Risk Factors and Potential Solutions for the Construction Industry in China

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The Chinese construction industry (CCI) has grown to be one of the largest in the world within the last 10 years. The size of the CCI is on par with many developed nations, despite it being a developing country. Despite its rapid growth, the productivity and profitability of the CCI is low compared to similar sized construction industries. In addition to the low efficiency of the CCI, the minimal documented performance information collected, shows projects being completed over budget, over the scheduled time, with poor quality of work. A literature research was performed on other developing countries similar to the CCI, to identify if there were any solutions that had been proven to improve the productivity and performance of a construction industry. It was found that Vietnam, The Kingdom of Saudi Arabia and India were the closest to China with enough documentation on their construction industry. Both countries identified the Best value Approach (BVA) as the only solution with documented performance showing it could solve the issues developing countries face with their construction industry. This paper proposes that more research should be performed looking into the ability of the CCI to implement the BVA.

Keywords: Literature search, Risk, Best Value, China, International.

Introduction

China Construction Industry

In the last 10 years the Chinese economy has been the fastest growing, and one of the largest in the world. Recent statistics have shown China's gross domestic product (GDP) increased from $4.6 billion in 2008 to $12.2 billion in 2017, making China the second largest economy in the world (Liu et al., 2012; Trading Economics, 2017). Compared to developed countries, it has surpassed their growth by more than 4 times in many cases. Table 1 shows the difference between China's GDP growth and the developed countries. China's GDP has grown 144% in the last 10 years. Compared to other developed countries, the GDP growth of China is three times that of South Korea and six times the U.S. Meanwhile, some developed countries' GDP decreased. For instance, the GDP of Japan and Canada respectively dropped 20.3% and 17% from 2007 to 2017 which were the highest decreases in GDP of developed countries. France's GDP also dropped 15.3% at the same time. As a developing country, Russia's GDP dropped 42% for last 10 years (Trading Economics, 2017), which is another strong evidence that China's economy is becoming stronger and contributing more to the international economic stage.

Table 1: GDP Growth Comparison of Developed Countries vs. China.

Country	GDP growth in last 10 years (2007-2017)
China	144%
South Korea	41%
U.S.	27%
Australia	23%
U.K.	-8.40%
France	-15.70%
Canada	-17%
Japan	-20.30%
Russia	-42%

When compared to developing countries, China still has the fastest growing GDP. Table 2 shows the comparison between China's GDP growth and other developing countries. The next fastest growing countries are Vietnam (GDP growth is 107%) and India (GDP growth is 91%) (Trading Economics, 2017).

Table 2: GDP Growth Comparison of Developing Countries and China.

Country	GDP growth in last 10 years (2007-2017)
China	144%
Vietnam	107%
Mongolia	99%
India	91%
Indonesia	83%
Saudi Arabia	76%
Philippines	75%
Thailand	74%
Oman	33%
Bahrain	24%
Turkey	15%

Along with this economic growth, the Chinese construction industry (CCI) has also grown to be one of the largest in the world (Cook, 2013). China has done this by spending the most amount on construction compared to other developed and developing countries on average (ENR, 2005). The CCI's contribution to the overall GDP increased from 3.8% in 1978 to 6.7% in 2016 (Liu et al., 2012; Chinese Construction Statistical Analysis, 2016)). The size of the CCI is on par with many developed nations, despite it being a developing country. Table 3 shows the ratio of construction GDP over Annual GDP from different countries including developed countries and developing countries. The average ratio of construction GDP among countries is 3.2%, which the U.S. construction industry's contribution to the GDP is 3.5% and Australia is 2.1%. The only Asian country which has a construction industry that contributes to the GDP comparable to the CCI is Japan. However, Japan being a developed country, it uses its construction industry as a control mechanism and support for its overall economy. When looking at Japan's overall GDP and its construction GDP, it can be observed that when the overall GDP went up, the construction GDP went down at the same time. The same is true for the opposite, when the overall GDP went down, the construction GDP would increase. For Japan they use construction to boost their economy in times of economic decline.

Table 3: The ratio of construction GDP over annual GDP of different countries.

