

DB 2020: Analyzing and Forecasting DB Market Trends

by

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## ABSTRACT

Over the last two decades, Alternative Project Delivery Methods (APDM), such as Design-Build (DB), have become more popular in the construction industry, specifically in the U.S., and the competition for APDM projects has risen among construction companies. The Engineering News Record (ENR) magazine analyzes DB firms and publishes the list of the top 100 every year. According to ENR articles and many scientific papers, the implementation of DB method has grown drastically over the last decade, however, information about growth trends depending on firm size and segment is lacking. Also missing is knowledge the future market trends over the next five years. Furthermore, public agencies and DB firms may be worried that DB projects do not distribute wealth equally among DB firms. Using the top 100 firms deemed representative of the DB market, the author has divided the market into volumes based on rankings to analyze the total DB market revenue growth. A comparison between international and domestic revenues indicated that the top five DB firms have 64% more involvement in the international market compared to the domestic market. Furthermore, while the research shows increasing market share only for the top five firms, the author has found that (1) a large portion of their market share is due to a large growth in their international market, and (2) revenues for all volumes of the DB market have increased. Moreover, regression and time series analyses allow for the forecasting of the DB market growth, which the author anticipate to move from about \$100B to about \$150B in 2020.

## DEDICATION

I dedicate this work to my lovely family, Maryam, Akbar, Ali, Arshia, and Helia, for their endless love, support and encouragement.

## ACKNOWLEDGMENTS

I would like to express my sincere thanks to Dr. Mounir El Asmar, my committee chair, for his continuous encouragement and guidance through my graduate study. He was not only a chair but rather a mentor and an advisor, who would always support and guide me in any way possible. My graduate years and this research work would have not been successful if not for his continuous dedication to help encourage and support.

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## CHAPTER 1

### INTRODUCTION

Crosthwaite (2000) describes construction as one of the most significant industries around the world because it has a considerable proportion of most countries' gross domestic product (GDP). For example, according to a report published in July 2014, the U.S. Census Bureau of the Department of Commerce estimated construction spending in 2003 in the U.S. amounted to \$981.3 billion, which makes up about 6% of the U.S. GDP (U.S. Census Bureau 2014). This significant portion of the U.S. GDP compared to other industries creates many opportunities and chances for people to compete with each other in construction market.

Competition exists in every group in the society, and construction is not an exception (Hayek 1948; High 2001; Ye et al. 2014). It is described by Ye et al. (2008) as an endless and all-pervading phenomenon in a market economy that is developed by several competitors, who compete with each other for the opportunities that exist in a market. A firm's success relies on its continuous interactions with the total market and its competitors (Kim and Reinschmidt 2006). Business diversity, industry growth, and product differentiation are some of the factors that Porter (1980) believes play a role in determining the severity of the competition. The high competition in the construction market creates a situation in which client groups dominate the industry (Egemen and Mohamed 2006; Chen 1991). Kim and Reinschmidt (2006) believe construction contractors do not create works but they take the available ones.



In such a competitive market situation, the construction contractors always have to look forward and try to be attentive to remain in the market (Betts and Ofori 1992). For example, there have been changes in delivery methods and recently, various project delivery methods have been used in the U.S. construction industry, including traditional Design-Bid-Build and alternative methods such as Design-Build (DB), Construction-Management-at-Risk (CMAR), Integrated Project Delivery (IPD), and Job Order Contracting (JOC). Most owners in the construction industry, both public and private, value the benefits of alternative delivery in transferring risk and in involving expert builders in the design and planning of projects. Numerous other benefits, such as reduction in costs, time, and conflicts, have piqued owner interest in alternative delivery methods.

Adoption of alternative project delivery initially started in the private sector; nevertheless changes in legislation allow more utilization in the public sector. As a result of both owner interest and enabling legislation, there is an increasing trend in alternative project delivery methods (APDM) markets over the past several years. This thesis focuses on DB since it is one of the most significant delivery systems that has been gaining popularity in recent decades. (Tulacz 2014)

Engineering News Record (ENR) is a magazine focused on construction and publishes annual 'ENR Top Lists' that provide data about top revenue producing firms.

The DB method delivers a construction project utilizing a single entity contracted to complete both the design and the construction of the project, known as the Design-Build or Design-Build contractor. For the DB market, ENR data shows the market

growing dramatically in the last eleven years except 2004, 2009 and 2010. (Tulacz and Rubin 2004; Tulacz 2005; Tulacz 2006; Tulacz 2007; Tulacz 2008; Tulacz 2009; Tulacz 2010; Tulacz 2011; Tulacz 2012; Tulacz 2013; Tulacz 2014). Although it is difficult to infer from the data about the difference in growth between the highest and lowest ranked firms, this research sheds light on these differences in the DB market by segmenting data from the ENR Top Lists from 2003 to 2013 and showing how the existing market share of the firm affects its growth.

## CHAPTER 2

### BACKGROUND LITERATURE

Yates (1994) states 1970 to 1990 as the years that many global engineering and construction firms have appeared in the market, changing the marketplace into a more competitive environment. Competitive atmosphere requires innovative strategies, for instance the advent of Alternative Project Delivery Methods (APDM) such as DB, CMAR, IPD, and JOC. Project delivery methods are one of the most important factors that determine the size of construction companies' influence on projects' quality (Konchar and Sanvido 1998). In some methods, such as DB, the contractor has more opportunities to enhance the quality of the project by being involved in the design phase (Konchar and Sanvido 1998). Unlike the traditional DBB method, DB assigns a single point of responsibility to decrease risks for the project owner and to shorten the delivery schedule by overlapping the design phase and the construction phase of the project (Murdoch and Hughes 2007; El Asmar et al. 2010).

Yates (1995), who completed one of the first studies about DB delivery, assumed that changing delivery systems would cause difficulties for some contractors and predicted that this problem would result in fewer firms adopting DB. However, further studies have shown growth for many contractors using DB delivery in many different markets. Rowings et al. (2000) surveyed 45 electrical contractors and expected the DB workload to grow from 28% in 2000 to 32% by 2005 for their trade. The wastewater and transportation industries each experienced 500% growth in DB projects from 1995 to 2002 (Molenaar and Scott 2003; Molenaar et al. 2004). According to a report in 2011, Design-Build Institute of America and RSMMeans Reed

Construction Data Market Intelligence found that DB was used for about 40 percent of the non-residential construction projects in 2010, a ten percent increase since 2005.

Also in 2011, DB for water related projects was predicted to increase from 19.9% market share in 2011 to 28.5% market share by 2016 (Water Design-Build Council 2011).

ENR top lists have been used for many research projects and studies about the market analysis of the top international contractors and design firms around the world (Wang et al. 2007, Huang et al. 2007, Zhao et al. 2009, Xiong et al. 2010, Wu et al. 2010, Zhang and Sun 2011, Du et al. 2011, and Yu 2012) but to the best of our knowledge there is not any research on the analysis of DB market.

Articles from the past 11 years of ENR magazine track the year-to-year increases and decreases of the DB market in the construction industry. Growing since its emergence in the 1990's, the DB industry saw its first major downturn from 2002 to 2003 with a dramatic 12.2% decrease in revenues for the top 100 DB firms. In spite of the market downturn, companies progressively continued to implement DB practices (Tulacz and Rubin 2004). Though the market was still decreasing through 2004 due to the decreased use from four large companies, simultaneously DB was gaining acceptance in the transportation market, dorm building, and multi-unit residential construction (Tulacz 2005).

Despite wariness and price concerns, DB continued to grow in both domestic and international markets in 2005. Chuck Dahill, PinnacleOne's CEO, reported to ENR in 2006, "In our owners' survey, 37% of the public owners responses expressed that they plan to use DB on at least one of their projects in next year" (Tulacz 2006). As

expected from this statement of owner confidence, the following year's article reported a 21.7% revenue increase for the top 100 DB firms. In fact, the top 100 continued to grow by 21.2% and 17%, in subsequent years (Tulacz 2007; Tulacz 2008; Tulacz 2009).

When the recession hit the construction industry and the revenue of top 100 DB contractors dropped by 8.4% and 12% over 2009 and 2010. Nonetheless, DB was able to face the downturn better than other delivery methods due to the American Reinvestment and Recovery Act projects, which needed to be delivered quickly (Tulacz 2010; Tulacz 2011). APDMs in general and DB in particular provide beneficial schedule improvements, as shown in several previous studies (Konchar and Sanvido 1998, Monelaar 1999, El Asmar et al. 2013). However, some owners still reverted to DBB during these tight times, trying to squeeze out the lowest price (Tulacz 2010; Tulacz 2011). Although times were tough, Tulacz (2011) predicted that alternative project delivery would flourish when the market recovers based on recent legislation changes. By mid-2010, public use of DB was allowed in some form in all 50 states; a major accomplishment for the DB industry (Tulacz 2011).

Pioneered by two of the top DB companies taking on massive petroleum and mining contracts, the market showed growth once again in 2011. Based on the most recent reports on completion of DB revenue worth over \$108 billion in 2013 (Tulacz 2014) for the top 100 DB firms, DB continues to progress.

ENR studies present the amount of DB growth in each year and also explain the reasons behind these occurrences but do not state anything about the internal profile of DB market. The studies carried out in this thesis attempt to fill this gap.

Furthermore, this study presents the predicted growth and revenues of the total market and all different volumes of that through 2020.

## CHAPTER 3

### MOTIVATION

All stakeholders involved in the construction industry need to have enough information about the market trends and their competitors' situations in order to have a great understanding and precise perception of their companies' strategies and targets. For example, according to ENR articles, top DB firms know the DB market is growing generally but they do not have any information about which size DB companies are growing faster than the others and what the future market trends over the next five years are. Furthermore, public agencies and DB firms may be worried that DB projects do not distribute wealth equally among DB firms. This thesis employs ENR lists of top DB contractors and their revenues to determine which companies are growing faster than the others, giving stakeholders more information to make better decisions.

Some contractors have faced much turbulence in the market but a few of them are truly stable. For instance, one company has been ranked number three in DB revenue for the past ten years. This study finds useful information by identifying trends in the DB market.

## CHAPTER 4

### PROBLEM STATEMENTS AND OBJECTIVES

When making strategic decisions, a company cannot only consider the total market profile, but must also understand the competitive environment and trends internal to the market.

