Implementation of the Best Value Approach in India

by

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A Thesis Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Science

Approved October 2013 by the
Graduate Supervisory Committee:

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ARIZONA STATE UNIVERSITY

December 2013

ABSTRACT

The construction industry in India suffers from major time and cost overruns. Data from government and industry reports suggest that projects suffer from 20 to 25 percent time and cost overruns. Waste of resources has been identified as a major source of inefficiency. Despite a substantial increase in the past few years, demand for professionals and contractors still exceeds supply by a large margin. The traditional methods adopted in the Indian construction industry may not suffice the needs of this dynamic environment, as they have produced large inefficiencies. Innovative ways of procurement and project management can satisfy the needs aspired to as well as bring added value. The problems faced by the Indian construction industry are very similar to those faced by other developing countries. The objective of this paper is to discuss and analyze the economic concerns, inefficiencies and investigate a model that both explains the Indian construction industry structure and provides a framework to improve efficiencies. The Best Value (BV) model is examined as an approach to be adopted in lieu of the traditional approach. This could result in efficient construction projects by minimizing cost overruns and delays, which until now have been a rarity.

DEDICATION

I feel privileged to dedicate this thesis to the Performance Based Studies Research Group

(PBSRG) based out of Arizona State University, United States which gave me the

opportunity to actively involve myself in Construction research which has always been

my interest. I have received unrelenting support throughout my research from my

mentors and co-workers at PBSRG. I have had the distinguished honor of interacting with

Construction researchers from all over the world. The duration of time I have served at

PBSRG has enhanced my research skills and invigorated my interest to achieve more in

Construction research.

ACKNOWLEDGEMENTS

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Chapter 1

INTRODUCTION

With an economic growth rate that is the second fastest in the world (8.9%) and a GDP that is the fourth largest in terms of Purchasing Power Parity (US$ 3.6 trillion), India is an emerging global business giant (Asia business council, 2006). The population of India is projected to rise to 1.7 billion by 2050, making it 400 million in excess of China which is currently the most populated country (UN population bureau, 2012). As a result, this will place a large strain on the existing infrastructure and construction industry to support this need. In spite of this growth and needed expansion, India is facing issues of inefficiency, which could pose a major problem in future of the construction industry and the development of its infrastructure. The problems which India is facing are very similar to the problems faced by other developing countries in Asia and all across the world. Infrastructural growth is required at a large scale in most developing Asian countries (Straub and Hagiwara, 2010).

Review of construction performance in other developing countries:

Malaysia: (Sambasivan and Soon, 2006)

- In 2005 about 17.3% of 417 government contracts in Malaysia experienced more than 3 months of delay or were abandoned.

- The construction industry sector is one of the most essential contributors of the Malaysian GDP. It accounted for nearly 3.3% of the GDP contribution in the year 2005.

- The huge wealth of opportunities in Malaysia provide an incentive for construction companies and necessitate efficiency.

- The problems in the Malaysian construction industry are related to contractor's improper planning, contractor's poor site performance, inadequate contractor experience, inadequate client's finance and payment for work, problems with sub contractors, shortage of labor supply, shortage of materials, equipment unavailability and failure and mistakes in the construction stage.

- The main effects of these problems are time overruns, cost overruns, disputes, arbitration, litigation and total abandonment.

Thailand: (Ogunlana and Promkuntong, 1996)

- Shortage or inadequacies in industry infrastructure has been a problem.

- Clients and consultants have added to the existing problems.

- Contractors are incompetent.

- The recommendation is that there should be effort on part of the economy managers and construction industry associations to provide necessary infrastructure for efficient project management.

- The construction industry contributes to 5% of Thailand's GDP.

Hong Kong: (Chan and Kumarswamy, 1997)

- Poor site management on Construction projects has caused significant cost overruns and delays.

- Unforeseen ground conditions which reflect lack of pre planning.

- Low speed decision making involving all project teams.

- The clients have initiated variations at different stages of the projects.

- Construction contributes to 6.4% of Hong Kong's GDP and a total of 9% to China's GDP.

Saudi Arabia: (Assaf and Al-Hejji, 2006)

- In a survey conducted by Assaf and Al-Hejji for large construction projects in Saudi Arabia, it was discovered that 70% of the projects experienced delays.

