

Study of Effectiveness of Outsourcing in Different Functional Areas of Hospital by Using Cramer's V Co-efficient

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Abstract

In this era of global cut-throat competition, organizations explore new managerial approach to edge over their competitors by resorting to different innovative strategies like outsourcing, which is being increasingly approached because of its appealing character. Given the role of providing a broad range but complex range services, many of which are brought from a host of organizations, health care are the most fertile ground for outsourcing. Over last few decades outsourcing has ingrained into vast functions of health care starting with allied then to non-core and now even to near core activates. The days are not far, when even the core activities of health care will be open for outsourcing in line with the concept of virtual company in other service sector. In this study an attempt has been made to find out the effectiveness of outsourcing in different activates of hospital sector.

Keywords: Effectiveness, Services, Health Care, Outsourcing.

Introduction

Outsourcing is growing in leaps and bound and is expected to reached a staggering figure of US \$ 1.8 trillion by next two years (<https://www.nurseregistray.com/blog/outsourcing-in-health-care>) in health care sector, with accounts receivable registering most highest rate of growth of around 250 percent as far as the clients of outsourcing projects are concerned, and about 150 percent gain in business (www.nurseregistary.com). This growth trends will continue to climb in future due to the increase in pressure of affordable cost, which is being most talked about in different countries all over the world. The patient protection and affordable act of US which calls for increasing requirement of up-keeping of hospital facilities with state-of-art technology (Raths, 2007), with mounting emphasis on quality and performance improvement. So much so, hospitals are constantly being cautioned to outsource the functions, which are still kept in-house. A host of business processes, starting from architectural design, construction of health care canters building and facilities therein, research, customer services, billing, insurance, claim collection, management support to contracting of housekeeping staff, catering, facilities maintenance, hospital management information system (non-clinical services) clinical services like lab and diagnostics, access to modern medical equipment and devices, advance medical services like medical imaging (Mack, et al., 2004; Magnezi et al, 2004), specialized clinical services of routine or established procedure like removal of cataract, management of emergency department, anaesthesia services of hospitals to leasing of hospitals (Vahit, Y et al, 2007), are outsourced, in order to achieve a higher degree of efficiency and expertise than they would have, if they relied on in-house staff. The outsourcing practice has been in use, irrespective of the size, location, form (public, private, clinics), however the incidence is higher in case of private sector than in public sector.

Literature Review

Constrained by limitation of resources with rise in cost and demanding patients, have forced the hospitals authorities to scout for 'opportunity of cost saving' for broad and complex array of activities, through the appealing choice of outsourcing (Vahit, Y et al, 2007). The activities of health care canters that are open to outsourcing can range from: hospital cleaning to leasing of different medical devices and equipment along with the specialized physician services like: intubation endoscope to arthroscopic equipment. According to Taylor and Blair, (2002), the outsourcing have been implemented for non-medical support services such as cleaning, catering, building and facilities function to outsourcing of clinical support services like: Lab and diagnostic services, outsourcing of specialized clinical services like dental and maxillofacial services, outsourcing of cardio thoracic wing within a private hospital set up to a different entity, human resources selection and recruitment and specialized back office work such as on-line filing of goods and service tax (GST), provident fund (PF) and processing of pollution control clearance and information technology related activities.

According (Mackey et al, 2004, Neil, 2004), outsourcing in healthcare provide access to outside knowledge and expertise, equipment and other infrastructure, thus help in enabling the health care organization to focus on the main objective of providing the healthcare services to patients in most cost effective manner.

Methodology

In order to understand the effectiveness or the impact outsourcing project, on different sectors or department of health care, we used the non-parametric chi-square based Cramer's V co-efficient. Cramer's V is a statistic, used to measure the strength of association between the outsourcing and its effect on different department or sector such as anaesthesia services, professional non-surgical and surgical services, housekeeping, lab and diagnostic services and bio-medical waste (BMW) service belonging to both main and allied activities, which has been purposefully selected by the researcher to include few, 'not so critical' and 'few most critical activities or functions' of a health care centre. The data and information regarding different aspects of the outsourcing for both the not so critical and the critical activities of the hospital was collected through structured questionnaire and semi-structured interview by administering the same to health care consultants of repute, administrative, nursing staff and also to few selected patients and their attendants, who are admitted as in-patient and stayed at least for 3 to 4 days in the sample hospitals, by which, these patients are at least aware of and are exposed to the services delivered to them by both outsourcing service providers and/ or the in-house staff.

