Impact of Outsourcing on Successful Completion of Projects in Construction Sector of Karachi

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Abstract

This study was aimed at examining impact of outsourcing construction-related works like Electrical, HVAC, Civil and Mechanical transportation on successful completion of projects in construction sector of Karachi. The study is explanatory in nature based on deductive approach. The data were collected with the help of a research instrument i.e. a questionnaire from a sample of 160 managers of the construction industry. Quantitative data was collected on a Likert scale ranging from 1 to 5 and analysed through statistical tools correlation and regression analysis by using SPSS, version 23. The results have revealed that impact of outsourcing of electrical, civil and mechanical/ transportation services is whereas HVAC work is not having significant impact on project success. The study is considered quite useful for management of the construction sector of Karachi in determining effectiveness of existing outsourced services. Other organizations and academia may also benefit from the study.

Keywords: Outsourcing Electrical Works, HVAC Works, Civil Works, Mechanical / Transportation Works, Technology Adoption, Project Success

1. Introduction

Successful completion of projects is the utmost desire of all managers who are responsible to complete them within allocated schedule, according to predefined cost and as per set quality standards. Since a number of skills are needed to undertake various activities related to the projects, organizations try to undertake themselves only those activities in which they are expert; remaining parts of the projects are handed over to those venders who are believed to be best in them. In reality, many parts of the projects are achieved through other venders for ensuring best quality product or service (Azmy, N. (2012). In the new millennium, individuals and organizations have a different perspective and perception about project management. Globally, outsourcing is gaining greater popularity with passage of time and because of fast expansion in different regions and markets to exploit the most effective and highly technological innovations (Myeda N., Kamaruzzaman S., Pitt M., 2011). The emergence of globalization has made outsourcing one of the widely embraced business strategies for delivering outstanding products and services during execution of projects in various sectors including the construction sector; outsourcing is definitely the most significant development within the projects landscape in recent years (Kremic, T. and Tukel, O., 2003). Outsourcing is used for shedding off non-core organizational activities to reduce unpredictability and increase adaptability to grow the business of the organization (Kremic T., Tukel O., Walter O. 2006).

Outsourcing plays a vital role in construction projects because builders make extensive use of quality material provided by the vendors. For this research, outsourcing of constructional works like Electrical, HVAC (heating, ventilating, air conditioning), Civil and Mechanical/Transportation have been considered as the foundation of the project success. These factors are combined in the Iron triangle, and encompass time, scope and cost. These factors are further derived by the quality, risk mitigation and technology enhancement which are mostly beneficial for success of any project (Kamanga, F. N., 2016). The present study is being undertaken to identify the extent to which construction sector at Karachi is satisfied with existing outsourcing facilities. Following are the objectives of this study:

- To examine the impact of outsourcing electric works on project success.
- To find out influence of outsourcing HVAC works on project success.
- To analyze the impact of outsourcing civil works on project success.
- To examine control of outsourcing mechanical transportation works on project success.
- To propose suitable measures to the construction sector of Karachi, for further improving positive impact of outsourcing.

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2. Literature Review

2.1 Significance of Project Success

Successful completion of every project is a natural desire of every project manager or project sponsoring organization. For ensuring this, project managers adopt different strategies. One the most popular strategies to achieve project success is outsourcing of non-core business activities to the expert vendors. Outsourcing helps in economizing on cost and timely achieving desired quality products or services (Turner, J.R, 2008). For this purpose, organizations are only focusing on their core business areas and handing over remaining activities to the outside vendors who are the best in those areas. Outsourcing typically brings the cost reductions and quality improvement, by which an organization leads to more successful outcomes in the project's domain (Velopi, 2010).

The PMBOK describes project, a temporary endeavour and a unique product/services/result (PMI, 2013). The temporary endeavour does not refer to duration of the project but directs that the project has a fixed start and termination. A project usually finishes when its purposes have either been attained or terminated due to some cogent reason (Prabhakar, G. P. (2009). The unique product, service or results either take form of tangible or intangible assets. As per PMBOK, a project can create a unique product within specified time and this product can either be subpart or a component of another item that can add value or enhance capabilities (PMI, 2013). According to PMBOK, projects essentially have well-defined goals, objectives and must have sufficient assets and resources to carry out all the required tasks. Hence, a project must have following characteristics (PMI, 2013).