- As per the contractors the delays were attributed to preparation and approval of shop drawings, delays in contractor's progress, payment by owners and design changes.

- As per the owners the problems are attributed to design errors, labor shortages and inadequate labor skills.

- As per the architects and engineers the problems are attributed to cash flow during construction, relationship between sub contractors and slow decision making on part of the owner.

Nepal: (Manavazhia and Adhikarib, 2002)

- Delay in delivery of materials and equipment has contributed a great amount to problems in the construction industry in developing countries like Nepal.

- The main causes of material and equipment procurement delays were found to be organizational weakness, supplier's defaults, government regulations and transportation delays.

Botswana: (Mselle et al., 2009)

- In a research test of Best Value procurement on the US embassy in Botswana, it was discovered that the client was working with a single vendor and the vendor was responsible for arriving at the scope. There by, there was no competition.

- The number of change orders experienced were many.

- There was no justifiable explanation for the change orders.

The general problems in all developing countries have been outlined by Muatjetjeju et al., 2009 as follows,

- Higher levels of corruption.

- Importance is given to relationships which makes who you know more important than what you know.

- Enforcement of more standards and rules.

- Management through control.

- Low levels of vendor skills.

- Price based approach towards non commodity areas such as construction.

The review of performance of other developing countries leads to the conclusion that non performance issues are a part of all these construction industries. At the same time construction is one of the highest contributors to the GDP of these countries. This fact underlines the importance of achieving efficiency in construction projects which until now has been a rarity.

Chapter 2

REVIEW OF CONSTRUCTION INDUSTRY PERFORMANCE IN INDIA

Background:

The construction industry in general has been growing an average of 9-11% a year due to increase in domestic and international manufacturing activities and industrial growth. The total market value of commercial and real estate schemes currently under construction in India is approximately $44 billion. The Indian government's decision to allow 100% Foreign Direct Investment in the real estate and infrastructure sectors has stimulated construction throughout the country (EC Harris research, 2011). Foreign companies have committed to providing 3.9 billion Euros in investments in the future. Recognizing the vital role of innovation in India's development and economic growth, the President of India has declared this decade as the 'Decade of Innovation' with a focus on inclusive growth (The Indo-Italian chamber of commerce and industry, April 2008). In order to capitalize upon this growth, the construction industry must resolve its inefficiency challenges.

With such large future investments and needs in development and infrastructure, the Indian construction industry is positioned to benefit if it can respond to the inefficiencies in the structure. Based upon current trends, India could suffer a GDP loss of $200 billion in the fiscal year 2017 due to inefficiencies (McKinsey, 2009). The current Indian construction industry structure is not capable of resolving these inefficiencies in its current state. It is very important that a solution for these inefficiencies needs to devised because construction has a huge influence on the country's economy.

Effect of construction on overall economy:

Construction has a major impact on the overall economic development of India. The construction industry is the second largest employer of labor in India. It is the second largest economic activity preceded by agriculture. The construction industry has contributed an estimated US$ 67.4 billion (8%) to the national GDP in 2010-11.Construction in India has accounted for more than 40% investment on development over the past 50 years. Nearly 16% of India's working population depends on construction for its livelihood (The Indo Italian chamber of commerce and industry, 2008). It contributes about 78% to the gross capital formation (Iyer and Jha, 2006). The Indian construction industry's impact on employment, interconnection with other sectors, and major contributions to GDP highlight its importance and also stress that any further inefficiencies could contribute to the economy's eventual decline.

Demand for Construction:

India's rapid economic growth over the last decade has placed tremendous stress on its limited infrastructure and an increasing demand. Investment in construction is on the rise, with more than US$ 500 billion worth of investment planned to flow into India's infrastructure by 2012 (PricewaterhouseCoopers, 2008). The planning commission of India has proposed an investment of around US$ 1 trillion, doubled since the last plan. This illustrates the demand and funds committed for development of the infrastructure in India, and the future growth in construction projects.