For instance, in 2009, David Richter, the CEO of Hill International Inc., was quoted in ENR saying: “Midsized firms below a certain level eventually will be acquired or squeezed out, leaving about ten mega firms and more narrowly focused boutique firms. That is why we went public to be above the line rather than below it” when talking about Hill International’s decision to continue acquiring Construction Management/Program Management firms, focusing on the public sector (Tulacz 2009).

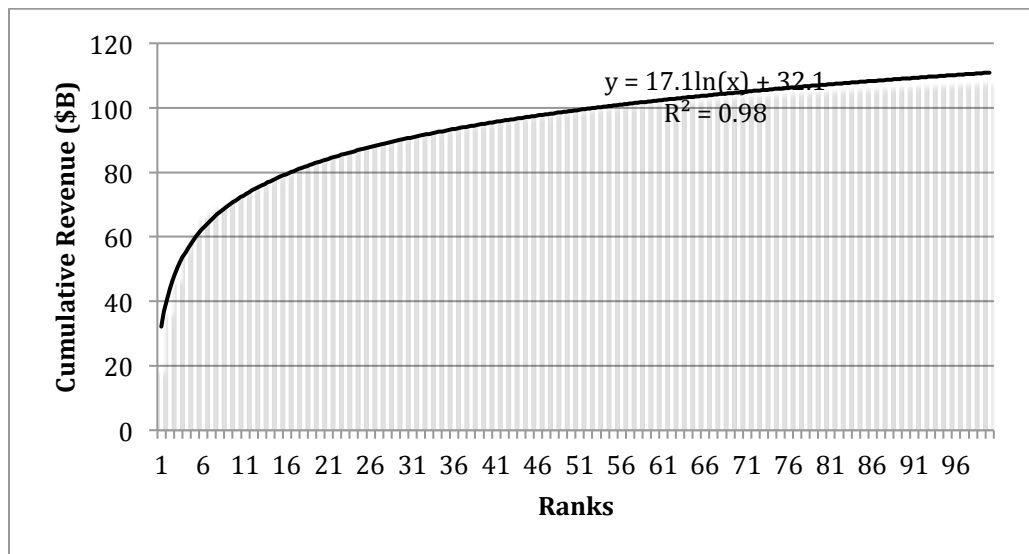
The objectives of the research presented in this thesis include: (1) analysis of the total DB market from 2003 to 2013 for the top 10 DB firms, (2) comparison among different revenue-based volumes of top 100 firms to understand how they have grown compared to one another from 2003 to 2013, (3) comparison between domestic and international revenues of top 5 DB contractors’ volume to find which market has had the most investment return, and (4) prediction of the future revenues and market shares of the total DB market and its different volumes.



## CHAPTER 5

### METHODOLOGY

A market can be defined as “an actual or nominal place where forces of demand and supply operate and make the possibility for buyers and sellers to contact each other” (Business Dictionary 2014). For the purpose of this thesis, the top 100 DB firms are considered to be representative of the DB market for that year. As a result, fixed effects models are applied since a sample of the population is considered to represent the entire market. Fig. 1 indicates that this assumption is plausible because the slope of accumulative curve for DB firms in the U.S. is very low when it reaches to 100th firm. In fact, it can be stated that most of DB market revenue belongs to the top 100 firms and the revenue of the rest of the market does not have a considerable contribution. Therefore, it is acceptable to consider the revenue of top 100 DB firms is an approximation of the total market revenue.



**Figure 1 - Cumulative revenue for the top 100 DB firms in 2013**

ENR lists of the top 100 DB firms along with each company's DB revenues for the previous calendar years were collected from the years 2003 to 2013. ENR compiles such data using a survey collected from large number of companies. The companies are required to provide a financial statement or fill out a financial form that would be signed by the senior executive for verifications. The survey that is shown in Appendix A contains a specific portion for DB projects, asking about the domestic and the international revenues of DB projects for each of the companies. The total DB revenues were plotted for every year to understand the changes in the DB market. The percentage difference shows the impact of change from one year to next. Also, the standard deviation of this market was calculated since 2003.

After getting a basic understanding of the market many iterations were tested to find the threshold where the top few firms' trend is different from the rest. By a sensitivity analysis, top 50, top 40, top 20, top 10, and top five DB firms were analyzed and concluded that top five DB firms is the market share threshold where it is vastly different from the rest. We decided to divide the market firms into six volumes: 1-5, 6-20, 21-40, 41-60, 61-80 and 81-100. Note that the number of firms in each volume is not equal. The volumes were chosen in a manner to easily illustrate the significant difference between the market shares of the biggest DB firms and the rest of the presumed market. In addition, the market share growths of different volumes have been calculated by dividing the revenue of each year with the base revenue of 2003. Corresponding percentages were indicated in a graph to illustrate which volumes have had positive growth and in which volumes' growth has been negative.

In addition, increase in market share of each volume for the past 11 years was calculated and compared. Moreover, comparison between the top DB contractors' international and domestic revenues and market shares pointed out the market in which the top firms have more growth.

### **Regression Analysis**

One method to predict the future trends of different types of data is Regression modeling, i.e. trying to fit the most accurate model. As the method suggests several models should be fitted to the data to find out which one is the most accurate. For this study, first order, second order, and third order polynomial models were tested and from the value of the predicted  $R^2$ , the best model was chosen. After selecting the model, future values could be predicted, specifically for this study the future revenue for DB market in the U.S. was forecasted for the next seven years.

### **Time Series Analysis Methodology**

Time-Series analysis is helpful for analyzing data that each point is correlated to previous ones in addition to the time. DB market revenue falls into this category. Using this analysis, finding a precise and appropriate model in order to predict the future years' revenues of DB market was investigated.

It is useful to overlay a smoothed version of the original data on the original time series plot to help reveal patterns in the original data. Due to the Great Recession in 2008, DB market data was not smooth. Hence, by simple moving average method the data has been smoothed. For this purpose, the research team used different spans of simple moving average method to figure out which one smoothes the data better. A

simple moving average of span 1, 2, 3, and 4 were used for this study. If we let  $M_T$  be the moving average, then the N-span moving average at time period T is

$$M_T = \frac{y_T + y_{T-1} + \dots + y_{T-N+1}}{N} = \frac{1}{N} \sum_{t=T-N+1}^T y_t$$

In order to proceed with prediction methods the data should be stationary where DB market data shows otherwise. A time series is said to be stationary if its properties are not affected by a change in the time origin. For this purpose, a difference order 1 was performed over the data so that Autoregressive Integrated Moving Average (ARIMA) model could be used to fit a model to our data. Obtained results reveal that Auto correlation function was not sinusoidal and did not have any spikes between its lags and therefore no moving average (MA) and autoregressive (AR) processes were needed. Thus a linear line was fitted to the data using a difference order 1. One may refer to Montgomery et al. (2011). Fig. 15 in results section shows this line and the predicted revenues for DB market.

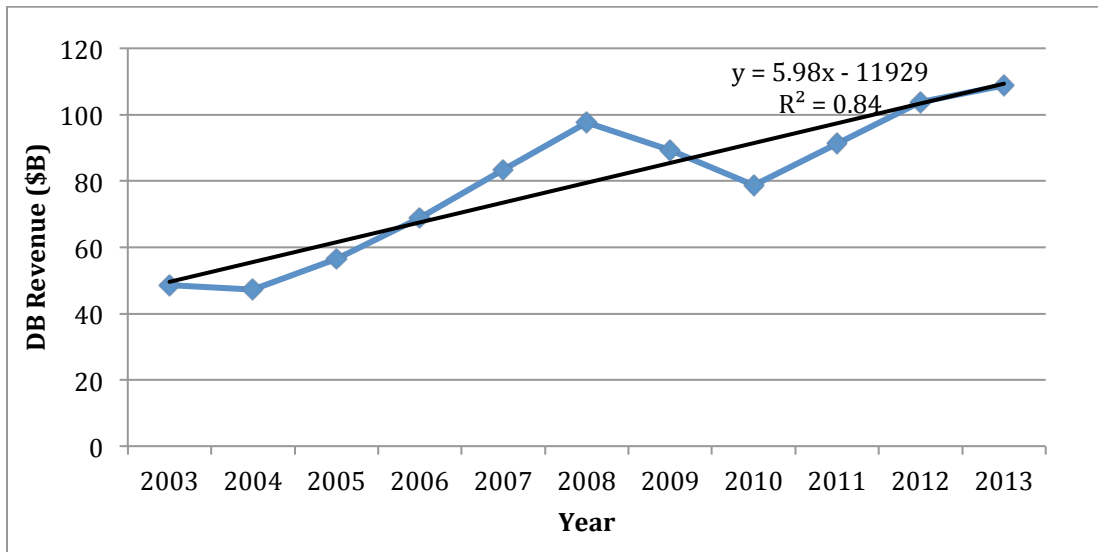
The same analysis is done for all different volumes of the top 100 DB firms in the United States. Acquiring each volume's revenue provides the tools to estimate the revenue of each of these firms and the total market revenue in 2020.

## CHAPTER 6

### RESULTS

After reviewing the existing literature on DB, it was evident that the revenue of the DB market has increased in recent years. This section discusses the results of the market analysis in order to reveal more information about the DB market and its trend over the last 11 years.