- A definite start and end.
- An explicit, predetermined goal.
- A sequence of composite or organized actions
- A restricted budget

2.2 The Iron Triangle: Scope, Time & Cost

For project success the critical factors are the key issues to be managed by the project team and the project manager (Divakar & Subramanian, 2009). Regardless of the how well planned are the scope, schedule and cost some critical issues may go wrong (Kerzner, 2006); (Williams, 2011). The critical factors, if mishandled, can lead to project failure (Williams, 2011). Everything has a cost whether it is time, resource or material, and this cost must be precise and exact. The project's work must be clear and the scope of the project is agreed upon by key stakeholders (Mulcahy & Dietthelm, 2011). Scope outlines the reason, characteristics, and jobs of a project and a well-defined scope identifies the project's success criteria. Three main attributes of the project (schedule, cost and quality) inspire organisations for giving some specialized task to the outside firms (Simmonds & Gibson, 2008). Most of the organisations take benefits by implement the outsourcing by gain maximum profit in the project including with cost saving increased productivity and concentrate in his core business (Lankford & Parsa, 2006). The schedule is developed by deconstructing the scope and scrutinizes it to lowest possible task or activity (Oren, 2009).

In the context of mega projects, there is always an expert appointed for resolving project constraint (Williams, 2011). Figure 1 represents the relationships between the triple constraints. For example, one factor i.e. time when changed will have effect on the project success or failure as the time and budget will have a relative change in the scope of the project. This identify that a small change in the scope, time or cost will have a change in the expectation of the project sponsor and stakeholder (Lewis, 2007); (Williams, 2011).

Figure 1: The Iron Triangle

2.3 Outsourcing

The trend of outsourcing is not restricted to only developed world; developing and underdeveloped countries are also making good use this approach. This is also a fast-emerging trend in Pakistani business community, especially in construction sector. The most common types of outsourcing include selective outsourcing, total outsourcing and transitional outsourcing (Hashmi, A. A., & Mansoor, A. 2013). Basically, organizations do not want to expand themselves and prefer for outsourcing the products or services due to high cost required for in-house installation of facilities (John R. Baldwin and Wulong Gu (2008). Although benefits of outsourcing are far more than the disadvantages attached to it, managers take up the challenges of managing outsourced parts through strong networking with the vendors (John R. Baldwin and Wulong Gu (2008). In the construction sector, outsourcing provides an added advantage, especially during the civil construction works. Advantages of outsourcing are usually evaluated from various perspectives discussed in ensuing paragraphs:

2.3.1 Cost Reduction

Cost reduction is the main concern when acquiring expertise from outside in the form of outsourcing. In case of construction sector, various activities can be outsourced at comparatively reduced price, partially or as a whole, during any phase of the project. Outsourcing helps in cost reduction in terms of employing less workforce and occupying limited space for core activity of the firm. While a firm can maintain less full-time workers, it can economise on other related expenses of space and utilities. Furthermore, organizations can work on low price for contracted assignments or services (Isaksson, A. and Lantz, B. (2015). Outsourcing strategy may be initiated only for those activities which a company is unable undertake effectively within the organization; it may also be initiated if a company decides to perform some activities with temporary workers (Flatworld Solutions, 2015).

2.3.2 Timely Project Completion

According to the PMI, 2013, time or schedule is the most important factor in project management. If project completion time is extended due to any reason which is not mentioned in project management plan, it may tarnish professional standing and image of the organization (Arias-Aranda D., Bustinza O.F. and Barrales-Molina V. 2011). In construction projects, many activities can be undertaken concurrently by deploying different vendors which leads to completion of the projects well within allocated time. Viable pricing term is commonly used to perform the job by contractors. For example, a 120 sq. yards house can be built within 6 months by the regular work of the construction company itself; however, the same task can be delivered within 4 months if that job is performed by an outside contractor. Moreover, an operator of earthmoving machine-like excavator can finish his work in four hours while a regular crew will take four days to finish (Benton, 2010).