Country	Construction GDP / Annual GDP
China	6.60%
Canada	6.50%
Japan	5.20%
Vietnam	4.40%
U.S.	3.50%
Australia	2.10%
Russia	1.80%
SEA Average	1.70%
U.K.	1.40%
France	1.20%
India	1.20%
South Korea	1.20%
Average	3.20%

Comparing the CCI GDP's growth rate to the U.S., the U.S.'s construction GDP declined by 20% in last 12 years (Trading Economics, 2017). Other research identifies that China's construction industry spending growth rate is higher than the U.S., and Eurozone countries [Global Construction Outlook, 2013]. For the international market participation, one research shows that China ranked No.3 within the construction global market in 2013 (Global Construction Outlook, 2013). It was the only developing country to compete with developed countries.

China Performance Information

Despite the CCI's rapid growth and its importance to the country's economy, the productivity and profitability of the CCI is low compared to similar sized construction industries. The CCI faces many issues dealing with its performance. One set of research findings stated that compared to the U.S. construction industry, the CCI employed 31 times more people and the average output per person is only 5% of U.S.'s workforce and 6% of output of the average Japanese workforce. Although CCI spends more than the U.S., it still delivers 23 times less construction services than the U.S., which shows the major issue the CCI deals with in regard to their low productivity and inefficiency (Xu et al., 2005; Zhang et al., 2008).

Currently the CCI does not have a lot of information on construction performance. A preliminary literature research revealed that there is no documentation on the CCI's overall performance published. There were only a couple of studies performed that found performance information on construction projects in China. One study researched stakeholder satisfaction. It found that out of 200 construction projects in China in 2005, 24.3% had violated related regulations and only 13% could be ranked as "good quality" (Zhang et al., 2008). Another research found that in 2005, only 12.85% of 515 government projects in Shenzhen and Hong-Kong completed within the schedule completion date (of the projects delayed the average delay was 21.34% over the original schedule). Also, in 2004, 73% of 30 government projects reported being 20.3% over the original budget (Zhang et al., 2008).

Research identified that the CCI has the following characteristics, which includes:

1. Important component for China. CCI is a large component of country's GDP.
2. Productivity and Efficiency is poor.
3. Large international market share.
4. Perceived performance issues, but little documentation of actual performance and quality.

Proposal

The CCI can improve its performance and efficiency through utilizing the advancements in construction delivery methods, developed by other countries. Worldwide there has been an effort to identify higher performing practices in risk management, project management, and procurement. There are many developing countries, where the construction industry has had rapid growth and also has been a major part of their development and are facing the same issues as China. This aim of this research is to identify the countries that the construction industry is most like the CCI and identify ways in which they have found could improve performance and productivity.

Methodology

To find ways to develop and improve the CCI the following steps will be followed:

1. Perform an analysis on developing countries and their construction industries (GDP, Construction GDP, Corruption Index, Construction GDP Growth, any other dominant information) to identify which countries are most like China and the CCI.
2. Perform literature research on construction best practices and solutions identified by developing countries similar to China and the CCI.
3. Identify solutions which solutions could improve the CCI.

Analysis on Developing Countries Similar to China and CCI

The analysis performed, collected the following information on major developing countries in Asia:

1. Corruption Index.
2. Construction GDP.
3. Construction GDP growth.
4. Available information on the countries.

The researcher identified 2 websites to research the construction GDP and corruption index of the major developing countries in Asia. The first website was the only source available that documented the desired information. The second source was used as a verification source.

Two sources were used:

1. TradingEconomics (Trading Economics, 2017)
2. Corruption Perceptions Index 2017 (Transparency International, 2017)).

Table 4 shows the major developing countries and their information. The corruption index score of the developing countries were looked at first. The corruption index score goes from 46 to 33. The lower the corruption score, the more corruption that the country experiences. Corruption score being defined as: Corruption Perceptions Index (CPI). Any developing country within 5-10 points of China's score was considered.

Table 4: Corruption Index of Developing Countries.