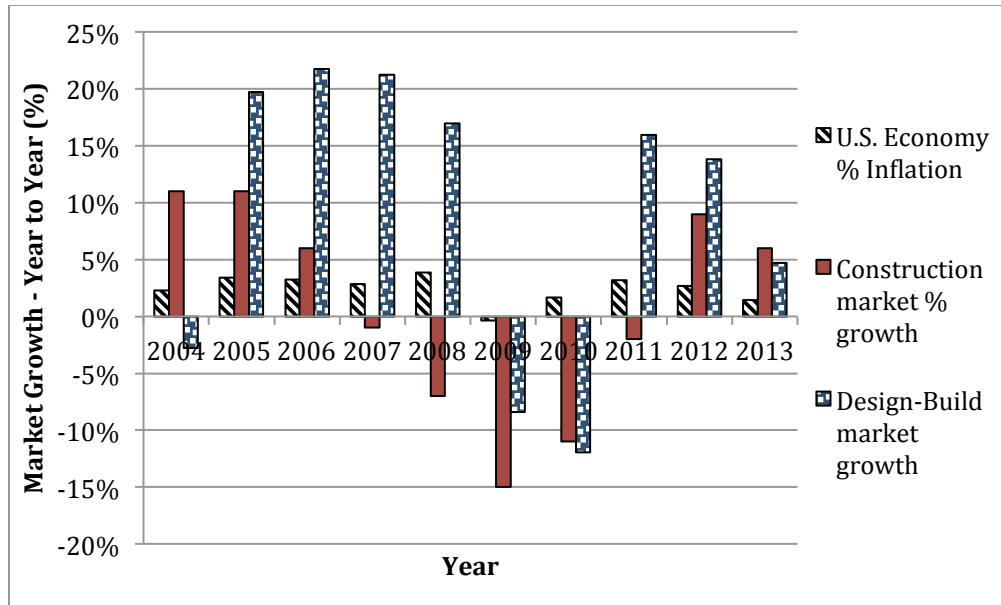
Fig. 2 shows the total revenue for the top 100 Design Builders from 2003 to 2013. As it is shown in the graph, there is an increase in revenue each year except 2004, 2009 and 2010. The downturn in years 2009 and 2010 are likely related to the Great Recession felt in most industries. Based on the fitted trend line, revenues for the DB industry are increasing by about \$6 billion each year on average. Over the past 11 years, the DB market has increased more than twice the original value (124% growth).



**Figure 2 - DB contractors' revenue from 2003 to 2013**

In a span of some years, this market has grown significantly as evident from the increasing slope in Fig. 2. However, there are a few years in which growth of this market has been negative. Fig. 3 sheds more light on this by showing the percent growth of this market from year to year. Over 15% growth in the DB revenues was experienced each year from 2005 through 2011 with the exception of the two recession years. To compare the situation of the DB market with the total construction industry, data for the total amount of construction work in each year is collected from the U.S. Census Bureau. This information is published monthly and it is considered representative of the U.S. Construction Market. From 2003 to 2004, DB market had negative growth but the total construction market growth was positive in this year. However, the trend is not the same for the upcoming years. Generally, DB market has grown more in the recent 11 years than the construction industry and as a result DB has gained a larger share of the total construction industry market and has been used more year after year.

Considering the fact that general inflation in the U.S. was between 2% and 4% during each of these years it is evident that such growth in DB revenues are significant (BLS 2014). Though still growing, the DB market has slowed slightly in 2012 and 2013.



**Figure 3 - Design-Build contractors' revenue changes**

To examine the width of this market, standard deviation of the DB firms has been drawn. Fig.4 demonstrates that the standard deviation has been increasing since 2003. This indicates that the data of the first 100 DB contractors has been more widespread in recent years and the distance of the design-builders' market share from the mean has increased. Also, upper control limit and lower control limit shown in Fig. 4 proves that the data is more wide spread in the last years.

Fig. 5 shows the market share percentage and also the revenue of different volumes of the top 100 design builders in the last eleven years simultaneously. As it was mentioned earlier, the volumes do not have equal numbers of firms. The top five firms have been growing their market shares over the years. In 2009, the top five Design-Builders accounted for more than half of the DB revenue and maintained that majority ever since. Although the market shares of all volumes except the top five have decreased, they all currently have more revenue compared to 2003.

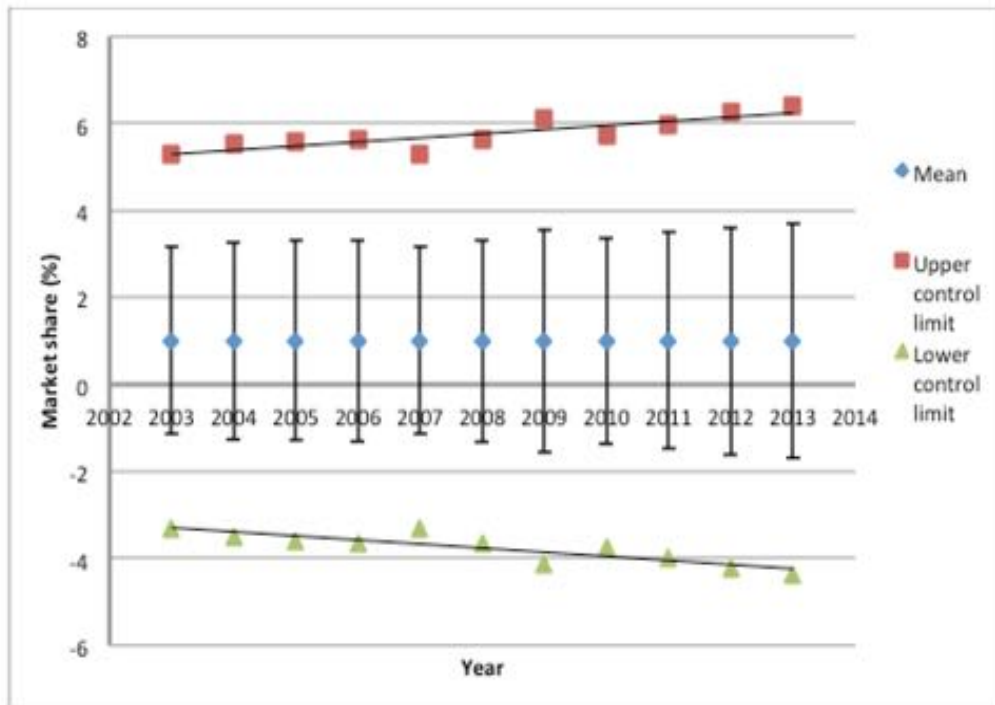
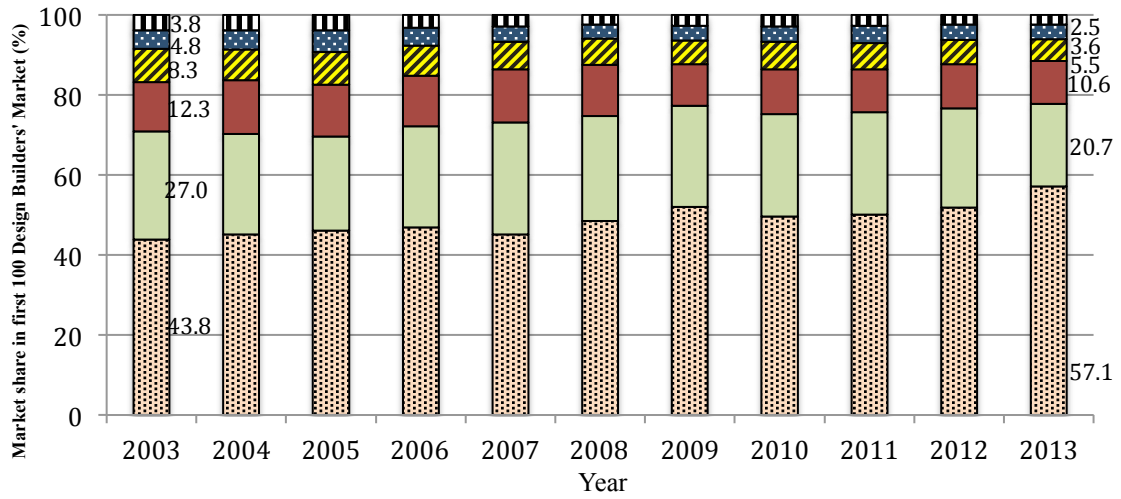


Figure 4 - Increasing standard deviations of DB market share





1-5 6-20 21-40 41-60 61-80 81-100

Year

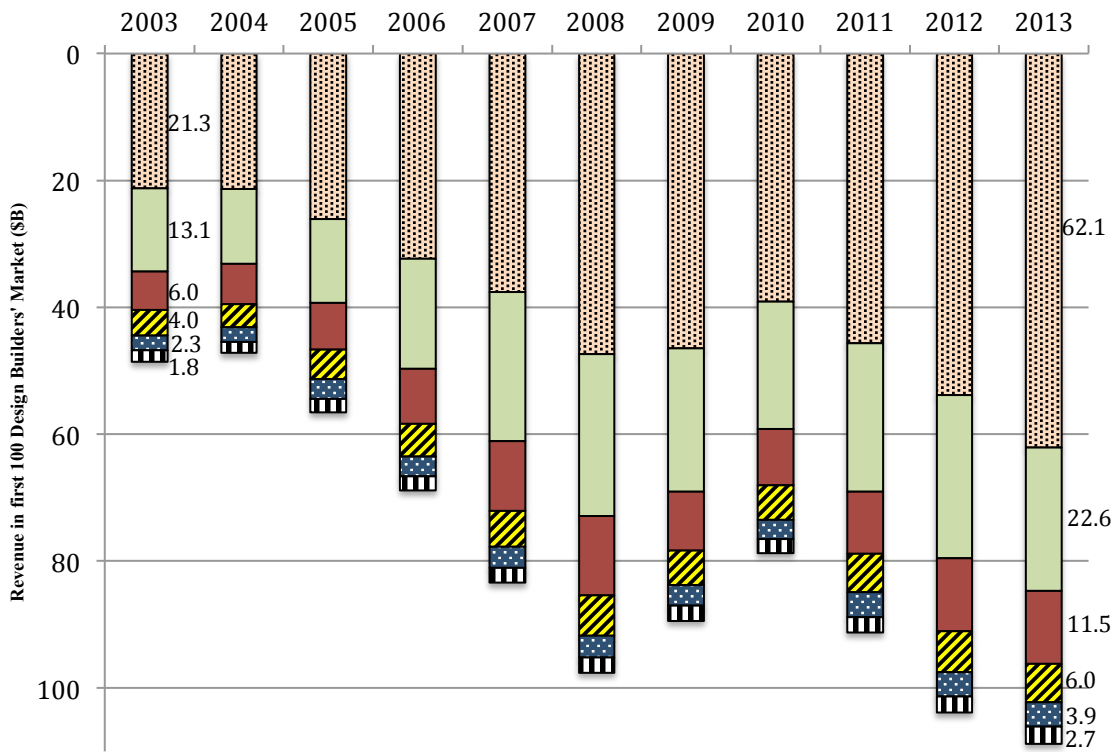
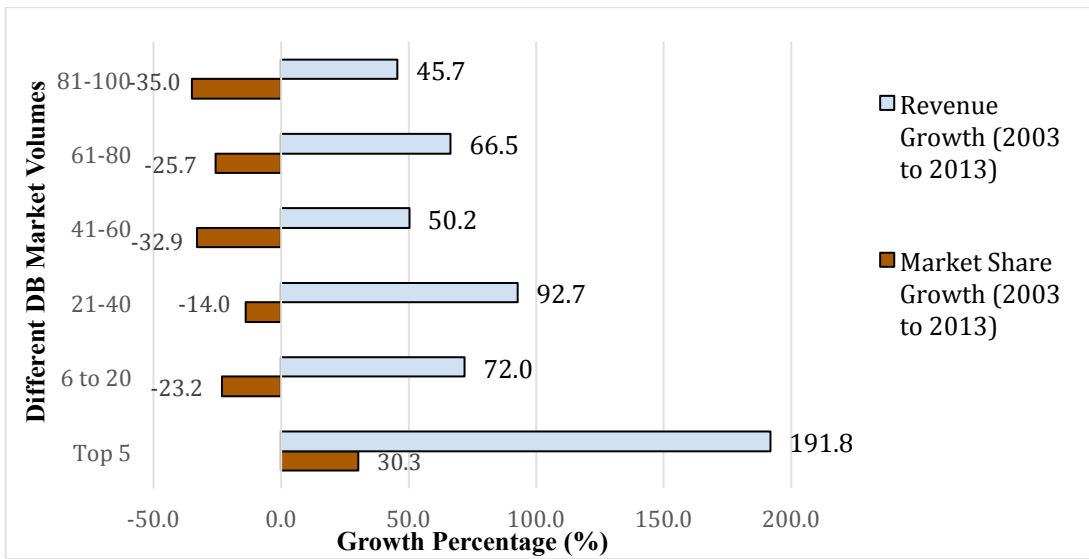