2.3.3 Scope Validation

Project scope statement classifies the activities, milestones and quality standards; it is necessary for project success. The scope validation is the main process during the progress review or kill points meetings. According to Lai et al, (2004), successful implementation of a quality management system during outsourcing of works is the key to survival and long-term prosperity of a company. Proper scope validation determines the starter of next phase or milestone which can be affected through internal or external developments. These details are commonly known as scope statements of the project work and must be defined in project charter (Simmonds & Gibson, 2008). A project manager of a construction projects is required to allocate tasks and give direction to the project team for delivering the project on time, within budget and as per scope. Outsourcing supports the project manager to achieve the task by determining the scope of each phase. Scope validation determines the work to be mentioned in project scope statement and compares actual work of project with the planned standard. The risks are also connected with outsourcing of construction related works including, wrong use of strategic behaviour regarding performance of the contractor, lack of knowledge and experience of the principal (R. Schoenmaker, J. A. de Bruijn, P. M. Herder, 2013).

2.4 Outsourcing of Civil Works

A construction project cannot be completed without support of external contractors, this phenomenon is very common in construction industry. While selecting an outside vendor, a number of factors are to be considered by the principal organisation (Schieg, 2007). The construction industry is also

a main services provider and a great source of reduction in unemployment rate. This sector provides employment to millions of people in diverse professions and skills (Idoro, 2009). The project teams who have several responsibilities consist of clients, consultants, contractors, suppliers and manufacturers. Civil Engineering Consultancy in construction projects is considered a critical outsourcing service. Civil engineering consultants play a major role in timely completion of construction project (Idoro and Okun 2011). Consultant are responsible for making proper feasibility of the project which is based on the requirement of client organisation, Consultant are normally hired for execution of civil projects. The role of consultant is to mitigate the technical risks in a conventional project (Havemann, G., 2007). Outsourcing is the best strategy to acquire globally emerging technology for any civil construction planning, drawings and execution. Client organisations adopt their strategy without significant investment in the technology and totally focus on core competencies (Kotabe & Murray, 1990; Quinn, 1992; Dess et al., 1995; Sang, 2010).

2.5 Outsourcing of Electrical Works

Electrical works that are mostly outsourced by the builders include installation of electrical panels, installation of electrical generators, purchasing and fixing of electrical fixtures, installation of telecom distribution boards, intercom system, fire alarm and CCTV control system. These systems are part of the building management system during construction projects of high rise and residential buildings (Schieg, 2007). Most of the electrical works outsourced for maintaining project schedule, cost and scope are undertaken by contractors. There are many reasons for outsourcing of electrical works including reduced operating cost and high employee productivity (David Clayton, 2003). Electrical engineering professionals, also called consultants, are involved in designing, planning and monitoring of projects (Stern, 2013).

2.6 Outsourcing of HVAC Works

Outsourcing of HVAC activities is a common practice in construction sector. It helps in avoiding worst quality workmanship, poor selection of chilling system, inadequate manufacturing of ducting works and using dirty filters which may lead to reduced equipment proficiency (Elyna Myeda, Nizam Kamaruzzaman, & Pitt, 2011). Outsourcing of HVAC services help in achieving time and cost advantage. It is also an essential part of the strategy to focus on core functions of the construction project and hand over non-core to the expert vendors. This type of outsourcing allows cost reduction and improved quality. The vendors should have a thorough understanding of HVAC works in projects for system designing, making of sheet ducts, installation of heating systems as well as installation of air-conditioning systems including the chillers (Arnold, U., 2000); (Lindskog, H., 2005).

