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OUTSOURCING OF MAINTENANCE SERVICES

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ABSTRACT

The objective of this paper is to present an assessment of the outsourcing practices of maintenance services at Saudi Arabian universities. The findings of the study would provide practical value for facilities maintenance managers in institutions of higher education endeavoring on the processing of outsourcing maintenance services in their campuses.

Key words: Outsourcing; Maintenance; Universities; Saudi Arabia.

Introduction

Facilities can be considered as assets or property investments needing to be maintained regularly to ensure their optimal value over their life cycle (1). Facilities' performance starts to decline immediately after they come into use and at that time the need for maintenance begins (2). According to British Standard 3811 (3), building maintenance is defined as ''a combination of all technical and associated administrative actions carried out to retain an item in, or restore it to, an acceptable condition.'' Maintenance of facilities includes cleaning, inspecting, repairing and

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replacing the components (2). Facilities will continue to be occupied and operate well only if they are properly maintained. Therefore, effective maintenance is necessary to keep up the appearance and efficiency of the facility, to operate all systems and components efficiently, and to keep the interior and exterior clean and safe. In many instances, owners and users of buildings spend billions of dollars each year on replacement components for their buildings (2).

Saudi Arabia's economy is now one of the 20 largest in the world (4). Therefore, the Kingdom has seen tremendous development over the recent years. The government has effectively used its income to improve the citizen's life style; by building universities, hospitals, airports, electricity and telephone networks to meet the rapid urban development. These facilities need to be maintained effectively to ensure that they optimally serve the main purpose (5).

The objective of this paper is to present an assessment of the outsourcing practices of maintenance services at Saudi Arabian universities. The findings of the study would provide practical value for facilities maintenance managers in institutions of higher education endeavoring on the processing of outsourcing maintenance services in their campuses.

Review of Literature on Building Maintenance

Maintenance is the performing of all actions to restore items, components or equipment in specified operational conditions. Maintenance is a key factor in extending the economic life for buildings, and so the main causes of maintenance improvement are emotions and economics (6). For achieving world-class performance, organizations have to undertake efforts to get better quality and reduce costs, for instance by inspecting the activities of the maintenance services that are crucial for many operations (7).

Objectives of Building Maintenance

The primary objective of maintenance is to preserve the asset to ensure that it serves its anticipated purpose (2). Other objectives of maintenance (8,9) include improving quality rate and effective control for process; improving the work environment; ensuring the safety of occupants using facilities; extending the useful life of items and components; higher product and machinery reliability; ensuring readiness of equipment and tools needed for emergency use; operating the facility utilities in the most economical way; and ensuring that the condition of the building meets all statutory requirements.

Maintenance Types and Methods

The maintenance process is performed as follows: When a problem is detected, it is necessary to determine its cause, so that it can be quickly corrected or reinstalled (6). There are many methods and types of maintenance. The following represents most of them (10):

- Run-to-failure: This method is suitable for minor corrective work, low price equipment and components.
- Corrective maintenance: This is done after a failure, to restore an item to a state in which it can perform its required function.
- Scheduled maintenance: Periodic inspection of facilities and replacement of components (11).
- Planned maintenance: This is carried out with foresight, control and the use of records to a predetermined plan.
- Preventive maintenance: This keeps a facility operating efficiently through regular inspection, and it aims to tackle small problems before they become expensive.
- Condition-based maintenance: If maintenance is based on expected failure of the component, it includes scheduled and corrective maintenance.
- Predictive condition monitoring: This is performed by the application of multiple technologies to monitor the condition of items.
- Reliability-centered maintenance: This method is used to determine the maintenance requirements of any asset in its operating context (12), and to improve the asset promptly instead of rectifying it in the future (8).
- Total productive maintenance: This includes many methods to improve reliability, quality, and production (8). By combining with the effort of operators for safety, and quality.
- Operating and maintenance training and administration: This considers the four integral parts of the maintenance system.
- Proactive maintenance: This reduces the total maintenance required through advanced performance including preventive/ predictive maintenance.
- Maintenance management metric: This allocates the value-added resources for improving component's overall effectiveness, and optimizing the cost per unit of production.
- Total quality maintenance: Total quality maintenance is a method for monitoring and controlling deviations in a service's quality by detecting and preventing the causes of failure. By this a strategy, the user maintains the technical and economic effectiveness of the process elements (8).