Figure 5 - Market share (Top) and revenue (Bottom) of DB firms in 2003-2013

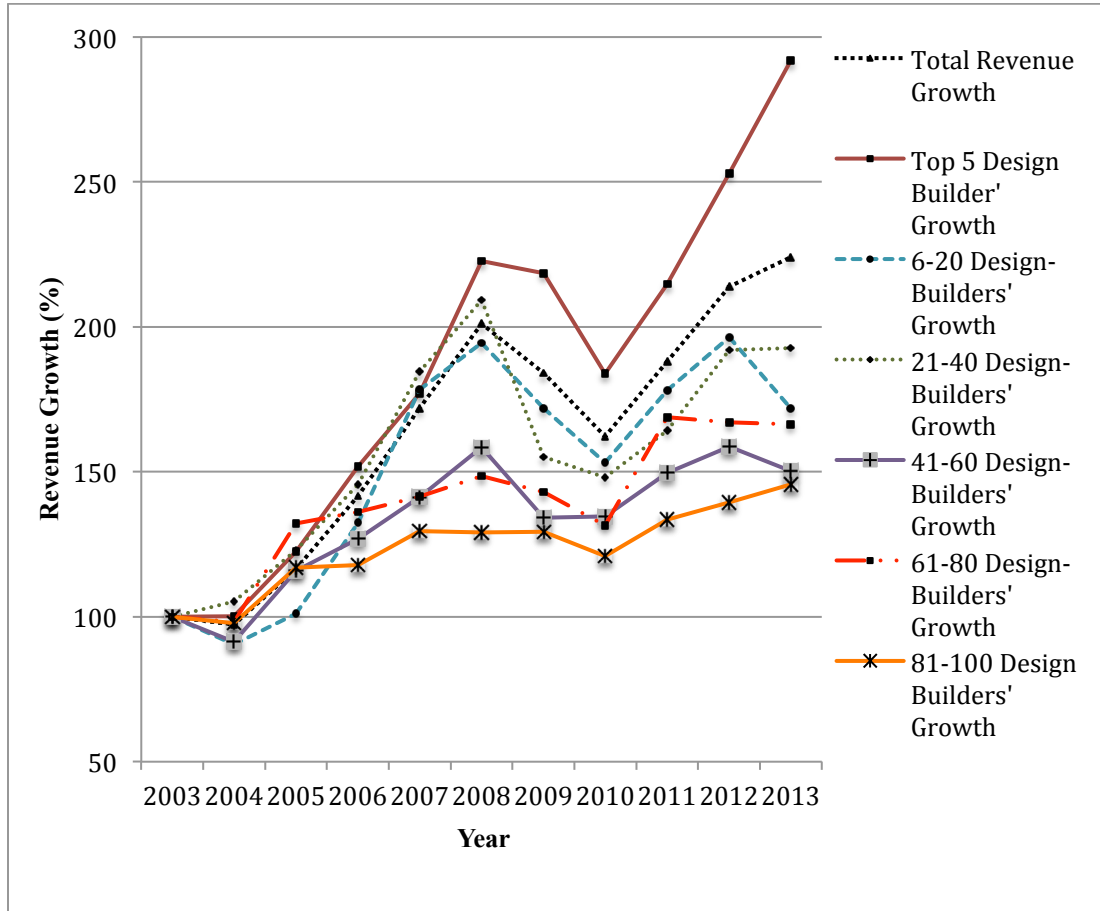
As seen in Fig. 6, although the top five is the only volume that has grown its share of the DB revenues over the past 11 years, the revenue growth is positive for all volumes. It is interesting to note that on average, the small Design-Builders (41 to 100) as well as the medium ones (6 to 40) are losing their market share by 31.3% and 20.3% respectively. So small firms are losing their market shares much faster than medium ones. The figure shows the bottom twenty design-builders (81 to 100) have the most loss among all volumes that is about 35%.



**Figure 6 - Revenue and market share growth for different market volumes from 2003 to 2013**

The revenue growth for each volume as well as for the total market is shown in Fig. 7. The top five design builders have more growth percentage than other volumes for eight of the 10 years. Fig. 7 shows that the top five Design-Builders are growing in the market much faster than the other volumes and the total market.

The volume of the middle ranked Design-Builders has fluctuated the most in revenue growth over the past 11 years. However, the smallest contractors (ranks 81-100) have had the lowest growth rates in the DB market, since 2006.

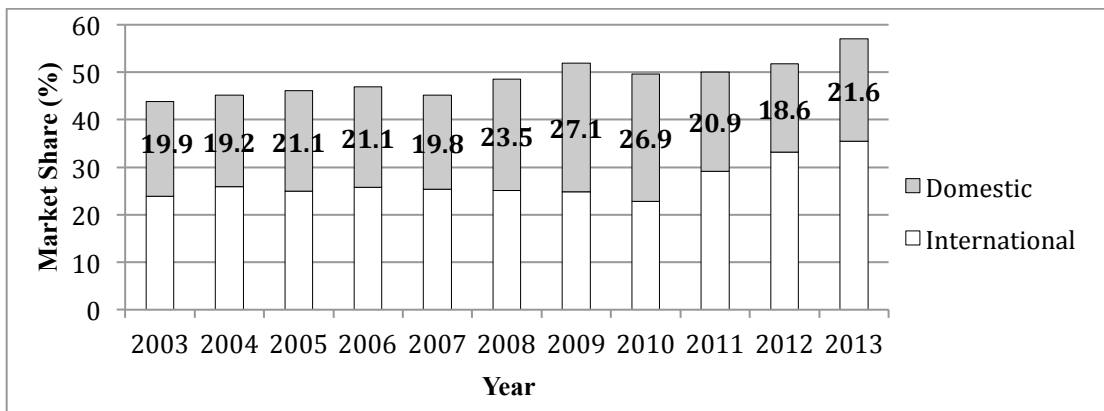


**Figure 7 - Revenue growth of different market volumes (base year 2003)**

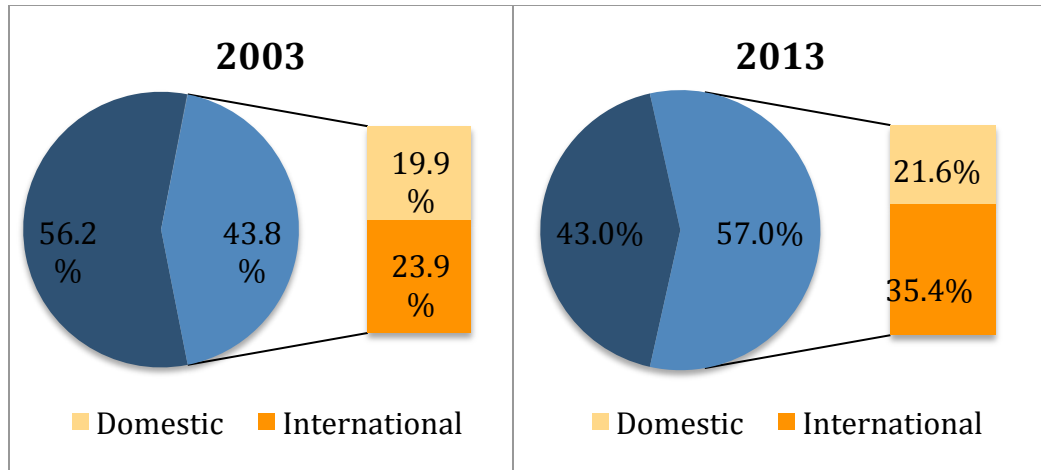
In Fig. 7, year 2003 has been set as the base year and then the growth of each volume is measured according to its revenue in 2003. As a result, the first point for all volumes has the value of 100% and the following points are compared with the base.

Noted from this graph, the top five design builders have a higher growth percentage than other volumes over the 11-year study period, having about three times revenue while the other volumes' having up to two times revenue in 2013

compared to 2003. The next line shows the same analysis for the 6<sup>th</sup> to 20<sup>th</sup> DB contractors in each year. This volume's revenue growth is the most fluctuating among all volumes. This group can be considered as the transition group between the big and the small DB contractors. The other five lines are showing revenue growth for four different volumes: 21<sup>st</sup> to 40<sup>th</sup>, 41<sup>st</sup> to 60<sup>th</sup>, 61<sup>st</sup> to 80<sup>th</sup>, 81<sup>st</sup> to 100<sup>th</sup>, and also the total market. Here, it is shown that the smaller design builders (ranked 81<sup>st</sup> to 100<sup>th</sup>) have the lowest revenue growth in comparison with the others. So generally, the bigger the DB firm, the more growth they experience.