Additionally, public sector projects have been an area of neglected study and research. Besides the infrastructure sector, other areas are in need of growth as well. The current housing shortage is projected as 18.58 million houses (Working group of planning

commission, 2012). Simultaneously, the rapid growth of the Indian economy has had a cascading effect on demand for commercial property to help meet the needs of business, such as modern offices, warehouses, hotels and retail shopping centers. Demand will also encompass the need for professionals: civil engineers, architects, planners, professionals in the field of sustainability, facility managers, project managers, contractors, and others. The supply chain factors of demand are compared and reveal that overall; these demands are currently unmet under the current construction industry structure (RICS, 2011).

Chapter 3

PROBLEM

The construction industry in India has seemed to encounter problems regarding performance issues. The problems deal with inefficiency, workforce, flaws in planning elements and the general mentality in construction.

Inefficiency

Inefficiencies are large in India, these could have resulted from underdeveloped labor and organizations, improper planning, and a mentality that contractors are commodities. Almost every project in India suffers from time and cost overruns. Some of the potential causes of inefficiencies suggested as per Mckinsey, 2009 are,

- Poor quality of planning and engineering design.

- Inappropriate contracts in use.

- Pre-tendering approval process is slow and centralized.

- Problems in land acquisition.

- Dispute resolution practices are weak.

- Performance management is weak.

- Non-availability or paucity of skilled and semi-skilled workers.

- Weak risk management skills.

- Lack of best-in-class procurement practices.

- Low prevalence of lean construction principles.

Workforce

The Indian construction industry is driven by an enormous work force that is largely unskilled and numerous unregistered contractors, highlighting the challenges India faces in performance measurement. The construction industry employs more than 31 million people, with 10% of the workforce being skilled and 90% is unskilled or semi skilled. The net increase in the labor workforce from 2010 until 2020 is projected to be 97 million (RICS research, 2011). Additionally, there are about 30,000 contractors in the organized sector (large to medium work volumes) and about 120,000 contractors in the unorganized/unregistered sector (medium to small work volumes) (Global insight, 2009, Planning commission, 2012). The lack of skilled labor and registered contractors could be contributing to the challenges India faces in performance.

Planning Elements

Indian projects could have suffered from inefficiencies due to improper planning, poor estimating and corruption. One such example of poor pre-planning was a road project in which a temple adjacent to the site of a proposed overpass was omitted from the Detailed Project Report (DPR) phase. The overpass was built, and subsequently due to local pressure, wasting US$ 3.68 million (McKinsey interviews, 2009). Another example of improper planning and estimation was in a project to construct four lanes of highway, when only two lanes were approved. As a result the project was delayed by 6 to 12 months. Project costs are under estimated by owners as the owner's estimate is usually 10-30% less than the bidder's estimate, which some attribute to the typically long delay from the DPR stage to the tendering phase (McKinsey and company, inc. 2009).

Mentality

While the low skills of vendors and their improper ability to plan projects could generally seen as the main source of inefficiency, the source outlined and exposed in this research is the structure of the construction industry, which is largely influenced by the way in which vendors are selected. Selection of contractors for construction projects in India has long been based largely on bid price alone. The selection of the lowest bidder has been one of the major reasons for unsuccessful or failed construction projects. Frequently, contractors will desperately quote a low bid price simply to be awarded a project and expect to compensate through claims (Singh and Tiong, 2006). When vendors are selected based upon the low bid mentality, it becomes difficult for vendors to differentiate themselves based on price alone. As a result, owners could be counteracting with management and control techniques (Kashiwagi, 2012). The utilization of the low bid technique and the mentality of owners looking to control vendors need to be explored, as a developing country like India cannot afford this inefficiency. Despite its worldwide growth, formal project management in the Indian construction industry is rarely evident (Sreepuram and Rao 2006). Modern day India has turned to adopt partnership strategies such as Build-operate-transfer, build-own-operate-transfer, build-own-operate, public private partnerships etc. (KPMG International, 2010).