Selection of Maintenance Contractors

The selection of maintenance contractors depends on their ability. The general criteria governing the selection of contractor (13,14) include reputation; geographical position; perceived quality of services; contractor resources; workload and availability; technical excellence; and low price.

Contracts of Maintenance Services

Maintenance contracts can be classified into three types (15). A description of each is provided as follows:

- Performance contracts: This applies where the complete maintenance services are awarded to a contractor.
- Facilitator contracts: The client is only the user of the physical assets, whereas they are owned and maintained by the contractors.
- Work-package contracts: Design and planning of the maintenance are performed by the client, who informs the contractors about the time that is needed to do maintenance services.

Moreover, maintenance can be organized by a variety of contracts (13). These contracts are as follows:

- Fixed price contracts: The price is agreed and fixed before the contract is signed.
- Lump sum contracts: The contractor receives a set amount as payment for delivering works to the owner. The contract price includes the contractor's reimbursement and his profit.
- Term contracts: The contractor must carry out certain types of work within certain limits of cost for an agreed period. The work is usually priced on either a measured term or day-work term.
- Cost plus contract: three types exist in this category (16). These include cost plus fixed contracts, where the contractor is reimbursed for actual allowable costs, and he receives a fixed percentage of the contract value as his fee or profit; cost plus fluctuating free contracts, where the contractor is paid the actual cost of the work plus a fee; and cost plus percentage contracts, where the contractor is paid the actual cost of the work, plus an agreed percentage of the actual cost.

Review of Literature on Outsourcing

Outsourcing is a process of transferring some activities to outside contractors in order to gain various benefits such as better services and lower costs (17). It is defined as the process by which a client employs a separate company, under a contract, to

execute a function previously done in-house (18). Outsourcing has become an important organization approach, and many advantages are gained, such as performing a service more effectively and efficiently. Outsourcing is related to the process called "contracting-out" and these two terms are sometimes used interchangeably (15). However, contracting-out is usually arranged before the organization does that specific task. The organization determines a service and gets a contractor to perform it. Therefore, the responsibility is left to the service provider. This is what differentiates outsourcing from "contracting-out" (19).

All the organization's activities are classified into four types: core activities, core-close activities, core-distinct activities, and disposable activities (20,21). Outsourcing may include all activities required for an organization's existence, except its core activities. Many of the arguments over whether or not a function should be outsourced are based on the core versus non-core organization analysis (22).

Organization Readiness for Outsourcing

Outsourcing can be considered as an effective opportunity to save cost and to improve service quality. However, the decision on outsourcing should be carefully studied by identifying the circumstances and assessing organization's readiness for outsourcing. This readiness can be assessed by establishing that there are issues which outsourcing can resolve and by attempting to measure all the associated costs. Readiness depends also on the capability of the market and on the cost-effectiveness of outsourcing as a means to accomplish the objectives of organization (23,24).

What Caused Outsourcing

In today's markets, the competition amongst organizations is extremely high. This competition enables the customers to insist on reliable services, and high quality products. To achieve this result, the organizations are driven to outsource their non-core functions so as to focus on their core functions. However, the distinction between core and non-core functions needs more attention. If an organization succeeds in disaggregating these activities, the non-core functions should be outsourced (18).

Reasons for Outsourcing

Outsourcing can provide specialized expertise which organizations cannot justify developing in-house. Outsourcing is not only for cost-saving, but is also an integral part of the overall strategy to concentrate on core functions. Organizations which outsource some activities have many reasons for doing so (22). By outsourcing, a higher level of expertise can be obtained at a lower cost. Outside experts can not only help in re-engineering processes to make them more efficient, but they can also apply the most useful new technology and ultimately raise flexibility and productivity to reduce the overall costs. Outsourcing allows organizations to redirect their resources

from non-core to primary activities, thus maximizing performance (25). The survey by the Plant Maintenance Resource Center (26) reports several reasons for outsourcing, including: increasing labor productivity; reducing maintenance costs; focusing in-house personnel on "core" activities; improving work quality; reducing influence of trade unions; improving environmental performance; keeping pace with rapidly changing technology; obtaining specialist skills not available . in-house; increasing access to specialist equipment; improving equipment uptime/performance; and reducing risk.

