

# Identifying the Global Performance of the Construction Industry

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This paper presents a literature research assessing the performance and issues of delivering construction services worldwide, by exploring reasons for delays and increased construction costs. The study shows a comparison of the performance of the construction industry between different continents and countries. The purpose of this paper is to identify the state of the construction industry, regarding the performance of delivering professional services. Multiple research databases were looked through and performance information was taken from over 95 publications. The results reveal that although the construction industry is growing throughout the world, there are many of the same problems being experienced in delivering construction projects in developing countries and developed countries. The literature reveals that all countries and continents are experiencing the same stubborn issues. On average, 72% of projects are delayed with 38% increase in original contracted duration, and 63% of projects experienced cost overruns with 24% increase in original contracted cost. Additionally, rework is also a factor that affects performance and accounts for 6% increase in total project costs. Customer satisfaction on projects is low, and 90% of all major issues causing non-performance are due to people.

**Key Words:** Construction, Worldwide, Performance, Cost overrun, Schedule delay

## Introduction

According to the Pew Research Center, the global population is expected to reach 9.6B in the year 2050, a 26% increase in population (from 7.1B in 2015). Of the 9.6B, 6B will be within the working age of 15-64 years old. Africa is expected to nearly double in population, surpassing the global share of people, while the U.S. is expected to add 89 million people to its population. India is expected to grow by 400 million, surpassing China's population, which is only expected to increase another 25 million. With such a large increase in populations around the world, infrastructure development is also expected to increase. Interestingly, Construction Industry Institute's (CII) expert, William Badger, estimates that the world will build more things in the next 30 years than in the last 2000 (CII, 2015).

## Problem

The purpose of this paper was to conduct literature research and document the state of the construction industry, regarding the performance of delivering professional services. A preliminary literature search was initially performed in the U.K. and U.S., and identified significant documentation of poor performance. The literature identified that the industry has struggled with overcoming poor delivery of services, and has not seen any significant improvement in the last three decades, despite the increase in professional education and training (Egbu, 2008; Goff, 2014). This is interesting, because not only will there be more projects in the next 30 years (CII, 2015), but projects

have become larger and more difficult to manage due to the increasing number of participants, the increasing importance of legal contracts (Kashiwagi, et al., 2009), and all the participants in the supply chain segmented in silos, resulting in an increased level of complexity. By observation, it appears that the industry is having a difficult time identifying the source of its own problem and has not developed a significant enough solution to overcome the high amounts of poor performing projects (in terms of on time, on budget, with high customer satisfaction). Multiple parties that may be proliferating the problem are the following:

- Manufacturers of systems and materials.
- Owners/owner project managers.
- Procurement personnel.
- General contractors/subcontractors.
- General contractors and sub-contractor project managers.

The research conducted in the U.K. has documented construction performance in showing minor improvements from 2000 to 2011 in certain areas, but continues to suffer in others (Kashiwagi, 2013):

- Overall customer satisfaction increased from 63% to 80%.
- Customer satisfaction for projects over 5M Euros was at 73%.
- Projects completing on time increased from 28% to 45%.
- Projects completing on budget increased 50% to 63%.
- Contractor profitability declined to 5% from 7% in 2010.

Studies have also been conducted in the U.S. showing similar results of construction non-performance (Kashiwagi, 2013):

- Productivity has decreased by .8% annually.
- Construction companies have the second highest failure and bankruptcy rate of 95%.
- Over 90% of transportation construction jobs are over budget (Lepatner, 2007).
- Almost 50% of time is wasted on job site (Lepatner, 2007).

Because the industry misunderstands the source of its own problems, few academic researchers and practitioners have published their ability to create a successful hypothesis, run cycles of tests, which have resulted in the changing of industry practices and poor performance. The most impactful research identified, has led to conclusions that pre-planning is critical, hiring expert contractors will result in better performance, risk is mitigated when the supply chain partners work together, and expertise is utilized at the beginning of projects (Rijt, and Witteveen, 2011). The fact remains that the delivery of professional services needs a solution that is proven in industry to overcome the seemingly inevitable poor performance.

## **Hypothesis**

With continued industrial growth around the world and poor performance identified in the United States and United Kingdom, the authors proposed that every country worldwide with documented performance information, has similar issues and performance.