Rank	Country	Score	Construction GDP ($)	Construction GDP (%)
62	Saudi Arabia	46	$8.64B	4.8%
64	Oman	45	$5.94B	8.9%
70	Bahrain	43	$0.59B	1.8%
75	Turkey	41	$8.08B	0.9%
79	China	40	$844B	7.5%
79	India	40	$35.7B	8.0%
87	Mongolia	38	$0.22B	2.1%
90	Indonesia	37	$19.21B	2.1%
101	Philippines	35	$4.3B	6.2%
101	Thailand	35	$2.27B	2.5%
113	Vietnam	33	$1.29B	4.4%

Second, the construction GDP of the considered countries was then looked at. Construction GDP is defined as the amount charged by construction companies to customers for the value of work (produced during the reporting period) excluding VAT and payments to sub-contractors (Office for National Statistics, 2016). China's construction GDP was $844B, no other country could compare with China's construction GDP. The country with the next highest construction GDP was India at $36B. The researcher noted that the magnitude of China's construction GDP makes the country unique from other developing countries. However, to identify countries similar to China, the percent the construction GDP contributed to the overall GDP was considered. China's construction GDP contributes 7.5% to the overall GDP. Any developing Asian country that their construction GDP contributes more than 4% to the overall GDP was considered.

This narrowed the countries similar to China to only 6 countries (see Table 5). Third, the next factor that was looked at was the construction GDP increase over the last 7 years. Table 5 shows the construction GDP increase for the 6 countries. One of the issues China faces is that although their construction industry is one of the largest in the world, it is relatively young (Zhang et al., 2008). Many issues arise when an industry grows too quickly. Looking at the growth of the CCI over the last 7 years it has increased by 172%. The only country that had a comparable growth was the Philippines that increased its construction GDP by 150%.

Table 5: Construction GDP Growth of Developing Countries.

Country	Construction GDP ($)	Construction GDP / Annual GDP	Construction GDP Increase (2010 – 2017)
Saudi Arabia	$8.64B	4.80%	38%
Oman	$5.94B	8.90%	74%
China	$844B	7.50%	172%
India	$35.7B	8%	14%
Philippines	$4.3B	6.20%	150%
Vietnam	$1.29B	4.40%	40%

After this analysis, the 6 countries remained as similar to China and the CCI (see Table 6). The fourth and last step was to perform a literature search on these countries to identify which countries had enough information on their construction industry to provide potential solutions to the CCI. The search included 4 major research databases (ASCE Library, Science Direct, Taylor and Francis Online, Emerald Insights), and more than 3200 articles were reviewed to identify any information on the construction industries in any of the six countries listed in Table 5. Table 6 shows the result of the literature research.

Table 6: Analysis to Identify Previous Work of Construction Industry in Developing Countries.

Country	Reference of Construction Industry
Saudi Arabia	45
Oman	1
China	46
Philippines	0
Vietnam	50
India	25

The only two countries that had information published and research performed on their construction industries was Saudi Arabia, Vietnam and India. Even though the other two countries (Oman and Philippines) characteristics were more similar to China's, they were not developed enough to be able to perform research on their construction industry.

Literature Research on Vietnam, Saudi Arabia and India Identified a Solution to Improving the Construction Industry

Almost 100 papers and publications were found on the Kingdom of Saudi Arabia, Vietnam and India construction industries (KSACI, VCI and ICI). These papers reviewed the issues, risks, and solutions that the countries have found to be able to improve their construction industries'. The literature research into these three construction industries found that all the countries also currently suffer from low performing construction services and are seeking for ways to improve them. The literature did not identify many solutions that can help improve construction performance. However, there was one potential solution identified called the Best Value Approach (BVA). BVA was identified by all three countries as a solution that could potentially work in improving construction efficiency and performance. The solution met all the requirements and constraints of the VCI, KSACI, and ICI (Nihas, 2013; Le, 2017).