The advantages of Cramer's V method of analysis are: it corrects the problem that measures of the association for table of different dimensions may be difficult to compare directly. Cramer's V can take a value between '0' which

indicate there is no or negligible association and value '1' indicate a stronger association between the variables. Cramer's V statistic is a systematic measure, in the sense it does not matter what is placed in the 'row' and what is placed in 'column'. This chi-square based analysis measures the degree of nominal association, as it gives good norming from '0' to '1' regardless of the table. It is possible to compare the strength of association between any two cross classification table. Lastly it is very effective in measuring the strength of association which is independent of the table size. Cramér's V is computed by taking the square root of the chi-squared statistic divided by the sample size and the minimum dimension minus 1.

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The Cramer's V measure is defined as:

$$V = \sqrt{\frac{\chi^2}{nt}}$$

Where, 't' is represent, the minimum of r-1,c-1,where r-1 is the number of row minus 1 and c-1 is the number of column minus 1 that is, if 'r' is the number of row and 'c' is the number of column then, 't' = (r-1, c-1). n represent the total numbers of observations and x is derived from Pearson's chi-square test Test of influence of outsourcing of 'anaesthesia service' on different category of professionals and patients:

Null Hypothesis H₀: There is no agreement between the ranks assigned by different category of hospital professionals including consultant and patients to outsourcing of anaesthesia services.

Alternate Hypothesis H₁: There exists significant agreement between the rank assigned by different categories of hospital professionals including consultant and patients to outsourcing of 'anaesthesia services'.

Table 1: Extent of Relationship of Outsourced Anaesthesia Service and Staff Belonging to Different Section or Department of Hospital Including that of Patients

ANESTHESIA SERVICES	NURSING STAFF	CONSULTANT S	PATIENT S	ADMINSTRATVE STAFF	TOTAL
NO	3	3	3	5	14
YES	15	9	16	12	52
TOTAL	19	15	23	17	74

CHI -SQUARE					
OBSERVED [O]	[E]	[O- E]	[O-E]SQ	[O-E]SQ/E	
4	3.59	0.41	0.16	0.05	
6	2.84	3.16	10.00	3.52	
7	4.35	2.65	7.02	1.61	
5	3.22	1.78	3.18	0.99	
15	13.35	1.65	2.72	0.20	
16	10.54	5.46	29.81	2.83	
12	11.95	0.05	0.00	0.00	
		Chi -square =		9.20	
Tabulated 0.05,df(4-1) * (2-1) = 3				7.815	

Interpretation

The calculated Chi-square value 9.20 is more than that of the tabulated value of 7.814, indicates that, 'the null hypothesis', of 'no agreement the rank assigned by different categories of hospital professionals including consultant and patients with of outsourcing of anaesthesia services is rejected. Thus it can be interpreted that, there exits sufficient statistical evidence to accept the alternative hypothesis of existence of significant agreement between the rank assigned by different categories of hospital professionals including consultant and patients with outsourcing of anaesthesia services.

Applying Cramer's contingency V formula $V = \text{Square root } (9.20/74 \times \text{minimum of } r-1, c-1) = 0.35$. Cramer co-efficient of 0.35 indicates a 'moderate strength' of association between different categories of hospital professionals including consultant and patients with outsourcing of anaesthesia services.

- Test of influence of outsourcing of 'Professionals– non-surgical' on different category of professionals of the hospital and patients.

Null Hypothesis: There is no agreement between the ranks assigned by different category of hospital professionals including consultants and patients to outsourcing of 'Professional – Non Surgical' services.

Alternate Hypothesis: There is significant agreement between the rank assigned by different categories of hospital professionals including consultants and patients to outsourcing of 'Professional - Non surgical' services'.