Advantages of Outsourcing

An organization should benefit from outsourcing when the task is precisely specified, performance is accurately evaluated, and there is competition from bidders (22). The benefits that may be gained through outsourcing include:

- Reducing the overall operation cost: The cost is the main drive to outsource a service delivers it at an acceptable rate (27).
- Improving the quality of services: Outsourcing is a method to improve and sustain the quality of services (23,28).
- Gaining expertise and knowledge: Outsourcing should provide knowledge and expertise in complex services, so that the in-house staff can upgrade their skills and knowledge. (23).
- Solving the problem of skill shortage: The contractor has specialized manpower to supplement the skills available in the organization (25).
- Focusing on core activities: Organizations need to focus on their core activities. If the core and non-core activities are well identified, outsourcing the non-core activities will help achieve this focus (25).
- Reducing and/or sharing risks: Facilities management becomes complex especially in a hazardous environment and interruptions dissatisfy the customer. Therefore, an organization uses outsourcing to spread or reduce these risks.

Disadvantages of Outsourcing

Outsourcing can produce many advantages, or it can bring problems. The following are some of the disadvantages:

- Monitoring costs: The organization might incur costs to make sure that an outsourced function is delivered at the required quality level and at the right time (29).
- Transaction costs: To find a suitable contractor, the investment involves the cost of transferring of assets to the contractor and then the on-going provision of services (17,21).

- Motivation is reduced: If outsourcing involves transferring people to the contractor, the organization cannot motivate them (14).
- The loss of control: Once a function is transferred to the contractor, the flexibility of control will be limited to the contract (30).
- Loss of collective knowledge: The knowledge about a facility and the function is no longer kept in an organization. If the organization wants any information then it has to go back to the contractor (27).
- Loss of in-house skills/expertise: When the management of function is totally transferred to the contractor, the internal employees lose their expertise (23).
- Security risks/threats to confidentiality: Introducing contractors to the site means secrets are becoming known by others, and thus risks are raised (17,31).

Outsourcing of Maintenance Services in Saudi Arabian Universities

This section presents the results obtained from a questionnaire survey conducted to identify the frequency of outsourcing building maintenance services in Saudi Arabian Universities to specialty contractors. Responses to the questionnaire survey were obtained from the maintenance department managers of 11 public universities in Saudi Arabia. These universities are Umm Al-Qura University; King Abdul Aziz University; King Fahd University of Petroleum and Minerals; King Faisal University; King Saud University; King Khalid University; Imam Muhammad bin Saud Islamic University; Taif University; Qasim University; Najran University; and Islamic University of Medina.

Design of Questionnaire Survey

The questionnaire survey included fourteen building systems or services that require maintenance activities during their service life as identified by the authors. These include heating, ventilation and air conditioning systems; fire protection systems; elevator systems; plumbing and sanitary systems; electrical systems; painting; major construction and renovation works; minor construction; carpentry; steel work; telecommunication systems; electrical appliances; housekeeping and waste disposal; and landscaping services. The frequency terms used, along with their corresponding scale weight, were "Always", with 4 points, "Often" with 3 points, "Sometimes" with 2 points, "Seldom" with one point, and "Never" with zero point.

Data Analysis and Discussion of Results

The mean frequency and for outsourcing the maintenance of each building system or service was calculated as follows:

- Step 1: The number of responses for each frequency term was multiplied by the corresponding weight of that frequency term.
- Step 2: The sum of the products of multiplication from Step 1 was divided by the number of persons responding to the questionnaire survey.

The frequency index for outsourcing the maintenance of each building system or service was then obtained through dividing the obtained mean frequency for that building system or service by the value of the highest scale weight for the frequency terms used, which is 4. The product was then multiplied by 100%.

To be able to obtain the frequency rates for outsourcing the maintenance of each of the listed building systems or services, the following calibration was adopted (Always: 75-100; Often: 50-75; Sometimes: 25-50; Seldom: 0-25 and Never: 0).