The Indian construction industry might not have been receptive to new ideas or methodologies to counter the inefficiencies. Despite its worldwide growth, formal project management in the Indian construction industry is rarely evident (Sreepuram and Rao 2006). Corruption could also be identified as the biggest factor for hindrance towards application of any progressive ideas like in most developing countries (Gould, 2013,

Muatjetjeju et al., 2009). The 2010 commonwealth games in New Delhi turned into a source of embarrassment for the entire country as the chief-in-charge of this event was accused and convicted of fraud regarding financial matters which resulted in poor quality of construction at the game venues (NDTV, 2012).

Chapter 4

PROPOSAL

On the basis of the information gathered it could be possible that the current performance of the industry might not support the needs of India. The problem could be related to the supply chain structure. A new model which is more efficient and can identify the problem to inefficiency accurately could produce better results. The Best Value model developed at Arizona State University in the U.S has proved its ability to solve problems related to supply chain structure. The purpose of BV selection process is to identify and select the highest expertise team among the vendor/contractor community. The authors propose this process can solve the problems of the Indian construction industry related to the above mentioned issues.

Chapter 5

METHODOLOGY

The methodology adopted to arrive at a conclusion regarding the solution to non performance issues of the Indian construction industry encompasses of two steps 1) the use of the construction industry structure diagram. The CIS diagram will provide a basis for the implementation of a new system such as the Best Value model. Further effort will be undertaken in developing a plan in order to cause the Best Value model to be a perfect fit in the context of the Indian construction industry. 2) Documented results proving the capability of Best Value to solve similar problems.

Construction Industry Structure (CIS) analysis:

In order to categorize the Indian construction industry and work towards solutions, the Construction Industry Structure (CIS) diagram (Kashiwagi, 2013) was utilized (Figure 1). The CIS is a diagram used to classify industry structures on the basis of the qualities listed, from perceived competition to performance. If the Indian construction industry is classified on the basis of the research in this paper, it would fall under the price based/ owner controlled quadrant due to their structure and practices of utilizing the low-bid traditional method. From this, the Indian construction industry can be seen as one with highly perceived competition and yet characterized by low performance. This validates the research that India's current methods cannot improve the inefficiencies nor meet their increasing construction demand.

High

III. Negotiated-Bid	II. Value Based (vendor controlled)
Minimized competition	Buyer selects based on price and performance
Long term	Vendor uses schedule, risk management, and quality control to track deviations
Relationship based	Buyer practices quality assurance
Vendor selected based on performance	Expertise and professionalism
IV. Unstable Market	I. Price Based (owner controlled)
	Wrong person talking
	Management, direction, and control
	No transparency
	Win-lose
	Low vendor profit

Performance (vertical axis), Perceived Competition — Low / High (horizontal axis)

Table 1 – The Construction Industry Structure (Kashiwagi, 2013)

The construction industry structure identifies the potential changes that need to be made in order to solve the supply chain structure related problem,

- Buyer needs to be selected on the basis of performance, not just price.

- The expert vendor needs to take control.

- Buyer/client should practice quality assurance instead of quality control.

- Increase transparency which in turn will increase accountability.

- Use of vendor expertise and elimination of non expert interference.

- Conversion of a 'Win lose' environment to a 'Win win' environment.

The Best Value approach has characteristics that may help India move from a price based, owner controlled, traditional environment to a higher performing environment. Best value is different from the traditional model in the following ways;

- Client is not an expert.

- Vendor is the expert.

- Does not require the buyer to identify what is being procured at the beginning of the procurement.

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- Requires the best value vendor to write the final contract and define the delivered product.

- Does not require the selection committee to have technical expertise.

- Increases the importance of vendors to show dominant value using performance measurements of their key personnel and processes.

- Technical questions are not asked or discussed until after the best value prioritization.

- Requires vendor to minimize risk they do not control.

- Minimizes the time and cost for vendors to prepare for the procurement process.

- Forces the client's project manager (PM) to be a quality assurance based PM, with non-technical duties.

Dominant results of BV:

The international applications of the BV model can provide many lessons learned and be a source of inspiration in response to India's challenges and unmet demand. The BV model has been applied on 1,600 international projects ($5.8 Billion USD) (PBSRG, 2012). The United States, Canada, the Netherlands, Malaysia and Botswana are of particular interest due to their successful implementations and challenges overcome.