The BVA was identified as the only solution that had documented performance information validating its ability to improve construction performance. It was found that KSACI had five Ph.D. candidates all performing research on the BVA (Alzara, 2016; Alofi, 2017; Alhammadi, 2017; Almutairi, 2017; Alghatani, 2018). In reviewing papers available on an on-line community called *Research Gate* it was found that the BVA Saudi Arabian articles had more than 1852 reads, showing the interest in the KSACI community (Research Gate, 2018). Vietnam also had a Ph.D. candidate that is performing research on its implementation of the BVA (Le, 2017). India had a master's student perform preliminary research on its potential implementation of the BVA. All findings from the author was published on the same online community (ResearchGate) and has 4,124 reads. What is significant about this is that compared to related research, the next highest number of reads has been seen to reach around 400. This also shows a significant interest in the Indian community. From the literature research it was identified that five major studies had been performed identifying the BVA to be the only model with the potential to help developing countries overcome their construction issues. These studies included the following:

1. CIB TG 61 Worldwide solutions to non-performance (Egbu et al., 2008; Rivera, 2017).
2. PBSRG Project Management Systems Comparison (Rivera, 2017; PBSRG, 2018).
3. Improving Infrastructure Projects in Sub-Saharan Africa (Monteng, 2016).
4. Saudi Arabian Classification System research (Alzara, 2016; Alofi, 2017; Alhammadi, 2017; Almutairi, 2017; Alghatani, 2018).
5. Preliminary analysis of implementing the BVA in India (Nihas, 2013)

CIB TG 61 Worldwide solutions to non-performance

A monumental research effort was performed in 2008 (Egbu et al., 2008), by Task Group (TG61) of the International Council for Building (CIB), which is now CIB Working Commission W117. The research effort investigated innovative construction techniques and systems that used performance metrics to increase quality and performance of services. The study involved 15 million articles and investigated 4,500 of them to ensure a complete search was made. The result of the effort identified that only 16 articles had documented that the method had increased performance and efficiency. It also discovered that there was only one method that had repeated testing to prove that the results could be replicated and that was the Best Value Approach (BVA) (at the time BVA was known as the Performance Information Procurement System (PIPS) / Performance Information Risk Management System (PIRMS)). The study found that 12 out of the 16 (75%) articles found, were written on the BVA.

PBSRG Project Management Systems Comparison

In 2016, The Performance Based Studies Research Group (PBSRG), performed an analysis of all the major project management (PM) systems. This effort was headed by Dr. Alfredo Rivera who wanted to identify the highest performing project management method. This study performed a literature search on all the top PM systems, including: Lean, Six Sigma, Waterfall, Agile, etc. The effort involved a literature search of 10,503 articles, from which the researchers reviewed more than 800 of them. The results of the study found that although many of the PM models had numerous anecdotal testimonies that the model increased quality, decreased time, and decreased cost, there was minimal documented evidence showing that the models had impacted the

performance of projects. The only PM model that had repeated testing and documented improvement of project performance was the Best Value Approach (BVA).

Improving Infrastructure Projects in Sub-Saharan Africa

In 2016, Dr. Emmanuel Moteng performed research through the SKEMA business school located in Lille, France, to identify if the BVA could improve project performance and efficiency in Sub-Saharan African countries, specifically the Democratic Republic of Congo (DRC). The DRC was currently engaged in an effort to try and create a hydro-electric dam in its country that would have the potential to create energy for almost all of Africa. The project had multiple issues that was causing delays and increased costs. The study analyzed the BVA to see if its approach could handle the causes of failure and constraint of the under developed African countries. Dr. Moteng through a literature research identified different factors of current project delivery systems and factors of the BVA. He then identified the constraints of the DRC and compared the current delivery methods to the BVA in which was more suited to the conditions of the DRC. The results are showed in Table 7. Dr. Moteng discovered that the current practices were failing because they required more management, communication, decision making, and owner expertise, which Sub Saharan African countries do not have the capability of supplying.

Table 7: Link between research questions, propositions and methods.