Table 1 : Mean frequencies, frequency indexes and frequency rates for the building systems or services that require maintenance activities

No.	Typical Maintenance Activities	Frequency Terms					Mean Frequency	Frequency index	Frequency Rate
		Always	Often	Sometimes	Seldom	Never			
1.	HVAC Systems	8	1	1	1	0	3.45	86.25	Always
2.	Fire Protection Systems	9	0	1	1	0	3.54	88.50	Always
3.	Elevator Systems	8	2	0	1	0	3.54	88.50	Always
4.	Plumbing and Sanitary Systems	6	3	0	2	0	3.20	80.00	Always
5.	Electrical Systems	7	2	0	1	1	3.30	82.50	Always
6.	Painting	6	1	3	1	0	3.10	77.50	Always
7.	Major Construction & Renovation Works	7	1	1	2	0	3.20	80.00	Always
8.	Minor Construction	4	0	1	2	4	1.80	45.00	Sometimes
9.	Carpentry	3	2	4	2	1	2.54	63.50	Often
10.	Steel work	5	2	2	1	2	2.82	70.50	Often
11.	Telecommunication Systems	4	5	1	1	0	3.1	77.50	Always
12.	Electrical Appliances	5	4	1	1	0	3.2	80.00	Always
13.	Housekeeping and Waste Disposal	7	2	0	2	0	3.27	81.70	Always
14.	Landscaping Services	6	1	1	3	0	2.91	72.50	Often

Table 1 shows a listing of all the identified fourteen building systems or services that require maintenance activities during their service life, along with their obtained mean frequencies, frequency indexes and frequency rates. The results of the survey indicate that Saudi Arabian universities are always outsourcing the maintenance activities of

the following building systems or services: HVAC systems; fire protection systems; elevator systems; plumbing and sanitary systems; electrical systems; painting; major construction and renovation works; telecommunication systems; electrical Appliances; and housekeeping and waste disposal. The results of the survey indicate also that universities are often outsourcing the maintenance activities of the following building systems or services: carpentry; steel work; and landscaping services. The results indicate that universities are sometimes outsourcing minor construction works to specialty contractors.

Conclusion

This paper presents an assessment of the outsourcing practices of maintenance services at Saudi Arabian universities. The authors have adopted the use of the statistical analyses method, as tool for identifying the frequency of the maintenance services. The results of this survey show that Saudi Arabian universities generally prefer to outsource their maintenance services to the contractors excluded KFUPM. The findings of the study would provide practical value for facilities maintenance managers in institutions of higher education endeavoring on the processing of outsourcing maintenance services in their campuses.

References

1. Hassanain, M.A., Froese, T.M., and Vanier, D.J., (2003) *Framework Model for Asset Maintenance Management*, Journal of Performance Constructed Facilities, Vol. 17, No. 1, pp. 51-64.
2. Arditi, D., and Nawakorawit, M., (1999) *Issues in Building Maintenance: Property Managers Perspective*, Journal of Architectural Engineering, Vol. 5, No. 4, pp. 117-132.
3. Glossary of Maintenance Management Terms in Tetro-technology, (1984), *British Standard 3811*, British Standards Institute, London.
4. Ministry of Planning, K.S.A. (1970-1995), First, Second, Third, Fourth & Fifth Development Plans.
5. Al-Sultan, K., (1996), *Maintenance in Saudi Arabia: Needs and Recommendations for Improvement*, Journal of Quality in Maintenance Engineering, Vol. 2, No. 4, pp. 5-16.
6. Patton, J., (1988) *Maintainability and Maintenance Management*, Instrument Society of America, North Carolina, U.S.A.
7. Swanson, L., (2001) *Linking Maintenance Strategies to Performance*, International Journal of Production Economics, Vol. 70, No. 3, pp. 237-244.