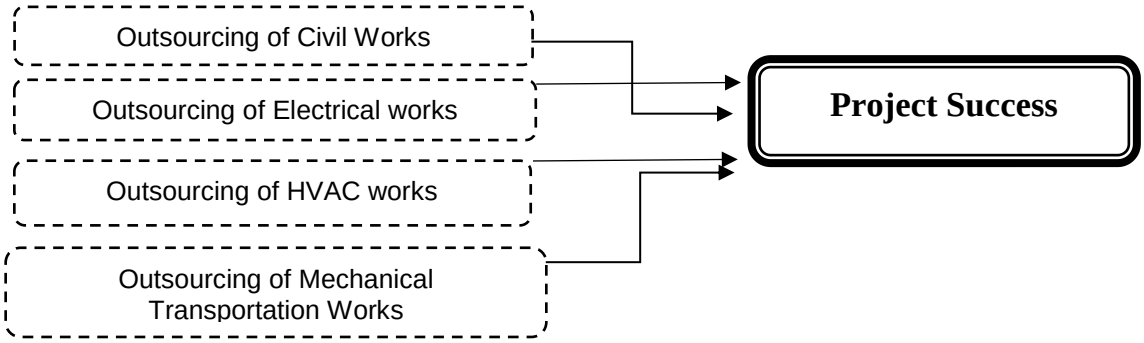
2.7 Outsourcing of Mechanical/Transportation Works

In construction projects, field transportation refers to the movement of labour, machinery and materials from one location to another. Outsourcing of transportation has become a popular business strategy used world-wide (Obeng et al., 2015). Investment in the engineering construction projects is quite big; usually the investment cost influences are high. In construction project processes, the costs vary from project to project. Transportation services are usually outsourced to avoid involvement into this activity and also to achieve cost effectiveness (Duiyong C., Jia Shidongand Sun Mingshan, 2014).

2.8 Theoretical Framework

Conceptual framework is a set of extensive values which are taken from related fields of enquiry structure and highlights the study variables and demonstrates the underlying relationships between them (Thomas, 2010). Outsourcing can be conceptualized as a process rather than an event and this procedure starts with the development of a financial and strategic business cases. Any business case is trailed by executing the outside sourcing model and at last dealing with the supplier to build up connection between buyer and contractors (Benton, 2010).

Figure 3: Theoretical Framework



2.10 Research Hypotheses

Followings are the hypotheses that were tested through statistical tools SPSS:

H1: There is a positive impact of outsourcing electrical works on projects' success.
H2: There is a positive impact of outsourcing of HVAC works on projects' success.
H3: There is a positive impact of outsourcing of civil works on projects' success.
H4: There is a positive impact of outsourcing of mechanical transportation works on projects' success.

3. Methodology

This study is explanatory based on quantitative data and deductive approach was adopted whereby research hypotheses were first developed, followed by data collection with the help of a questionnaire prepared on a Likert scale of 1 to 5. According to Easterby-Smith et al. (2012), using quantitative analysis by a researcher deepens one's understanding of the research problem. Target population is the entire construction sector at Karachi whereas population under study comprises of 274 managers of six construction companies of Karachi including NESCOM, Bahria Town, Fazaia Housing Scheme, NESPAK, Astral Constructors Pvt Ltd and Paragon Construction Pvt Ltd. The sample size for this study was 160 managerial level employees. Stratified random sampling technique, also called proportional random sampling or quota random sampling was used to approach respondents. Statistical tools, Pearson's Correlation and Regression analysis were used to analyse the data and test hypotheses, with the help of SPSS, version 22.

4. Analysis

4.1 Test of Reliability

The reliability test of the constructs was calculated using Cronbach's alpha analysis (Sekaranb & Bougie, 2010). The value of Cronbach's Alpha mentioned (in table 1), for each variable is greater than 0.7 which shows that all variables are reliable.