## **Methodology**

In order to better understand the worldwide performance of delivering professional services in the construction industry, the authors proposed to do the following:

1. Literature research on construction performance worldwide.
2. Compare construction performance worldwide.
3. Literature research on major construction issues worldwide.
4. Analysis of worldwide construction data.

In order to identify the worldwide construction performance, the authors conducted the following four steps:

1. First, the authors documented and reviewed all publications on construction performance that they could locate.
2. Second, the authors selected 38 major countries from six major regions, to further investigate the construction performance. The major countries were selected, based upon the availability of documentation of performance information on construction projects.
3. Third, the authors reviewed each publication documented, and identified the four major performance indicators that contributed to unsuccessful projects:
  - a. Rework – work that was not properly done, and required additional hired labor to correct.
  - b. Cost overrun – the amount of money exceeding the original cost.
  - c. Schedule delay – the amount of time exceeding the end completion date (critical path).
  - d. Customer satisfaction – how satisfied the owner/client was with the delivered service.
4. Fourth, the authors created an excel spreadsheet database that would track each country's publications, in terms of the four performance indicators and major issues available.

#### *Searching and Filtering through Literature*

The study first looked into currently available construction performance data from CII and KPMG, to quantify the issues within the industry. Next, the study looked for additional performance information in 3,200 publications. Relevant publications were found by viewing abstracts from one of the four research databases [ASCE Library, Science Direct, Taylor and Francis Online, Emerald Insights]. In total, out of the 3,200 publications, 260 were found to be related to the research topic, and were reviewed in more detail. After further review, only 95 had documentation for each selected country, on the four performance indicators and major issues. The regions and countries researched were the following (see Table 1 below):

Table 1

#### ***List of Countries Researched (PBSRG, 2015)***

<b>Regions</b>	<b>Countries (# of Documented Papers)</b>	<b>Total Countries</b>	<b>Total Papers</b>
Africa	Botswana (1), Ethiopia (1), Ghana (3) Kenya (1), Libya (1), Nigeria (11), Rwanda (1), Uganda (1), United Republic of Tanzania (1)	9	21
America	Canada (1), USA (4)	2	5
Asia	Cambodia (1), China (1), Hong Kong (1), India (6), Indonesia (2), Korea (3), Malaysia (6), Thailand (2), Vietnam (2)	9	24
Europe	Finland (1), Ireland (1), Netherlands (1), Norway (1), Portugal (2), Sweden (1), Turkey (3), United Kingdom (4)	8	14
Middle East	Iraq (2), Jordan (2), Kuwait (2), Oman (2), Pakistan (2), Palestine (3), Qatar (1), Saudi Arabia (5), United Arab Emirates (2)	9	21
Oceania	Australia (5)	1	5
Multiple Regions	Multiple Regions (5)	n/a	5

## Construction Performance Worldwide

The study found that worldwide, construction organizations have been struggling with delivering services on time, on budget, with high customer satisfaction (PBSRG, 2016). Interestingly, the authors identified that contrary to popular belief that modern countries have an advantage over third world countries, due to their larger budgets and higher levels of technology, poor performance was the same in every examined country (Liu, 2016).

In support of these conclusions the authors identified a recent worldwide construction study, conducted in 2015 by the Construction Industry Institute, confirming similar findings (CII, 2015):

- 2.5% of projects defined as successful (scope, cost, schedule, & business).
- 25 to 50% waste in coordinating labor on a project.
- Management inefficiency costs owners between \$15.6 and \$36 billion per year.
- An estimated \$4 billion to \$12 billion per year is spent to resolve disputes and claims.

In the next sections, the authors identified the data that was found from each of the four performance indicators and major issues.

### *Rework*

Ashford (1992) defines rework as “the process by which an item is made to conform to the original requirement by completion or correction”. In the study, the authors found rework data from three regions (America, Europe, and Oceania), consisting of four countries (USA, Sweden, UK, and Australia), totaling 8 publications. The data identified that rework in general, is responsible for 6% of the total project cost for the last decade. This is consistent with similar literature the authors identified. According to Jim Zack, Executive Director of Navigant Consulting [construction consulting], “rework happens on every project...” (Moore, 2012). It is estimated that on average, rework by contractors adds 2-20% of expenses to a contractor’s bottom line. In total, according to CII, that is an estimated \$15B a year. Additionally, CII reported that rework for a standard industrial construction project is 5.6%, whereas a civil and heavy industrial project would increase to around 10%. Additionally, another study was conducted in trying to figure out who was the main cause for rework, identified that it was majorly due to designer error and owner changes (Love, 2000).