8. Al-Najjar, B., (1996) *Total Quality Maintenance: An Approach for Continuous Reduction in Costs of Quality Products*, Journal of Quality in Maintenance Engineering, Vol. 2, No. 3, pp. 4-20.
9. Magee, G.H., (1988) *Facilities Maintenance Management*, R. S. Means Company, Kingston, Mass, USA.
10. Mostafa, S.I., (2004) *Implementation of Proactive Maintenance in the Egyptian Glass Company*, Journal of Quality in Maintenance Engineering, Vol. 10, No. 2, pp. 107-122.
11. Kececioglu, D., (1994) *Maintainability, Availability and Operational Readiness: Engineering Handbook*, Prentice-Hall, Upper Saddle River, NJ, p. 335.
12. Moubray, J., (1993) *RCM Reliability-Centered Maintenance*, Butterworth-Heinemann Ltd, Oxford, UK.
13. Chanter, B., and Swallow, P., (1996) *Building Maintenance Management*, 2nd Ed., UK.
14. Bertolini, M., Bevilacqua, M., and Braglia, M., (2004) *An Analytical Method for Maintenance Outsourcing Service Selection*, International Journal of Quality & Reliability Management, Vol. 21, No. 7, pp. 772-788.
15. Martin. H.H., (1997) *Contracting Out Maintenance and a Plan for Future Research*, Journal of Quality in Maintenance Engineering, Vol. 3, No. 2, pp. 81-90.
16. Mahmoud, T., (1994) *Assessment of the Problems Facing the Maintenance Industry in Saudi Arabia*, M.S Thesis, Architectural Engineering Department, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.
17. Graham, R., (1996) *Outsourcing the Major Legal Issues*, Information Security Technical Report, Vol. 1, No. 3, pp. 51-56.
18. Barrett, P., and Baldry, D. (2003), *Facilities Management: Towards Best Practice*, Blackwell Science Ltd, UK.
19. Klammat, F.J., (2001) *Guide to FM Outsourcing*, e-book, available at: http://www.aptek.net/Book/intro/preview.pdf
20. Arnold, U., (2000) *New Dimensions of Outsourcing: a Combination of Transaction Cost Economics and the Core Competencies Concept*, European Journal of Purchasing & Supply Management, Vol. 6, No. 1, pp. 23-29.
21. Lindskog, H., (2005) *SOTIP as A Model for Outsourcing of Telecom Services for the Public Sector*, Proceedings of the 38th Hawaii International Conference on System Sciences, Vol. 08, P. 261.
22. Beitz, D., (1998) *Successful Outsourcing – How to Achieve Advantages for your Organization*, Facility Management Association Of Australia, Measuring and Managing Contractor Performance 26-27 November.

23. Campbell, J. D., (1995) *Outsourcing in Maintenance Management: A Valid Alternative to Self-Provision*, Journal Quality in Maintenance Engineering, Vol. 1, No. 3, pp. 18-24.

24. McIvor, R.T., Humphreys, P.K., and Aleer, W.E., (1997) *Strategic Models for the Formulation of an Effective Make or Buy Decision*, Management Decision, Vol. 35, Issue 2, pp.169-178.

25. Quinn, J.B., (1999) *Strategic Outsourcing: Leveraging Knowledge Capabilities*, Sloan Management Review, Vol. 40, No. 4, pp. 9-21.

26. Plant Maintenance Resource Center, (2001), *Maintenance Outsourcing Survey Results*, available at: www.plant-maintenance.com/maintenance_articles_outsources.html

27. Jennings, D., (2002) "Strategic Sourcing: Benefits, Problems and a Contextual Model." Management Decision, Vol. 40, No. 1, pp. 26-34.

28. Kremic, T., Tukel, O.I. and Rom, W.O., (2006) *Outsourcing Decision Support: A Survey of Benefits, Risks, and Decision Factors*, Supply Chain Management: An International Journal, Vol. 11, No. 6, pp. 467-482.

29. Yik, F.W. and Lai, J.H., (2005) *The Trend of Outsourcing for Building Services Operation and Maintenance in Hong Kong*, Facilities, Vol. 23, No. 1/2, pp. 63-72.

30. Lau, K.H. and Zhang, J., (2006) *Drivers and Obstacles of Outsourcing Practices in China*, International Journal of Physical Distribution & Logistics Management, Vol. 36, No. 10, pp. 776-792.

31. Alexander, K., (1996) *Facilities Management: Theory and Practice*, E & FN SPON, UK.