FACTORS	CCI CONDITIONS	DRC CONDITIONS	BEST VALUE APPROACH	CURRENT PRACTICES
Management	*Less Available*	*Less Available*	*Require Less*	*Require More*
Communications	*Less Available*	*Less Available*	*Require Less*	*Require More*
Decision Making	*Less Available*	*Less Available*	*Require Less*	*Require More*
Transparency	*Require More*	*Require More*	*Bring More*	*Bring Less*
Performance measurement	*Require More*	*Require More*	*Bring More*	*Bring Less*
Owner is the expert	*Less Available*	*Less Available*	*Require Less*	*Require More*
Alignment of resources	*Require More*	*Require More*	*Bring More*	*Bring Less*
No silos	*Require More*	*Require More*	*Bring More*	*Bring Less*

To identify how Dr. Moteng's research is related to the CCI, Table 7 was modified from Dr. Moteng's original version to include a column that identified the CCI conditions. The DRC and CCI conditions matched up perfectly, showing that the BVA could not only help the DRC, but also the CCI as well.

Saudi Arabian Classification System Research

From 2016-2017 multiple Saudi researchers at Arizona State University performed their dissertation research efforts on identifying ways to improve the Kingdom of Saudi Arabia's construction industry (KSACI) and contractor classification system. Their studies showed that the KSACI had been delivering poor performing construction services for more than the last 10

years. The research also discovered that the current contractor classification system (CCS) also was not able to ensure that the government was receiving high performing construction services. Dr. Saud Almutairi performed a literature searching 80 countries to identifying all of the CCSs being used. Out of the 80 countries he found that only 8 countries used a CCS. He also discovered that none of the CCSs had a way to continually track contractor performance over time. The only system that had showed a capability to regulate the performance of contractors over time was the BVA. From this research the KSACI used the BVA principles to help reshape the Kingdom of Saudi Arabi's CCS.

Preliminary Analysis of Implementing the BVA in India

In 2013, Syed Nihas performed research at Arizona State University as part of his Master's Thesis, to identify the state of the construction industry in India and identify if the BVA could be implemented despite how diametrically opposed its characteristics are compared to the traditional culture of India. Syed Nihas, through a literature research and survey of 136 number of contractors in India, identified the construction industry possesses characteristics that are similar to those of DRC, Saudi Arabia and Vietnam such as the industry is owner-centric, uses of management, direction, and control approach to risk, silo thinking, and increase of decision making (Nihas, 2013).

He identified that in order to implement the BVA the following structure would need to be setup:

1. Identify visionaries in the construction industry that want to run testing on the BVA to identify impact (visionaries include owners, educators, stakeholders in the supply chain).
2. The representatives must be identified through education and presentations. Visionaries are susceptible to deductive, simple, 30K foot, supply chain approach.
3. Identify a local university that can set up a research hub to sustain research effort of conducting tests and documenting results.
4. Industry representatives and educators must work together.
5. Run small tests, document and publish results in journals.
6. The tests must be presented to the industry.
7. Repeat the cycle.

Since his study, over 8 presentations have been given to Indian construction industry leaders on how to deliver services more successfully. An engineering university has been potentially identified as the post to set up BVA research and testing, but it is currently being developed.

Literature Research Conclusion

The Best Value Approach was the only solution that Vietnam, Kingdom of Saudi Arabia and India identified as a method that could help improve their construction industry performance. The major studies and references that these countries found to support this conclusion involved researching thousands of papers and analyzing delivery, project management, and contractor classification systems. The only solution that both countries identified as a potential solution to their issues have been the Best Value Approach (BVA).

Best Value Approach

The "Best Value Approach" is licensed by Arizona State University's intellectual property (IP) licensing arm, AzTech. The BVA is the most licensed IP (60 licenses over 25 years) developed at the most innovative university in the U.S. (identified as the most innovative university for the past four years) by the U.S. News and World Report (ASU News, 2018). It has been tested over 2,000 times delivering over $6.6B of services in ten different countries (PBSRG, 2018).
The Best Value Approach was developed by Dr. Dean Kashiwagi at Arizona State University in 1991 for his dissertation research. Over the last 27 years the Performance Based Studies Research Group, has been testing the BVA continually and documenting its results. The testing has led to modifications in the BVA that have improved project results and made it easier to implement.

The BVA utilizes performance information to identify expertise through a competitive process, then allows expert vendors to plan a project from beginning to end and create transparency by using a simplified milestone schedule to track project time and cost deviations. The entire process minimizes the professionals' thinking and decision making, allowing the expert vendors to minimize cost by 5 – 30%, and minimizing vendor caused time and cost deviations to under 1% (PBSRG, 2018).