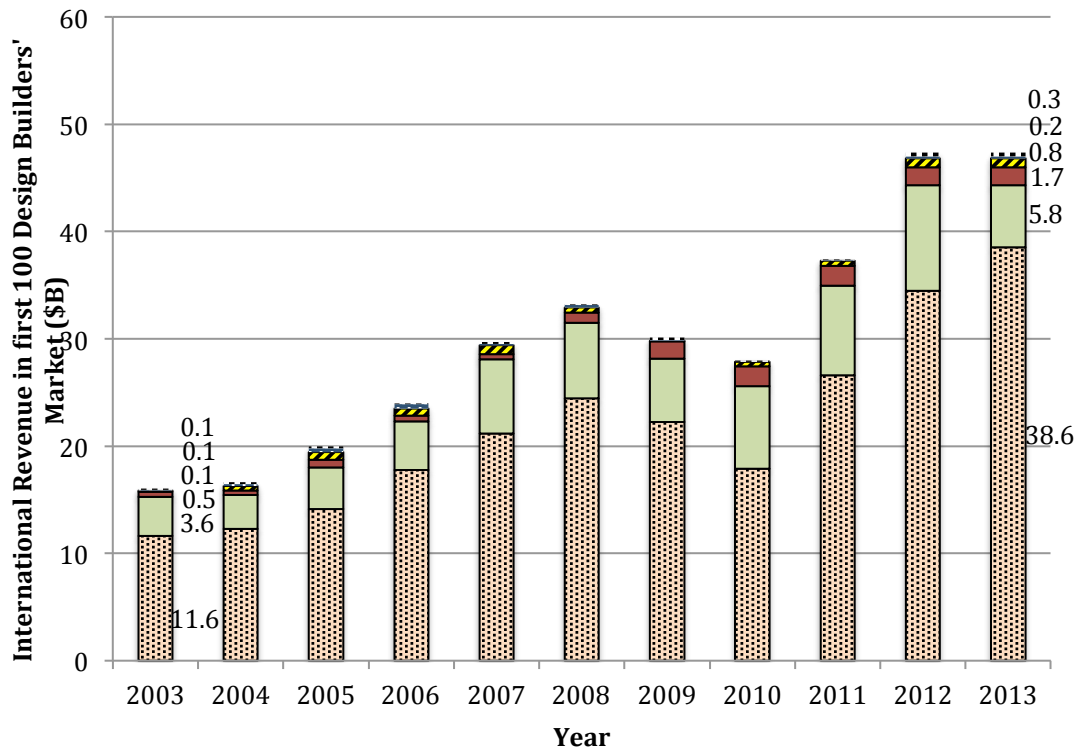
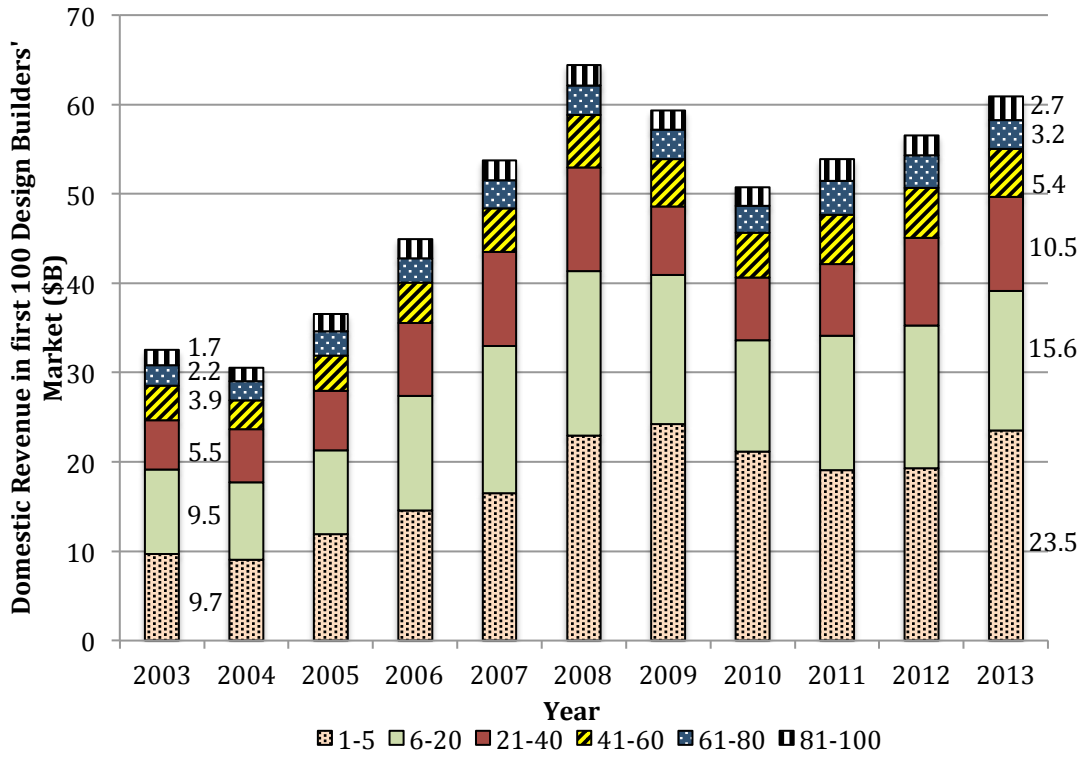


**Figure 8 - Top five DB contractors' market share in total by international and domestic market**



**Fig. 9 Top five DB firms' market share in 2003 (left) and 2013 (right)**

Fig. 8 divides the total market share of the top five DB firms into international and domestic market. In 2013, the top five Design-Builders gained about 35.4% and 21.6% of the total market respectively from the international and the domestic markets. Fig. 9 shows that this volume of the market has a 13.2% growth in market share from 43.8% in 2003 to 57% in 2013. Most of this growth is gained from the international market that is about 11.5% as opposed to 1.7% growth in the domestic market.



**Figure 10 - Domestic (top) and international (bottom) revenue for DB firms.**

The top portion of Fig. 10 illustrates the domestic revenues for different volumes of the DB market, while the bottom portion illustrates the international revenues. The Comparison between the revenues over the 11 years study span in the Figure 10 shows more growth in the international market rather than the domestic market. In fact, the international revenue of the top 100 DB firms in the U.S has increased by 149% considerably higher than the domestic market growth, about 87%. In addition to the significant increment in the international projects, the top five DB firms are leading the international market more substantially in comparison with the other volumes and a large portion of their market share is due to their international projects. Analysis of the total revenue of the other firms, 6<sup>th</sup> to 100<sup>th</sup>, indicates the significant difference in their shares in the domestic and the international markets which are almost 62% and 19% in 2013 so the domestic growth is more leveled across the different firms and most of the international revenues of DB firms belongs to the top five.

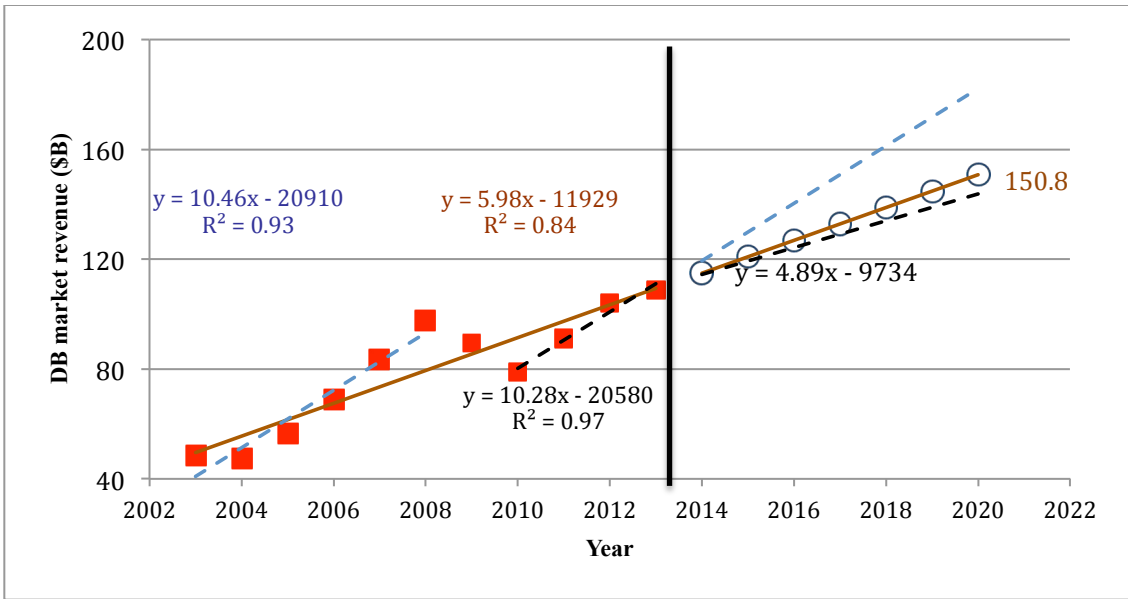
### **Regression Analysis**

For the market prediction, as mentioned in the methodology section, three different regression models are fitted to our data and also their predicted-R<sup>2</sup> values are calculated in order to find the best model. Predicted-R<sup>2</sup> values for linear, second order polynomial, and third order polynomial regression models are 78.30%, 75.51%, and 53.63% respectively. Therefore, the linear model is the most accurate model for analyzing the market trends and predicting the future revenues of DB market. It is predicted that DB market grows about \$6B each year so the DB market

