recommendations* in maintenance 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.
- VAR00013 - VAR00028 reflects that *feedback from other department heads* in maintenance decision making closely connects to *frontline maintenance technicians' dissatisfaction at doing more tasks* in judging the barriers to deployment of multi-skilling for in-house staff.

CONCLUSION

Being an international smart city like Hong Kong, modernized management techniques and advanced facilities have been adopted in upkeeping the Hotel Industry to promote for a smarter city. Not only to escalate its Gross Domestic Product (GDP), but also to attract more tourists coming, to enjoy also the better managed Hotel Facilities. Contemporary outsourcing affects significantly in each business sector, whether it is public, private, profitable or non-profitable organization. Using various hotel data, outsourcing strategies do apply in managing secondary or supplementary services to mitigate expenditures, release capital resources, upgrade service quality whilst concentrate in organizations' primary activities for contributing towards a successful smarter city. 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 3 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. It establishes the importance of these correlated factors that influencing outsourcing decisions. Leaving either one factor alone among each paired-sample in such processes is unwise. This empirical research provides practical values and insights for hotel operators in smarter cities upon outsourcing some or all maintenance services, in particular hard services. For future studies, it may extend to cover survey from also outsourced contractors to strengthen the research if resources permitted.

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