### *Cost overrun*

Cost overrun can be considered as the difference between actual cost of a project and its cost limit. It occurs when the resultant cost target of a project exceeds its cost limits where cost limit of a project refers to the maximum expenditure that the client is prepared to incur on a completed building project (Memon, 2012). In the study, the authors found cost overrun data from five regions (Africa, America, Asia, Europe, and Middle East), consisting of 16 countries (Ethiopia, Ghana, Nigeria, Uganda, India, Korea, Malaysia, Netherlands, Norway, Portugal, Turkey, United Kingdom, Kuwait, Pakistan, Palestine, United States), totaling 26 publications. Table 2 shows the percentages of projects by region that are over budget and the average over budget amount compared to the original cost.

Table 2  
*Cost Overrun by Regions (PBSRG, 2016)*

Region	% Project Over budget	% Over budget amount
Africa	69%	29%
N. America	98%	28%
Asia	59%	16%
Europe	50%	29%
Middle East	65%	15%

According to Table 2, 68% of projects from those 5 regions were overrun. Of the 68%, project budgets are overrun on average by 23%.

This data is supported by similar research in this area. Bent Flyvbjerg (2003), a professor in Oxford's Said Business School, identified that it is not uncommon for major infrastructure projects to overrun by 50%. In fact, after looking at many of the large infrastructure projects around the world, he identified fifteen of the world's largest cost overruns that ranged from 255% to as high 36,000% (CIMA, 2013). These statistics similarly match a study CII conducted on cost overruns on construction projects, which identified only 30% of projects completed within 10% of planned cost.

Despite many misconceptions about whether one region has less cost overruns than another, there has been no clear evidence in terms of documented cost performance that would suggest that to be true.

#### *Schedule Delay*

Schedule delay can be defined as late completion of works as compared to the planned schedule or contract schedule. It occurs when the progress of a contract falls behind its scheduled program (Memon, 2012). In the study, the authors found schedule delay data from five regions (Africa, America, Asia, Europe, and Middle East) consisting of 17 countries (Ghana, Nigeria, Tanzania, Uganda, Hong Kong, India, Jordan, Korea, Malaysia, Portugal, Turkey, United Kingdom, Kuwait, Oman, Palestine, Saudi Arabia, United States), totaling 31 publications. Table 3 shows the percentages of projects by region that are over schedule and the average delay amount compared to the original schedule.

Table 3  
*Schedule Delay Performance Metrics by Regions (PBSRG, 2016)*

Region	% Projects Delayed	% Delay Amount
Africa	75%	53%
N. America	98%	37%
Asia	68%	37%
Europe	53%	55%
Middle East	79%	30%

Similar to the cost overrun performance information, Table 3 shows similar schedule performance information for most regions. On average, 74% of projects experience delay. Of the 69%, project duration is delayed 42% greater than the original scope. Interestingly, Europe and Africa have the highest percentage of project delay amount, despite Europe being more geographically and economically developed.

### *Customer Satisfaction*

In the construction domain, client satisfaction in particular, plays a fundamental role in determining the perceived success of a project (Cheng, 2006). In the study, the authors found customer satisfaction data from six regions (Africa, America, Asia, Europe, Middle East, and Oceania), consisting of 15 countries (Nigeria, Tanzania, India, Korea, Malaysia, Vietnam, Finland, Portugal, United Kingdom, United Arab Emirates, Jordan, Kuwait, Saudi Arabia, Canada, Australia), totaling 16 publications. Out of the 6 regions, 100% of the publications identified poor customer satisfaction with the construction services delivered over the past 10 years. Out of the major parties, procurement services [private and public owners], public owners identified greater concerns of receiving lower quality of work compared to private owners (Cheng, 2006). Out of the 16 publications, the authors were unable to identify why this is the case.

As support to the data identified in this study, a recent study in 2014 by KPMG International was conducted, and revealed similar information. The study consisted of a survey that interviewed 109 senior leaders from the engineering and construction industry. The respondents were from large organizations that ranged from less than \$250M to more than \$5B in annual income. The survey was compiled into a report that identified the major setbacks in the global construction industry, to include the level of dissatisfaction on projects. It was identified that project failure on average was 53%, with its highest failure rates coming from public sector projects, and second highest failure rates coming from the energy and natural resources sector projects. With the continued difficulty of bringing projects in on time, on budget, with little rework, customer satisfaction overall will continue to suffer (KPMG, 2015).