Table 1: Summary of Reliability Test

Variables	No of Items	Value of Cronbach's Alpha
Outsourcing of Electrical Works	4	0.855
Outsourcing of HVAC Works	3	0.748
Outsourcing of Civil Works	4	0.834
Outsourcing of Mechanical/ Transportation Works	3	0.823
Project Success	4	0.731

4.2 Correlation Analysis

Table 2: Correlations Analysis

		OE	OH	OC	OM	PS
OE	Pearson Correlation	1	-.020	-.060	-.180	.069
	Sig. (2-tailed)		.798	.450	.023	.389
	N		160	160	160	160
OH	Pearson Correlation		1	.040	.171	.196
	Sig. (2-tailed)			.613	.031	.013
	N			160	160	160
OC	Pearson Correlation			1	.534	.281
	Sig. (2-tailed)				.000	.000
	N				160	160
OM	Pearson Correlation				1	.418
	Sig. (2-tailed)					.000
	N					160
PS	Pearson Correlation					1
	Sig. (2-tailed)					
	N					

The correlation coeffient shows how strong the linear relationship between two variables are. If the correlation is positive, that means both the variables are moving in same direction. Negative correlation implies, when one variable increases the other variable decreases. If correlation is +/- 0.8 and above, high degree of correlation or the association between the dependent variables are strong. correlation between +/- 0.5 to+/_0.8, sufficient degree of correlation and less than +/-0.5, weak correlation. Correlation depicts the relationship of independent variables with dependent variable will be positive or negative. These variables are related definitely and unfavourably which implies that having high or low scores are connected with one another. In order to see the association between project success and outsourcing of Electrical, HVAC, Civil and mechanical/transportation works, we performed Pearson's correlation analysis and we found 0.069, 0.196, 0.281 and 0.418 respectively. Hence, the correlation is found to be significant at 0.00level.

4.3 Regression Test

Regression analysis also covers the model summary, ANOVA table and the co-efficient table to specify the variance of the model. The table stated below represents the Model Summary of the study which has been conducted.

Table 3: Regression Test Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.466[a]	.217	.197	.63005

a. Predictors: (Constant), OE, OH, OC, OM
b. Dependent Variable, PS

The Model Summary of Regression Analysis indicates the R, R Square, Adjusted R Square and the standard error of the estimate. All these values which are found out conclude, that how well a regression model fits the data. The multiple correlation co-efficient (R) has value 0.466 which indicates a near moderate level of prediction. The value of R Square is 0.217 and this value indicates that this model explains 12.1% variation of all independent variables in the dependent variable. The value of adjusted R Square is 0.197 and the standard error of the estimate is 0.63005. All these values are in favour of research.

4.4 ANOVA

The table stated below represents the ANOVA table of the study which has been conducted.

Table 4: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	17.045	4	4.261	10.735	.000[b]
	Residual	61.530	155	.397		
	Total	78.575	159			
a. Dependent Variable: PS						
b. Predictors: (Constant), OE, OH, OC, OM						

In table 4, df is defined as “degree of freedom” and F is defined as “frequency”. ANOVA is a statistical technique which is used to compare differences of means among more than two groups. The table states that independent variables are statistically significant and hence, therefore predict the dependent variable, F = 10.735 at the significance level of 0.000.

4.5 Co-efficient Test

Table 5: Co-efficient Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.901	.302		6.299	.000
	OE	.113	.056	.144	1.996	.048
	OH	.052	.029	.131	1.808	.327
	OC	.063	.064	.083	.983	.072
	OM	.280	.064	.378	4.354	.000

a. Dependent Variable: PS

According to the analysis, the co-efficient table 16 concludes that the “Significant” values in the last column .048, .327, 0.72, .000, predicts the significance of the variables and hence represents that, which of the variables are useful and which are not useful. It shows the regression coefficients, the intercept and the significance level of all the independent variables. Through the analysis the regression function is estimated to be

$$Y = 0.1901 + 0.113x_1 + 0.052x_2 + 0.063x_3 + 0.280x_4$$

The p values of intercept, Outsourcing of Electrical works, Outsourcing of HVAC works, Outsourcing of Civil works, Outsourcing of Mechanical/transportation works are found to be 0.000, 0.048, 0.327, 0.072, 0.000 respectively which shows that except Outsourcing of Civil works all rest of three independent variables: Outsourcing of Electrical works, Outsourcing of HVAC works and Outsourcing of Mechanical/ Transportation works are highly significant.

5. Discussion

The results show a significant relationship between three-independent variable i.e. outsourcing of electrical works, outsourcing of civil works and outsourcing of mechanical/ transportation works, with the dependent variable project success. Further details are discussed in ensuing paragraphs.