The BVA has three main phases (selection, clarification, and execution) (see Figure 1). It can also perform a pre-qualification phase, but it is optional. The three phases cover the main project delivery activities, such as, procurement, negotiations, contract creation, project management, and risk management. This enables the BVA to help in the entire project delivery process. What makes the BVA unique is that it is the only project delivery method that minimizes the need for the owner to have any technical expertise or responsibility for the project, while still ensuring the vendor is accountable for delivering a high performing product. It does this through creating a structure that can first select the contractor with the highest level of expertise. It then requires the expert to perform the work without any management from the owner/buyer. However, it also requires the vendor to justify their schedule, cost, and how they will do the work, in a way that the owner/buyer can understand and approves of.

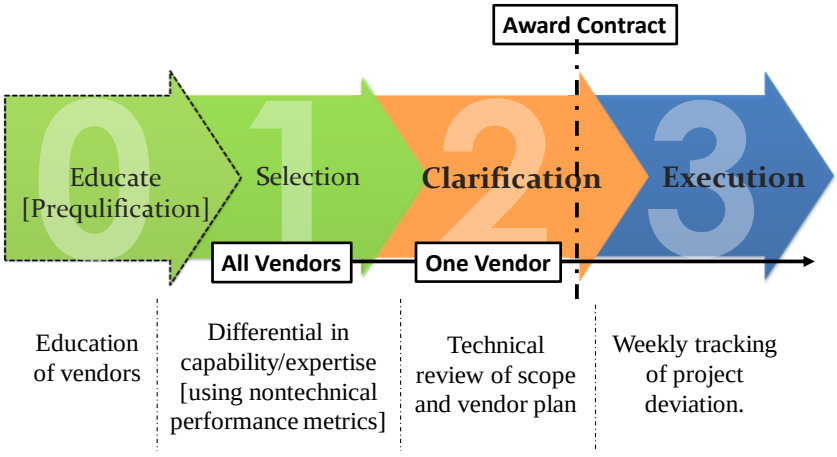

Figure 1: PIPS Phases.

There have been many professionals that have expressed concerns with the system and do not believe that a vendor can be given control of a project and deliver high quality services and think in the best interest of the owner/buyer. However, the results of the BVA has identified that it not only improves performance, but also increases the value the owner/buyer receives. A research study was performed on the Best Value Approach by Dr. Jacob Kashiwagi at Delft University of Technology, out of the Netherlands (Kashiwagi, 2013). The research involved 5 different major buyers in the United States (Arizona State University, State of Idaho, University of Idaho, Schering Plough (now MERCK), and the State of Oklahoma), and involved 31 projects (30 different types of services). The study documented the results of the projects when the service was delivered using traditional models. The results of the service were also documented when it was delivered through the BVA. The study found the following (see Table 8):

1. Cost of services decreased on average by 31%.
2. Suppliers were able to offer the buyer 38.5% more value, totaling up to $72.76M.
3. Average customer satisfaction of services provided increased by 4.59 points on a 1-10 scale (134% greater than the traditional customer satisfaction rating).

Table 8: BVA Project Delivery Results Compared to Traditional Model Results.

	Overall Comparison	
Criteria	*Traditional*	*BVA*
# of Outsourced Services	31	
Cost of Services	$274,480,342	$189,001,943
Added Value	-	$72,762,248
Average Customer Satisfaction	3.43	8.02

The BVA has the following characteristics:

1. Automation: minimizes all thinking and decision making by the professional representing the owner.
2. Simplicity: uses the language of metrics to communicate.
3. Transparency: uses only observable metrics to minimize any decision making.
4. Minimizes communications to three submittals of two pages each, a cost proposal and an interview.
5. Utilizes a rating system that rewards the level of expertise, risk mitigation and value added if claims of performance are supported by observable performance metrics. If thinking and decision making is required, a neutral rating is given.
6. The Best Value expert vendor writes the contract.