### *Major Issues of Non-Performance*

As the performance of each publication was documented, the authors simultaneously documented the major issues of non-performance reported. Out of the 260 research publications, 57 of them contained documentation of 438 reported issues that can cause non-performance in construction. These publications represented 6 major regions (Africa, America, Asia, Europe, Middle East, and Oceania) and 29 countries. Due to the large number and variability of the major issues identified, the authors documented the top 10 issues from each publication. Next, each of the 57 publications' top 10 list were prioritized based on the number of times a major issue appeared. Once completed, the authors prioritized the top 10 list from most to least documented issues (see Table 4). This formed a new and robust worldwide top 10 list of all major construction issues of non-performance on projects worldwide.

From this analysis, the authors found that financial problems are the most commonly observed issue worldwide. The full list of causes, their ranking, and percentage appearance are listed in the table below:

Table 4  
**Top 10 Causes of Non-Performance (PBSRG, 2016)**

Top Ranked Issues	No. of Incidents	Rank	% Appearance
Monthly payment difficulties/ financial problems	47	1	15.3%
Poor project/contract management	28	2	9.2%
Shortage of materials/equipment	25	3	8.2%
Additional work/variation in client's	24	4	7.8%
Design change	23	5	7.5%
Poor planning and scheduling	22	6	7.2%
Poor qualification/shortage of labors	19	7	6.2%
Delay in construction/other delays	18	8	5.9%
Unforeseen site condition	17	9	5.6%
Poor/inaccurate estimate	16	10	5.2%

The top 10 major issues make up of 78% of all causes of non-performance reported. Interestingly, 9 out of 10 major causes are due to people and not external circumstances such as weather or acts of god.

#### *Overall Analysis*

After analyzing 95 construction publications, in terms of construction performance [rework, cost overrun, schedule delay, and customer satisfaction], Table 5 shows the overall results.

Table 5  
**Overall Analysis (PBSRG, 2016)**

	% Projects Delay	% Delay Amount	% Projects Over budget	% Over budget amount	Customer Sat.	Rework
Africa	75%	53%	69%	29%	Dissatisfied	No data
Asia	68%	37%	59%	16%	Dissatisfied	No data
Europe	53%	55%	50%	29%	Dissatisfied	5%
Middle East	79%	30%	65%	15%	Dissatisfied	No data
N. America	98%	37%	98%	28%	Dissatisfied	9%
Oceania	No Data	No Data	No Data	No Data	Dissatisfied	5%

Overall, all major regions worldwide have similar documented construction performance. Despite geographical and economic statuses, the data does not support any dominant advantages one major region may have over another in this regard.

#### *Limitations of Study*

Though extensive, the authors recognize that this study's findings can be strengthened through documenting and analyzing more publications per major region. Additionally, there may be undocumented and missing data for each region. The intention of this paper is not to confirm that worldwide construction performance is poor, only show that the performance is similar. Lastly, it should

be taken into consideration that through the exhaustive literature review conducted by the authors, this study is the first of its kind. This study is considered groundbreaking and may become a large part in helping to advance the construction industry in the future.

## Conclusion

The demand for construction around the world is rapidly increasing, as populations grow. Construction development will be greater in the next 30 years, than in the last 2000. As projects become increasingly more complex due to increased size, number, and supply chain participants, project managers are having difficulty delivering services on time, on budget, with high customer satisfaction. Despite the assumed ideas that wealthy countries have a significant advantage of higher performance and quality, due to increased access to advanced technologies and qualified laborers, research has shown neither advantage playing a huge role in increased performance of delivering services. According to this research study, every country around the world that has documented performance information has similar issues and performance. Lastly, by understanding the four major performance indicators for unsuccessful projects, and the locations that are experiencing them more than others, provides the industry with valuable information (in terms of paying closer attention to these items and areas when starting a project).

## Recommendation

In an attempt to understand the root cause of the issues the construction industry has been facing, the authors propose to conduct a follow-on study. The study will investigate the major parties responsible for causing the issues, and examine why it occurs. Lastly, the authors propose to identify a solution that is simple enough to implement throughout the world.

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