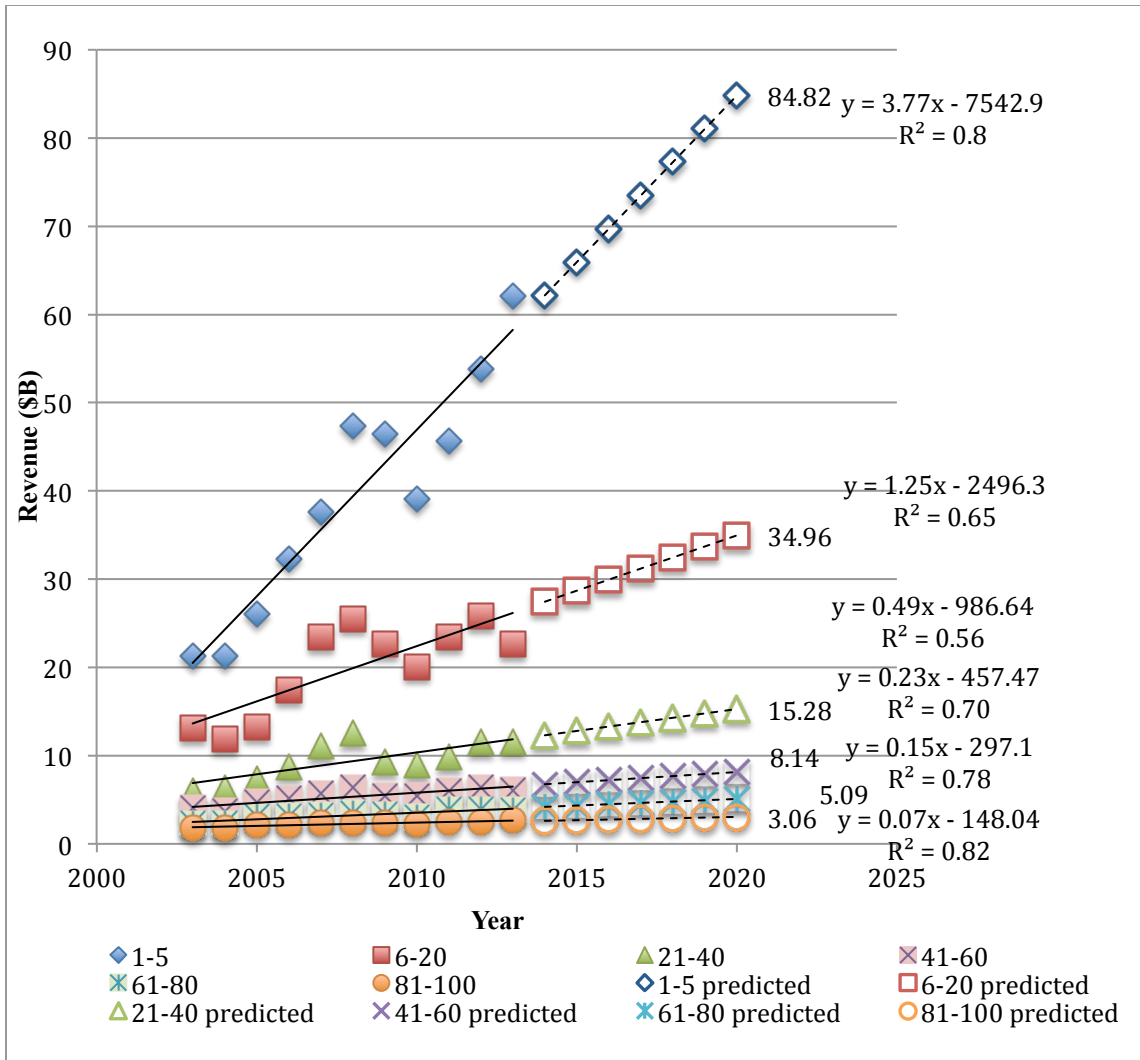
revenue in 2020 will be about \$150.8B; however Fig. 11 shows the slope for regression analysis for before and after recession years is about \$10B. The upper and lower lines indicate the upper and lower limits for our analysis. For the upper line, we are assuming that the market grows with the same rate as that before recession and the lower limit is based on the last year slope and the change that market had between 2012 and 2013.

After the recession the market had a very dramatic growth for two years but the speed of this market's growth has been slowed down recently. The author believes this steep slope for after recession is due to the American Reinvestment and Recovery Act of 2009 (ARRA) that was an economic stimulus package enacted by the 111<sup>th</sup> United States Congress in February 2009 and signed into laws on February 17, 2009, by president Barack Obama. The main objective of ARRA was responding to the great recession and saving and creating jobs almost immediately (Douglas 2012). Obviously, DB was a very good option for this quick response to the recession because shortened delivery schedule is one of the main advantages of this project delivery method. Construction can be done very fast using DB when the project is shovel ready. It means that the front end planning needed to be done before deciding to implement DB delivery method for ARRA projects. The same regression analysis and estimation is done for all of the top 100 DB firms' volumes; Fig. 12 shows these analyses and predictions. It is important to note that by using fixed effect model, characteristics such as size of the companies, and length of recession are manually controlled.





**Figure 11 - Regression modeling for DB Market revenue**



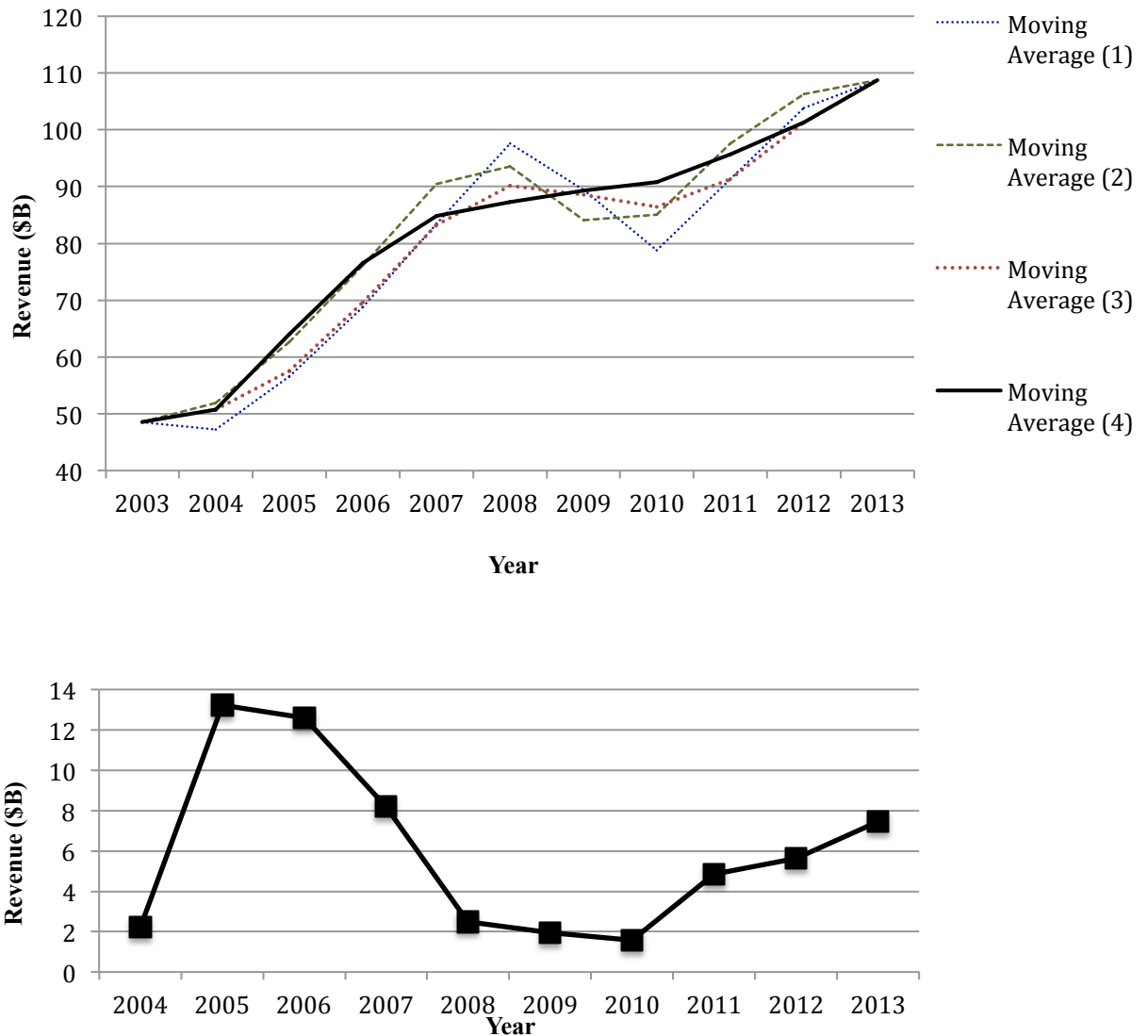
**Figure 12 - Regression modeling for different volumes of the top 100 DB firms**

### Time-Series Analysis

Fig. 13 (top) shows moving average of span 1, 2, 3, and 4. Apparently, span 4 is the best-smoothed version of the original data revealing its patterns. However, this data is not stationary because its distribution in the y-axis is affected by a change in the time origin.

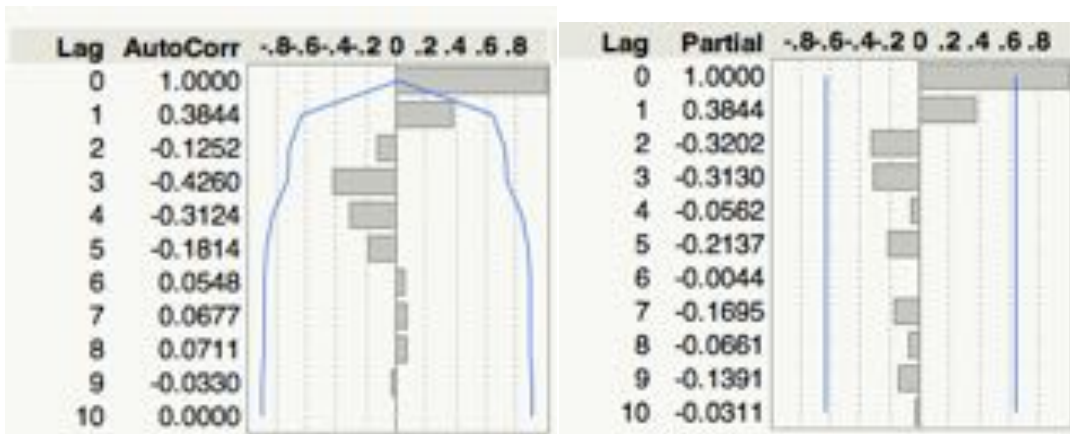
As mentioned in the methodology section, a difference order 1 was derived from the data to make it stationary. Fig. 13 (bottom) indicates the difference order 1 for the

smoothed data by moving average of span 4, transforming the data to stationary form since its properties are no longer affected by a change in time origin. The auto-correlation function plot and partial auto-correlation plot indicate the satisfactory stationary white noise residuals, resulting in using ARIMA (0,1,0) model, which seems appropriate for modeling the DB market data.