A prime user of Best Value in the United States has been the state of Oklahoma. A total number of 20 projects (100 million USD) have been performed using the BV model. The total savings from these projects has been 29 million USD. No project has seen a cost or time overrun. Average customer satisfaction is 9.5/10 (PBSRG, 2012). Oklahoma had a history of protests from the vendors after failing to secure their contracts. The BV method minimized these protests and devised a way to handle them efficiently by providing

dominant information that documented the process and clearly evaluated the vendors based on their capabilities. This has resulted in far less number of lawsuits and litigations (Kashiwagi, Sullivan, 2012). Apart from this Arizona State University has adopted Best Value for its dining services and book store management. It has saved them $100 million since adopting Best Value (PBSRG, 2012).

In Canada, similar success has been achieved using the BV model. In total, nine projects ($209 million USD) have been performed at the University of Alberta resulting in savings worth $12 million USD. The client project manager's satisfaction on these projects has been 9.9/10. While successful, the implementations in Canada uncover some of the challenges that are currently being addressed in the construction industry sector, such as the need for overall organizational efficiency and supply chain management (Lines et al., 2013). Applications in Canada proved that Best Value could be combined with the existing design-build method, which also makes the transition to a new system smoother.

The BV model revolutionized the Dutch construction industry by reducing cost overruns and delays, in response to their battle with collusion similar to India. The results from projects in the Netherlands showed their delivery time was accelerated by 25%. Time and cost spent on transactions were reduced by 50-60% for both vendors and clients. NEVI, which is the third largest procurement group in the world and a Dutch professional procurement group, has adopted the BV method. The BV model is now being used on complex projects and organizational issues (Kashiwagi, Sullivan, 2012). The Netherlands is perhaps the closest comparison to India when it comes to industry problems. The solution which worked there should stand a reasonable chance in India.

Like India, Malaysia is also another country which has a price based environment. PBSRG attempted to change this situation by introducing Best Value in Malaysia. The professionals agreed with the concepts of Best Value, but were not able to implement it in practice (Kashiwagi et al., 2012). A group by name Brunsfield has attempted to help this effort by using a postgraduate education program to help in the transformation of paradigm. Brunsfield is implementing the "best value" approach to the entire supply chain from development to facility management.

Implementation of Best Value was tried in Botswana as well. The three agencies involved were the US embassy at Botswana, the Bank of Botswana and the University of Botswana. The findings from the US embassy tests confirmed that the problems were caused due to the client's decision making while possessing very little information about the initial conditions and final conditions which governed the project. Additional issues were that the client had false expectations from the non expert vendors who were hired (Mselle et al., 2009).

The Bank of Botswana project was initiated by the identification of a graduate student from the University of Botswana who would be instrumental in bringing the BV technology into Botswana. This effort helped uncover many facts about implementation of the BV approach in a developing country. The BV expert was faced with the challenge of explaining to the Bank of Botswana team with regard to how high performers act in a given situation and instilling confidence amongst the project team which would enable them to be pro active and proceed with the project even in the absence of the BV expert. This test also led to the conclusion that graduate students should be identified in order to

initiate self improvement and bring about a change in their surrounding environment (Mselle et al.,2009).

There was also an effort made to introduce the risk management research and education program in Botswana. The obstacles faced by the facilitator of this effort were convincing the professors at University of Botswana to teach out of research results and not just text books, getting the professors to understand that students are totally capable of challenging current practices, aligning his efforts with their expectation, getting them to embrace the change in paradigm, run prototype tests and overcome the existing cultural resistance to change (Mselle et al., 2009).

Chapter 6

CONCLUSION

India has the same problems in the construction industry as the other developing countries. Best Value essentially identifies the price based quadrant as a prime contributor of problems related to inefficiency and below par performance. As the emphasis is laid completely on low price, the project success and quality is fixed to a bare minimum right at the outset. With the initial conditions of a project fixed to such minimum standards, it could be impossible to change the outcome of the project to a successful one.

The professionals in a developing country face the problem of a controlling owner not using their expertise. Best Value identifies that this is a universal problem. The solution lies in understanding of industry structure and the use of expertise to minimize confusion and transactions. Best Value provides a frame work for contractors to distinguish themselves as high performers in the construction industry. This will in turn create more value on the client's project. Best Value will create a win-win scenario for the client and the vendor. (Kashiwagi and Sullivan, 2012).