5.1 Outsourcing of Electrical Works

While referring to the first variable shows a strong relationship between outsourced electrical works and project success, results show that organisations using electrical services provided by vendors are up to satisfactory level. Organisations outsourced their electrical works to reduce operating cost, quality and within time completion of works and get improved services adopted with enhance technologies which can improve working environment. Some electrical works are not easy and safe jobs so outsourcing is done on a large scale in construction organizations. Electrical works mostly outsource their functions like installation of electrical panels, installation of electrical generators, purchasing and fixing of electrical fixtures,

installation of telecom distribution boards, intercom systems, fire alarm, and CCTV control systems for Building management system during construction projects of high rise and residential buildings. The results are matching with study of Stern, (2013).

5.2 Outsourcing of HVAC Works

While referring to the 2nd variable, results indicate slightly weak relationship between outsourced HVAC works and project success. It means that organizations using HVAC services provided by vendors are up to satisfactory level although this level is low. Especially in HVAC works in projects, the outsourcing vendor should have a thorough understanding of the industry for HVAC system designing, making of sheet ducts, installation of heating systems as well as installation of air-conditioning systems including with chillers. The results are matching with research by Arnold, U., 2000, Lindskog, H., (2005).

5.3 Outsourcing of Civil Works

While referring to the 3rd variable, results show a strong relationship between outsourced Civil works and project success in construction organisations. It means that organisations using Civil services provided by vendors are quite satisfied. Organisations outsourced their civil works to reduce operating cost, quality and within time completion of works and get improved services adopted with enhance technologies which can improve working environment. The results are matching with research by Havemann, G., (2007) and Idoro and Okun (2011).

5.4 Outsourcing of Mechanical/Transportation Works

With regard to impact of mechanical/transportation works on project success, the results are in favour of the hypothesis. It means that organisations using mechanical/transportation services provided by vendors are satisfied. By acquiring the transportation works outside, it saves plenty of time, money, and resources. Organisations outsource their mechanical/transportation works to reduce operating cost, quality and within time completion of works and get improved services adopted with enhance technologies which can improve working environment. The results are matching with results obtained by Anton ogorelc, (2007).

6. Conclusion & Recommendations

6.1 Conclusion

This study aimed at identifying impact of various outsourced services on the project success. The success of project was measured through factors like cost, time and quality/scope which can directly impact on success of projects so construction organizations mostly adopt outsourcing to achieve their satisfaction level in which they can perform best within time, within budget and build a quality product. For the current study, following four services, which are usually outsourced in construction organizations, were considered:

- Outsourcing of Electrical works.
- Outsourcing of HVAC works.
- Outsourcing of Civil works.
- Outsourcing of Mechanical/Transportation works.

The findings of the study indicate that there is a weak relationship between project success and outsourcing of HVAC works while Outsourcing of Electrical works, Civil works and Mechanical /transportation have positive impact on project success. It may be because the outsourced vendors are providing better services in comparison with the in-house services.

6.2 Recommendations

Following are some of the recommendations aimed at further improving the success rate of projects through utilization of outsourced services:

- Special attention is required for improving impact of HVAC works. Vendors may be supported and quality for these services may be improved. Efforts may be made to distribute the HVAC works further to engage more than one vendor.
- External vendors must clearly understand the expectations of project compliances.
- Management can also use a strategy to outsourcing multiple vendors to improve success level of project.

- The project managers may continue to evaluate outsourcing vendors on regular basis to ascertain quality of the services. In the modern era of rapid technological advancement, such effort is critical to maintain competitive edge in the industry.
- A promotional campaign may be initiated to keep employees aware of the benefits that they can get out of the outsourcing.

6.3 Suggestions for Future Research

This research has focused on only few services being outsourced by the construction industry. Project success criteria i.e. time/schedule, quality, cost, risk and adoption of new technology were kept in mind. The other key factors may also be considered for further research. A similar research may also be undertaken in other organizations which are availing outsourcing various similar or different services through outsourcing. Research may also be undertaken to find out effectiveness of outsourcing in other industries and organizations.

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