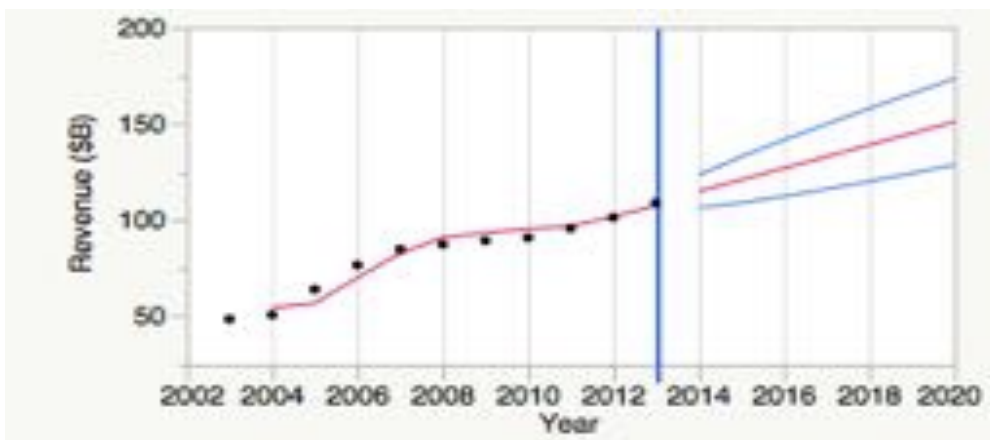


**Fig. 13. Different spans of simple moving average for DB market data (top) and First difference order graph for the smoothed data (bottom)**

As auto correlation and partial auto correlation functions for difference order graph were not sinusoidal and also did not have any spikes between their lags (Fig. 14), no moving average (MA) and autoregressive (AR) processes were needed for modeling. Thus by just deriving difference order 1 from the smoothed data, a line could be fitted to the data. Fig. 15 shows this line and the predicted revenues for the DB market. The same analysis for all of the DB market volumes is shown in Appendix B.



**Figure 14 - Auto correlation (left) and Partial auto correlation (right) functions for difference order graph**



**Figure 15 - Predicted DB market revenues for future years until 2020**

Table 1 shows the predicted revenues of DB market different volumes that are derived from both regression and time-series analyses. All segments of the DB market are predicted to continue growing in revenues also; this table indicates that the predictions of these two methods are very close to each other. The last two columns show the lower and upper limits of time-series analysis for all volumes and the total market. The second values for the total market upper and lower limits in 2020 are from the regression analysis.

**Table 1 - Forecasted revenue growth for DB market volumes**

Volume	2013 Current (\$B)	2020 Predicted Revenues – Regression Analysis (\$B)	2020 Predicted Revenues – Time-series Analysis (\$B)	Lower Limits (\$B)	Upper Limits (\$B)
1 <sup>st</sup> to 5 <sup>th</sup>	62.1	84.8	90.7	78.2	103.2
6 <sup>th</sup> to 20 <sup>th</sup>	22.6	34.9	29.2	20.5	37.9
21 <sup>st</sup> to 40 <sup>th</sup>	11.5	15.3	15.4	11.9	19
41 <sup>st</sup> to 60 <sup>th</sup>	6.0	8.1	7.4	6.1	8.8
61 <sup>st</sup> to 80 <sup>th</sup>	3.9	5.1	4.9	4.2	5.6
81 <sup>st</sup> to 100 <sup>th</sup>	2.7	3.1	3.3	2.9	3.7
Total DB market	108.8	150.8	150.9	128.6 to 143.8	173.3 to 182.2

## CHAPTER 7

### CONCLUSION

This thesis analyzes the DB market more precisely in order to identify the anticipated trends. The analysis conducted in this study depicts a 124% growth of DB project delivery market in the previous decade in spite of market declines in 2004, 2009, and 2010. The falloff in 2009 and 2010 was likely due to the Great Recession, which affected most industries in the U.S. However, the economic recovery in the following years (2011 to 2013) offset these declines and the DB market still averaged just under \$6 billion growth per year.

Continued advancement of the DB market has led to an essential need to capture and analyze the colossal difference in the market share changes between the largest DB firms and the smaller ones. The discussion in this research indicates that although all DB firms' nominal revenue has increased in the last decade, only the top five firms have succeeded in maintaining or increasing their market shares. The smaller Design-Builders have lost their shares year after year. Respectively, the small (41<sup>st</sup> to 100<sup>th</sup>) and medium (6<sup>th</sup> to 40<sup>th</sup>) DB firms have lost 31.2% and 17.9% of their shares. However, the top five largest Design-Build firms' market share has grown by 30.3%.

The research illustrates the top five Design-Builders recently have had more market share in the international market (35.4%) compared to the domestic (21.6%) so the international market have helped them to be distinguished from their competitors and most of this volume's growth is related to their growth in the international market.

Regression and Time series methods were used to predict the future trend of the market. Implementing the available information into these models provided a valuable understanding of the future market where it indicates that the market share of top five firms will increase up to 60% in the upcoming years as opposed to rest of the firms which are predicted to continue losing their market share.

This research faced some limitations such as (1) the data is not available for years before 2003, (2) the list of top DB firms in each year include just the top 100 firms, and (3) the revenue of each DB firm is reported totally so the specific revenue of each firm for different markets such as residential, commercial, etc. is unavailable.

Future research can be completed using more data to train the predictor, or in other words provide higher levels of confidence for future DB market growth predictions. In addition, considering a larger population and randomized subset of data will allow for use of a random effects model. This type of model will account for unpredictable heterogeneity in the system, this will allow to study the effect of merging, acquisition, and swapping among the companies. Applying these methods to other alternative project delivery methods and comparing them with DB should be considered as well. Moreover, studying projects sizes and also mergers and acquisitions of the DB firms and how these correlate with the results obtained in this research could also make another opportunity for future research.

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APPENDIX A

ENR SURVEY OF LEADING CONTRACTORS AND DESIGN FIRMS



## SURVEY OF LEADING CONTRACTORS AND DESIGN FIRMS

For publication in Engineering News-Record

Please read the attached guidelines and definitions before filling out this survey form.

PLEASE MAKE ANY CORRECTIONS ON THE MAILING LABEL REGARDING YOUR COMPANY NAME AND CITY AND STATE. IF THE COMPANY NAME AND ADDRESS ON THIS LABEL IS DIFFERENT FROM HOW YOU WISH IT TO APPEAR ON THE ENR TOP LISTS, PLEASE NOTE THAT FACT ON PAGE 6 OF THIS SURVEY.

1. In what year was your company founded? [                      ]
2. Is your company's revenue from construction contracting or design services (check one):
- for calendar year 2013 (preferred)  
 for fiscal year ending (Month) [                      ] (Year)                      ]

### CONSTRUCTION - Top 400 Contractors

Fill out this section if your firm had any CONSTRUCTION contracting revenue in 2013.

**Important—No Double Counting:** Exclude ANY revenue from divisions or subsidiaries that will be allowed to participate on the Top 400, Top 500 Design Firms, Top CM Firms or Top 600 Specialty Contractors under their own name. DO NOT include the following in Question 3:

- Design revenue if also reported in Question 5 covering Design Firms
- CM-for-Fee revenue from Question 6(B) for Agency CM Ranking or Program Management fees from Question 6(C).
- But CM-at-Risk Revenue from Question 6(A) should be included with your Construction revenue in Question 3.

3. What was your firm's gross revenue (in \$ millions) from general contracting in 2013?
- A. Domestic ..... \$ [                      ]
- B. International (see page 4 for countries in each region):
- |                                       |                             |
|---------------------------------------|-----------------------------|
| (1) Canada .....                      | \$ [                      ] |
| (2) Latin America .....               | \$ [                      ] |
| (3) Caribbean Islands .....           | \$ [                      ] |
| (4) Europe .....                      | \$ [                      ] |
| (5) Middle East .....                 | \$ [                      ] |
| (6) Asia/Australia .....              | \$ [                      ] |
| (7) North Africa .....                | \$ [                      ] |
| (8) Central and Southern Africa ..... | \$ [                      ] |
| (9) Antarctic/Arctic .....            | \$ [                      ] |
| TOTAL INTERNATIONAL .....             | \$ [                      ] |
- C. TOTAL FOR RANKING PURPOSES (3A + 3B) ..... \$ [                      ]

D (1). How much of this contracting revenue reported in Question 3(C) comes from projects using design-build as the delivery system? (Report design revenue from design-build contracts in Question 5. See guidelines.)

Domestic .....	\$ [                      ]
International .....	\$ [                      ]
TOTAL .....	\$ [                      ]

D (2). How much of your design-build revenue reported in Question 3(D) comes from projects using Design-Build-Operate (DBO) or Design-Build-Operate-Maintain (DBOM) contracts.

Domestic .....	\$ [                      ]
International .....	\$ [                      ]
TOTAL .....	\$ [                      ]

E. How much of your 2013 domestic and international gross construction contracting revenue, including construction management contracts at-risk (Question 4A) was in the market categories below? This question must be answered by all firms with construction revenue. IMPORTANT: YOUR ANSWERS IN EACH OF THESE MARKET CATEGORIES SHOULD SERVE AS A STARTING POINT FOR FILLING OUT THE MARKET SECTOR QUESTIONS ON THE ENR 2014 SOURCEBOOK SURVEY FORM, ENCLOSED WITH THIS SURVEY.