By observation and evidence of the discussions through the paper it is easy to comprehend that the Indian Construction industry occupies the price based or owner controlled quadrant. A price based system forces an expert vendor to drop quality and resort to minimum standards since they are constrained by a low and inappropriate budget. Best Value will aim to change this prevailing scenario to the value based system. The change in paradigm has yielded success in other countries where Best Value has been applied. This new model may result in curing the Indian Construction industry's

inefficiency problems and will help enhance the value of projects that are to be undertaken at a very large scale.

REFERENCES

Assaf, S.A., and Al-Hejji, S (2006), 'Causes of delay in large construction projects', *International journal of project management 2006;24(4):349-57.*

Chan, D.W.M., and Kumaraswamy, M.M, 'A comparative study of causes of timeoverruns in Hong Kong construction projects', *International journal of project management 1997;15(1):55-63.*

E.C Harris research built asset consultancy (2011), 'International focus on India'. URL: http://www.echarris.com/pdf/7992_International%20Focus%20on%20India%20FINAL.pdf, (Accessed: 2013, March 25)

Dr. William Gould (2013), The India site, a brief history of corruption in India, URL http://www.theindiasite.com/a-brief-history-of-corruption-in-india/ (Accessed: 2013, February 20)

Iyer, K.C, Jha, K.N (2006), 'Critical factors affecting schedule performance: Evidence from Indian construction projects', *Journal of construction engineering and management, ASCE*/August 2006.132:871-881
.
KPMG International (2010), Global infrastructure, Project delivery strategy: Getting it right.   URL: http://www.kpmg.com/NZ/en/IssuesAndInsights/ArticlesPublications/SmarterProcurement/Documents/Getting-it-Right.PDF (Accessed: 2013, March 24)

Kashiwagi and Sullivan 2012 'the Research Model that Revolutionized the Dutch Construction Industry*', Journal for the Advancement of Performance Information & Value*, 4(2), (Dec 2012)

Kashiwagi, D (2013*), 'Information measurement theory - a revolutionary approach to risk management'*, performance based studies research group, Tempe, Az. Publisher: KSM Inc., 2012.

McKinsey & company inc. (2009), Building India: Accelerating infrastructure projects. http://www.mckinsey.com/locations/india/mckinseyonindia/pdf/Building_India_Executive_Summary_Media_120809.pdf URL: (Accessed:2013, March 20)

Lines, Brian; Sullivan, Kenneth; Perrenoud, Anthony. (2013).' Design-Build Application of Best Value Project Delivery Techniques: Facility Optimization through Preplanning..'*Journal for the Advancement of Performance Information and   Value*. 5(1). Future release.

Manavazhia, M.R., and Adhikarib, D.K (2002), 'Material and equipment procurement delays in highway projects in Nepal', *International Journal of project   management 2002; 20:627-32.*

Mselle, P., Kashiwagi, D., Sullivan, K. (2009). 'Graduate Risk Management Research & Education Program in Botswana'. *Fifth International Conference on Construction in   the 21st Century (CITC-V), Collaboration and Integration in Engineering,   Management and Technology*. Istanbul, Turkey, Proceedings CD, Paper 134, pp   1089-1097.

Mselle, P., Muatjetjeja, M., Kashiwagi, J. and Sullivan, K. (2009) "US Embassy Botswana: Research Test of Best Value Procurement" *International Conference   on People in Construction*, Port Elizabeth, South Africa, pp. 300-312 (July 12-   14, 2009).

Mselle, P., Muatjetjeja, M., Kashiwagi, J. and Sullivan, K. (2009) "Nelson Powder Memorial Contribution to Research Based Graduate Education" *International Conference on People in Construction*, Port Elizabeth, South Africa, pp. 313-324   (July   12-14, 2009).