Table 2: Extend of Relationship of Outsourced Professional Non Surgical Consultancy Service and Staff Belonging to different Section or Department of Hospital Including that of Patients

PROFESSIONAL NON SURGICAL CONSULTACY SERVICE	NUSRING STAFF	CONSULTANTS	PATIENTS	ADMINSTARTVE STAFF	TOTAL
NO	2	4	12	8	26
YES	19	17	12	15	63
TOTAL	21	21	24	23	89
CHI -SQUARE					
OBSERVED [O]	[E]	[O- E]	[O-E] SQ	[O-E] SQ/E	
2	6.13	-4.13	17.10	2.79	
4	6.13	-2.13	4.56	0.74	
12	7.01	4.99	24.89	3.55	
8	6.72	1.28	1.64	0.24	
19	14.87	4.13	17.10	1.15	
17	14.87	2.13	4.56	0.31	
12	16.99	-4.99	24.89	1.46	
15	16.28	-1.28	1.64	0.10	
Calculated Chi square		Chi Square		10.35	
Tabulated Chi, at 0.05 significance level and degree of freedom df (4-1)X(2-1)=3				7.815	7.814

Interpretation

Since calculated Chi-square value 10.35 is more than that of the tabulated value of 7.814, indicates that, the null hypothesis of no association between the rank assigned by different category of hospital professionals including consultants and patients with outsourcing of 'Professional – Non Surgical' services is rejected. Thus it can be interpreted that, there exists sufficient statistical evidence to accept the alternative hypothesis of 'existence of significant agreement between the rank assigned by different categories of hospital professionals including consultant and patients with outsourcing of 'Professional - Non surgical' services'.

Applying Cramer's contingency V formula $V = \text{Square root } (10.35/89 \times \text{minimum of } r-1, c-1) = 0.34$. Cramer co-efficient of 0.34 indicates a 'moderate strength' of association between different categories of hospital professionals including consultant and patients with outsourcing of 'Professional - Non surgical' services'.

- Test of influence of outsourcing of 'Principal–Surgeon' on different category of professionals of the hospital and patients.

Null Hypothesis: There is no agreement between the ranks assigned by different category of hospital professionals including consultants and patients to outsourcing of 'Principal surgeons'.

Alternate Hypothesis: There is significant relationship between the rank assigned by different categories of hospital professionals including consultants and patients to outsourcing of 'Principal surgeons'.

Table 3: Extend of Relationship of Outsourced Principal Professional Non-surgical Consultancy Service and Staff Belonging to Different Sections or Departments of Hospital Including that of Patients

SURGEON [PRINCIPAL]	NUSRING STAFF	CONSULTANTS	PATIENTS	ADMINSTARTVE STAFF	TOTAL
NO	3	6	10	3	22
YES	17	9	8	14	48
TOTAL	20	15	18	17	70

CHI -SQUARE					
OBSERVED [O]	[E]	[O- E]	[O-E]SQ	[O-E]SQ/E	
3	6.29	-3.29	10.80	1.72	
6	4.71	1.29	1.65	0.35	
10	5.66	4.34	18.86	3.33	
3	5.34	-2.34	5.49	1.03	
17	13.71	3.29	10.80	0.79	
9	10.29	-1.29	1.65	0.16	
8	12.34	-4.34	18.86	1.53	
14	11.66	2.34	5.49	0.47	
		Chi square calculated		9.38	
Chi square tabulated with 0.05 confidence level, degree of freedom (4-1) x(2-1)=3				7,814	7.814

Interpretation

Since calculated Chi-square value 9.38 is more than that of the tabulated value of 7.814, indicates that, the null hypothesis of no association ranks assigned by different category of hospital professionals including consultants and patients with that of outsourcing of 'Principal surgeons'. Thus it is interpreted that there is sufficient statistical evidence exist to accept the alternative hypothesis of 'there exists significant relationship between different categories of hospital professionals including consultants and patients with outsourcing of 'Principal surgeons'.