The BVA is comprised of four phases (Figure 1). These phases achieve the following:

1. Prioritize the competitive vendors based on five selection criteria: level of expertise, identification and mitigation of risk, value added, cost and interview.
2. Take the best value vendor (highest level of expertise and lowest price) into a clarification phase where the expert vendor shows a plan from beginning to end, simplifies the plan with milestones based on observable metrics and includes all stakeholder actions in the plan.
3. Vendor creates a Weekly Risk Report (WRR) that tracks the project time and cost deviation. It becomes the major component of the contract.

4. Expert vendor writes the contract that includes the terms and conditions of the owner.
5. The owner signs the contract and the expert vendor executes the service.

Testing of the BVA over 25 years has resulted in the following:

1. Minimized vendor caused project deviations to less than 1%.
2. Confirmed that 90% of all project risk are caused by the owner's professionals and that the expert must mitigate the risk that they do not control.
3. 100% of all projects with a clarification period and WRR are successful.
4. Professional PM only need to do 10% of the work of traditional systems and still achieve better results.

The BVA is a system that has a proven past performance of improving project efficiency and performance. The BVA could improve the performance of the CCI and help it to develop to become more productive and efficient.

Key Difference Between China and Other Developing Countries

During this research there was only one major difference found between China and its similar developing countries (Vietnam, Saudi Arabia, and India), as well as almost every developing country identified. The difference is the high government participation in the construction industry. In the CCI there is little or no separation between government and construction enterprises. Most contractors and vendors are owned by the government. The dynamics of this structure creates a construction industry that is less transparent, and performance based, and more relationship based than most other countries. One of the relationship-based characteristics in the CCI is known as "Guanxi" (good relations). Research studies have shown that guanxi is perceived from project stakeholders as the most important criterion determining the success rate of a project. Some engineers determine if their project is successful simply by if they have good relations/guanxi among the stakeholders, regardless if the project was delayed, over budget, and low quality. (Wang, X. and Huang, J., 2006). To make the situation worse, China's state-owned construction enterprises are large and inefficient, many have administrative processes and technology that are outdated and not competitive. Most of them have an equity debt ratio of 75% (He, 2000), which is very high for construction enterprises, and some are likely to declare bankruptcy, even if no competition is posed by foreign enterprises. On the other hand, many non-state-owned constructions enterprises are higher performing. Currently the privately-owned consulting firms are smaller compared to the government consulting firms, but the total output of the private sector has surpassed that of the state-owned enterprises since 1989 (Xu et al., 2005).

Conclusion

In the last 10 years the Chinese construction industry (CCI) has become one of the largest in the world. It rivals many developed countries' construction industries. It has become one of the most important aspects of China's economy. However, its rapid growth has also created issues in

productivity and performance. It has also had a difficult time documenting its performance and issues.

To help the CCI identify possible solutions to its issues, this research performed an analysis and literature research on other developing countries that were similar to the CCI to see if there were any solutions that had been proven to improve the productivity and performance of a construction industry. After analyzing the major developing countries in Asia (Corruption Index, Construction GDP, % Construction GDP contributes to overall GDP, and Available Information), there were only three countries that were found to be similar to the CCI: Vietnam, The Kingdom of Saudi Arabia and India.

All three countries identified that the Best Value Approach was the only proven method that had performance documentation validating its ability to improve performance and productivity. In researching on the BVA, four major studies were found identifying the following:

1. BVA was the only construction method with repeated documentation showing high performing results.
2. BVA was the highest performing and most documented project management model.
3. BVA has the right factors enabling developing countries to implement the method.
4. BVA impacts every major step in project delivery (procurement, negotiation, contract creation, and project management).

The BVA has been implemented in 10 different countries and research has shown that it is able to deliver services for 30% cheaper and deliver almost 40% more value.
Although the BVA seems to be a viable solution, the research did recognize that China has one major difference than other developing countries: the government's involvement in both the buying and delivering of construction services. Due to the government being both the buyer and the contractor in many cases, it has created an environment where in many cases relationships (Guanxi) is more important to success than the cost, time, and quality of a project.
Further research will be done analyzing if the CCI would be able to implement the BVA and improve construction performance and productivity.

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