Muatjetjeju, M; Mselle, P; Sullivan K; Kashiwagi, D. (2009)   Is the Culture Or a Unstable   Procurement   Model   that   Causes   Nonperformance   in   Botswana ProjectManagement? *Fifth International Conference on Construction in the 21st Century (CITC-V) "Collaboration & Integration in Engineering, Management,   and Technology". May 20-22, 2009. Istanbul: Turkey.*

NDTV India (January 19, 2012), 'top 10 facts about Kalmadi's commonwealth games scandal',   URL   [http://www.ndtv.com/article/india/top-10-facts-about-kalmadi-s   commonwealth-games-scandal-168481](http://www.ndtv.com/article/india/top-10-facts-about-kalmadi-s%20commonwealth-games-scandal-168481) (Accessed: 2013, January 29)

Ogunlana, S.O., and Promkuntong, K (1996), 'Construction delays in a fast growing economy: Comparing Thailand with other economies'. *International journal of   project management 1996;14(1): 37-45.*

Performance   based   studies   research   group,   Arizona   state   university,   URL: http://pbsrg.com/project-case-studies/, (Accessed: 2013, March 3).

Population   reference   bureau,   'The   BRIC   countries',   URL http://www.prb.org/Articles/2012/brazil-russia-india-china.aspx,   (visited,   2013 March 2)

PricewaterhouseCoopers (2009), 'infrastructure in India: A vast land of construction opportunity'.   URL: http://www.pwc.com/gx/en/engineering-construction/emerging-markets/publications-infrastructure-in-india-a-vast-land-   of-construction-opportunity.jhtml (Accessed: 2013, March 21).

Report of the working group *, Human Resource Development for Construction Sector*, 12th plan (2012-17), constituted as per CIDC letter No.2253/12th- National plan/WG2011 dated 22nd September, 2011 (Annexure-1) New Delhi.

Report of the working group, *procurement systems and dispute resolution for construction sector*, 12th plan (2012-17). Constituted as per CIDC letter   No.2253/12th-National plan/WG2011 dated 22nd September, 2011 (Annexure-1) New Delhi.

Report of the working group, *quality standards and environment issue for construction sector*, 12th plan (2012-17). Constituted as per CIDC letter No.2253/12th- National plan/WG2011 dated 22nd September, 2011 (Annexure-1) New Delhi.

Report of the working group, *R&D for construction sector*, 12th plan (2012-17). Constituted as per CIDC letter No.2253/12th- National plan/WG2011 dated 22nd September, 2011 (Annexure-1) New Delhi.

Report of the working group, *regulatory framework, including self regulation and issues leading to time and cost over runs in the projects for construction sector*, 12th plan (2012-17). Constituted as per CIDC letter No.2253/12th- National plan/WG2011 dated   22nd September, 2011 (Annexure-1) New Delhi.

RICS Research (2011), 'Real estate and construction professionals in India by 2020, a demand and supply assessment of specialized skill-sets in built environment'. URL:http://www.rics.org/Global/Real%20estate%20and%20construction%20professionals%20in%20India%20by%202020.pdf, (Accessed: 2013, March 21)

Sambasivan, M., and Soon, Y.M (2006), 'Causes and effects of delays in Malaysian construction industry', *International journal of project management 25 (2007) 517526.*

Singh, D., and Tiong, L.K. (2006), 'Contractor selection criteria: Investigation of opinions of Singapore construction practitioners', *journal of construction   engineering and management*. 132 (9), 998-1008.

Sreepuram, P., Rao, A.K. (2006), 'Build organization capabilities to utilize IT*', Proceedings of the World Conference for Design and Construction,* INCITE/ITCSED 2006, New Delhi, India, November 2006, Vol. 4 pp72-80

Straub, S., and Hagiwara, T.A (2010), 'Infrastructure and growth in developing Asia', *ADB   economics   working   paper   series   No.231.*   URL: http://library.umac.mo/e_resources/org_publications/b11823525.pdf, (Accessed: 2013, September 25).

Tabish, S.Z.S & Kumar Neeraj Jha (2011): 'Identification and evaluation of success factors for public construction projects'*, construction management and   economics*, 29:8, 809-823.

The Indo-Italian chamber of commerce and industry (2008), 'overview of the construction   industry   in   India'.   URL: http://www.ukessays.com/essays/management/construction-industry-in-india-construction-management-essay.php (Accessed: 2013, March 20)