Applying Cramer's contingency V formula $V = \text{Square root } (9.38/70 \times \text{minimum of } r-1, c-1) = 0.36$. Cramer co-efficient of 0.36 indicates a 'moderate strength' of association between the outsourcing of principal surgeon and occupational status of the hospital professional including patient.

- Test of influence of outsourcing of 'House Keeping Services' on different category of professionals of the hospital including consultant and patients.

Null Hypothesis H_0 : There is no agreement between the ranks assigned by different category of hospital professionals including consultants and patients to outsourcing of 'housekeeping services'.

Alternate Hypothesis H_1 : There exists significant agreement between assignment of rank by different categories of hospital professionals including consultant and patients to outsourcing of 'housekeeping services'.

Table 4: Extend of Relationship of Outsourced Housekeeping Services and Staff Belonging to Different Sections or Departments of Hospital Including that of Patients

OUTSOURCING OF HOUSE KEEPING	NUSRING STAFF	CONSULTANTS	PATIENTS	ADMINSTARTVE STAFF	TOTAL
NO	2	4	9	8	23
YES	23	21	9	17	70
TOTAL	25	25	18	25	93
CHI -SQUARE					
OBSERVED [O]	[E]	[O- E]	[O-E]SQ	[O-E]SQ/E	
2	6.18	-4.18	17.50	2.83	
4	6.18	-2.18	4.76	0.77	
9	4.45	4.55	20.69	4.65	
8	6.18	1.82	3.30	0.53	
23	18.82	4.18	17.50	0.93	
21	18.82	2.18	4.76	0.25	
9	13.55	-4.55	20.69	1.53	
17	18.82	-1.82	3.30	0.18	
		calculated Chi square =		11.67	
		Tabulated Chi Square		7.814	

Interpretation

Since calculated Chi-square value 11.67 is more than that of the tabulated value of 7.814, indicates that, the null hypothesis of no association between the outsourcing of housekeeping activities of the hospital with different occupational status of professional including consultant and patient is rejected. Thus it is interpreted that, there is sufficient statistical evidence exist to accept the alternative hypothesis of significance association different categories of hospital professionals including consultant and patients of outsourcing of housekeeping. Applying Cramer's contingency V formula $V = \text{Square root } (11.67/93 \times \text{minimum of } r-1, c-1) = 0.35$ Cramer co-efficient of 0.36 indicates a moderate strength of association between the outsourcing of housekeeping services and occupational status of the hospital professionals including patient.

- Test of influence of outsourcing of 'lab and diagnostic Services' on different category of professionals of the hospital including consultant and patients.

Null Hypothesis H₀: There is no agreement between the ranks assigned by different category of hospital professionals including consultant and patients to outsourcing of 'Lab and diagnostic services'.

Alternate Hypothesis H₁: There exists significant relationship between rank assigned by different categories of hospital professionals including consultant and patients to outsourcing of lab and diagnostic services.

Table 5: Extend of Relationship of Outsourced lab and Diagnostic Services and Staff Belonging to Different Sections or Departments of Hospital Including that of Patients

OUTSOURCING OF LAB & DIAGNOSTIC	NURSING STAFF	CONSULTANTS	PATIENTS	ADMINISTRATIVE STAFF	TOTAL
NO	3	2	10	3	18
YES	27	16	12	15	70
TOTAL	30	18	22	18	88
CHI -SQUARE					
OBSERVED [O]	[E]	[O- E]	[O-E] SQ	[O-E] SQ/E	
1	6.14	-5.14	26.38	4.30	
2	3.68	-1.68	2.83	0.77	
3	4.50	-1.50	2.25	0.50	
1	3.68	-2.68	7.19	1.95	
27	23.86	3.14	9.84	0.41	
16	14.32	1.68	2.83	0.20	
18	17.50	0.50	0.25	0.01	
15	15.18	-0.18	0.03	0.00	
		chi square calculated value		8.147	
		Chi square tabulated value		7.814	

Interpretation

Since calculated Chi-square value 11.67 is more than that of the tabulated value of 7.814, indicates that, the Null hypothesis of no association between the outsourcing activities of the hospital and occupational status of hospital staff including that of patient is rejected. Thus it is interpreted that there is sufficient statistical evidence exist to accept the alternative hypothesis of significance association different categories of hospital professionals including patients with that of outsourcing of lab and diagnostic services.

Applying Cramer's contingency V formula $V = \text{Square root } (8.147/88 \times \text{minimum of } (r-1, c-1) = 0.30$. Cramer co-efficient of 0.36 indicates a 'moderate strength' of association between the outsourcing of lab and diagnostic services and different occupational status of the hospital staff including patient.

- Test of influence of outsourcing of 'bio-medical waste disposal services' on different category of professionals of the hospital including consultant and patients.

Null Hypothesis H₀: There is no agreement between the ranks assigned by different category of hospital professionals and patients to outsourcing of bio-medical waste disposal services.

Alternate Hypothesis H₁: There exists significant agreement the rank assigned by different categories of hospital professionals including patients to outsourcing of bio –medical waste disposal services.

Table 6: Extent of Relationship of Outsourced Bio-medical Waste Disposal Services and Staff Belonging to Different Sections or Departments of Hospital Including that of Patients

OUTSOURCING OF BIOMEDICAL WASTE DISPOSAL SERVICES	NURSING STAFF	CONSULTANTS	PATIENTS	ADMINISTRATIVE STAFF	TOTAL
NO	0	0	4	1	4
YES	17	10	8	12	47
TOTAL	17	10	12	13	51

CHI -SQUARE					
OBSERVED [O]	[E]	[O- E]	[O-E]SQ	[O-E]SQ/E	
0	1.33	-1.33	1.78	1.33	
1	0.78	0.22	0.05	0.06	
4	0.94	3.06	9.36	9.94	
1	1.02	-0.02	0.00	0.00	
17	15.67	1.33	1.78	0.11	
10	9.22	0.78	0.62	0.07	
8	11.06	-3.06	9.36	0.85	
12	11.98	0.02	0.00	0.00	
		Calculated Chi square =		12.361	
		Tabulated Chi square		7.814	

Interpretation

Square calculated value 12.361 is greater than Chi-square tabulated value of 7.814, hence null hypothesis is rejected hence the alternative hypothesis is accepted, which indicates that there exist significant association between outsourcing of bio-medical waste disposal services with the different category of hospital staff including consultants and patient.

Applying Cramer's contingency V formula $V = \text{Square root } (7.814/51 \times \text{minimum of } (r-1, c-1)) = 0.22$. Cramer co-efficient of 0.22 indicates a 'low to moderate' strength of association between the outsourcing of bio-medical waste disposal services with different categories of hospital including that of consultant and patient.

Conclusion

The analysis of 'degree of association between outsourcing of different service' like anaesthesia, principal surgeons, professional but non-surgical services and housekeeping and lab and diagnostic service is vary from 'moderate to high'. This indicates that impact of outsourcing of different hospital functions starting from non-core not so critical functions like housekeeping, Lab and diagnostics, bio-medical waste management to most important and critical function like anaesthesia service, on-surgical physician consultancy and principal surgeons for undertaking major or ultra-major surgeries on hospital administrators, nursing staff, hospital consultants and patients is 'significant'. The impact of 'bio-medical waste disposal' services outsourcing has 'low to moderate impact' on the different group of hospital user. This is hopefully because, the patients do not generally understand the consequence of the improper – disposal of the bio-medical waste. Further in spite of regular advice, caution and familiarizing with the established protocol the paramedical staff at times deviate from the protocol for segregation and disposal of bio-medical waste. The biomedical waste disposal being outsourced to, either of the two empanelled contractors in the twin city of Hyderabad and Secunderabad as stipulated by the Telangana Pollution Control Board. The outsourcing service providers also discharged the work so meticulously discharging on daily basis without any break even for a day in a year. Thus, the significant contribution of discharging the duties and responsibilities with proper recording keeping of numbers of bag collected from different section or department by the outsourcing service provider with little supervision by the hospital staffs leading to increase in performance of the healthcare centre to a great extent.

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