	Domestic (From Quest. 3 (A))	International (From Quest. 3 (B))
E (1) General building (commercial bldgs., offices, stores, education, etc.)	\$ [ ]	\$ [ ]
E (2) Industrial process (pulp and paper, steel, non-ferrous metal refineries, etc.)	\$ [ ]	\$ [ ]
E (3) Manufacturing (manufacturing production facilities such as auto assembly plants, electronic assembly, etc.)	\$ [ ]	\$ [ ]
E (4) Water supply (dams, reservoirs, water transmission lines, aqueducts, etc.)	\$ [ ]	\$ [ ]
E (5) Sewerage/solid waste disposal (sanitary/storm sewers, treatment plants, landfills, etc.)	\$ [ ]	\$ [ ]
E (6) Transportation (airports, bridges, highways, roads, canals and locks, etc.)	\$ [ ]	\$ [ ]
E (7) Hazardous waste (chemical, nuclear, asbestos, lead, etc.)	\$ [ ]	\$ [ ]
E (8) Power (thermal, hydroelectric, waste-to-energy plants, transmission lines, etc.)	\$ [ ]	\$ [ ]
E (9) Petroleum (refineries, natural gas, petrochemical, offshore, pipelines, etc.)	\$ [ ]	\$ [ ]
E (10) Telecommunications (Transmission lines, cabling, towers & antennae, data centers, etc.)	\$ [ ]	\$ [ ]
E (11) Other (specify)	\$ [ ]	\$ [ ]
<b>TOTAL</b>	<b>\$ [ ]</b>	<b>\$ [ ]</b>

4. What is the value of new construction contracts (in \$ millions) awarded to your firm in 2013 (see guidelines)?

Domestic .....	\$ [ ]	
International .....	\$ [ ]	
<b>TOTAL .....</b>	<b>\$ [ ]</b>	<b>[ ]</b>

**DESIGN-Top 500 Design Firms**

Fill out this section if your firm received revenue from any design services in 2013.

**Important—No Double Counting:** Exclude ANY revenue from divisions or subsidiaries that will be allowed to participate on the Top 400, Top 500, Top CM Firms or Top 600 Specialty Contractors under their own name.

**DO NOT include the following in Question 5:**

- a. Revenue from program management contracts for services managing or coordinating multiple projects for a single owner. Report this program management revenue in 6(C).
- b. CM and project management work provided on a fee-only basis, which is covered in Question 6(B).
- c. Contracting revenue reported in Question 3 or the contracting portion of design-build contracts covered in Question 3(D).

5. What was your revenue for design services (in \$ millions) performed in 2013?

A. Domestic .....	\$ [ ]	[ ]
B. International (see page 4 for countries in each region):		
(1) Canada .....	\$ [ ]	[ ]
(2) Latin America .....	\$ [ ]	[ ]
(3) Caribbean Islands .....	\$ [ ]	[ ]
(4) Europe .....	\$ [ ]	[ ]
(5) Middle East .....	\$ [ ]	[ ]
(6) Asia/Australia .....	\$ [ ]	[ ]
(7) North Africa .....	\$ [ ]	[ ]
(8) Central and Southern Africa .....	\$ [ ]	[ ]
(9) Antarctic/Arctic .....	\$ [ ]	[ ]
<b>TOTAL INTERNATIONAL</b> .....	<b>\$ [ ]</b>	<b>[ ]</b>
C. <b>TOTAL FOR RANKING PURPOSES (5A + 5B)</b> .....	<b>\$ [ ]</b>	<b>[ ]</b>
D. What amount of your total design revenue was passed through directly to other design firms or subconsultants?		
Domestic .....	\$ [ ]	[ ]
International .....	\$ [ ]	[ ]
<b>TOTAL .....</b>	<b>\$ [ ]</b>	<b>[ ]</b>

**DESIGN PORTION OF DESIGN BUILD**

E.(1) How much of your total design revenue in Question 5(C) comes from projects using design-build as the delivery system where your firm assumes part of the project risk? (Report any construction revenue from design-build contracts in Question 3(D))

Domestic .....	\$ [ ]	[ ]
International .....	\$ [ ]	[ ]
<b>TOTAL .....</b>	<b>\$ [ ]</b>	<b>[ ]</b>

**ARCHITECTURAL REVENUE (FOR ARCHITECTURAL RECORD MAGAZINE RANKING)**

E.(2) How much of your design revenue in Question 5(C) comes from architectural services (including pass-throughs to other design firms)?

Domestic .....	\$ [ ]	[ ]
International .....	\$ [ ]	[ ]
<b>TOTAL .....</b>	<b>\$ [ ]</b>	<b>[ ]</b>

- F. What type of design organization is your firm (check one)?
- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Architect             | <input type="checkbox"/> Engineer-contractor | <input type="checkbox"/> Environmental                  |
| <input type="checkbox"/> Geotechnical engineer | <input type="checkbox"/> Consulting engineer | <input type="checkbox"/> Landscape architect            |
| <input type="checkbox"/> Engineer-architect    | <input type="checkbox"/> Architect-engineer  | <input type="checkbox"/> Other (specify) [            ] |

- G. What type of work does your staff do?
- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Architectural           | <input type="checkbox"/> Mechanical     | <input type="checkbox"/> Civil                          |
| <input type="checkbox"/> Construction management | <input type="checkbox"/> Structural     | <input type="checkbox"/> Planning (type) [            ] |
| <input type="checkbox"/> Electrical              | <input type="checkbox"/> Transportation | <input type="checkbox"/> Environmental                  |

H. How much of your 2013 design revenue from Question 5 (A) and 5(B) was derived from projects in the following categories?  
 This question must be answered by all firms with design revenue. IMPORTANT: YOUR ANSWERS IN EACH OF THESE MARKET CATEGORIES SHOULD SERVE AS A STARTING POINT FOR FILLING OUT THE MARKET SECTOR QUESTIONS ON THE ENR 2014 SOURCEBOOK SURVEY, WHICH IS ENCLOSED WITH THIS SURVEY FORM.

	Domestic	International
	(From Quest. 5 (A))	(From Quest. 5 (B))
H(1) General building (commercial bldgs., offices, stores, education, etc.)	\$ [            ]	\$ [            ]
H(2) Industrial process (pulp and paper, steel, non-ferrous metal refineries, etc.)	\$ [            ]	\$ [            ]
H(3) Manufacturing (manufacturing production facilities such as auto assembly plants, electronic assembly, etc.)	\$ [            ]	\$ [            ]
H(4) Water supply (dams, reservoirs, water transmission lines, aqueducts, etc.)	\$ [            ]	\$ [            ]
H(5) Sewerage/solid waste disposal (sanitary/storm sewers, treatment plants, landfills, etc.)	\$ [            ]	\$ [            ]
H(6) Transportation (airports, bridges, highways, roads, canals and locks, etc.)	\$ [            ]	\$ [            ]
H(7) Hazardous waste (chemical, nuclear, asbestos, lead, etc.)	\$ [            ]	\$ [            ]
H(8) Power (thermal, hydroelectric, waste-to-energy plants, transmission lines, etc.)	\$ [            ]	\$ [            ]
H(9) Petroleum (refineries, natural gas, petrochemical, offshore, pipelines, etc.)	\$ [            ]	\$ [            ]
H(10) Telecommunications (Transmission lines, cabling, towers & antennae, data centers, etc)	\$ [            ]	\$ [            ]
H(11) Other (specify)	\$ [            ]	\$ [            ]
<b>TOTAL</b>	<b>\$ [            ]</b>	<b>\$ [            ]</b>

**CONSTRUCTION MANAGEMENT/PROGRAM MANAGEMENT**

Fill out this section if your firm provided construction management and/or program management services in 2013 (see guidelines). Please note the distinction between construction management, which is directed to a single project, and program management, which involves conceptualizing, planning and supervising multiple projects for a single owner.

**CONSTRUCTION MANAGEMENT AT-RISK**

6. A. What revenue (in \$millions) did your firm receive from CM-at-risk projects in 2013 (i.e., CM work included in Quest. 3(C)?

Domestic .....	\$ [            ]
International .....	\$ [            ]
<b>TOTAL</b> .....	<b>\$ [            ]</b>

**CONSTRUCTION MANAGEMENT FOR FEE ONLY**

6. B. (1) What was the constructed value of your firm's projects (in \$ millions) in 2013 where you provided CM or project management services on a fee-only basis? [IMPORTANT: Exclude program management projects.]

Domestic .....	\$ [            ]
International .....	\$ [            ]
<b>TOTAL</b> .....	<b>\$ [            ]</b>

6. B. (2) What were your gross fees (in \$ millions) in 2013 for CM, or project management services provided on a fee-only basis? [Exclude program management fees that belong in 6(C) below.] Please include only your fees for professional management services and NOT revenue or pass-throughs from design or construction of the project itself.

Domestic .....	\$ [            ]
International .....	\$ [            ]
<b>TOTAL</b> .....	<b>\$ [            ]</b>

**PROGRAM MANAGEMENT FEES**

6. C. What were your gross fees (in \$ millions) in 2013 from program management contracts for services managing or coordinating multiple projects for a single owner? Please include only your fees for professional management services and NOT revenue or pass-throughs from the design or construction of the project itself.

Domestic .....	\$ [            ]
International .....	\$ [            ]
<b>TOTAL</b> .....	<b>\$ [            ]</b>



**INTERNATIONAL WORK**

Fill out this section if your firm did any construction or design work outside of its home country in 2013.

7. In the following list of countries, check those in which your company had construction work under way in 2013 or in which your firm provided design and design-related services in 2013.

Country	Const.	Design	Country	Const.	Design	Country	Const.	Design
<b>A. NORTH AMERICA</b>			67. Slovakia	<input type="checkbox"/>	<input type="checkbox"/>	124. Turkmenistan	<input type="checkbox"/>	<input type="checkbox"/>
1. Canada	<input type="checkbox"/>	<input type="checkbox"/>	68. Spain	<input type="checkbox"/>	<input type="checkbox"/>	125. Uzbekistan	<input type="checkbox"/>	<input type="checkbox"/>
<b>B. LATIN AMERICA</b>			69. Sweden	<input type="checkbox"/>	<input type="checkbox"/>	126. Vietnam	<input type="checkbox"/>	<input type="checkbox"/>
10. Argentina	<input type="checkbox"/>	<input type="checkbox"/>	70. Switzerland	<input type="checkbox"/>	<input type="checkbox"/>	127. Laos	<input type="checkbox"/>	<input type="checkbox"/>
11. Bolivia	<input type="checkbox"/>	<input type="checkbox"/>	71. Ukraine	<input type="checkbox"/>	<input type="checkbox"/>	128. Mongolia	<input type="checkbox"/>	<input type="checkbox"/>
12. Brazil	<input type="checkbox"/>	<input type="checkbox"/>	72. United Kingdom	<input type="checkbox"/>	<input type="checkbox"/>	<b>G. NORTH AFRICA</b>		
13. Chile	<input type="checkbox"/>	<input type="checkbox"/>	73. Yugoslavia (former)	<input type="checkbox"/>	<input type="checkbox"/>	130. Algeria	<input type="checkbox"/>	<input type="checkbox"/>
14. Colombia	<input type="checkbox"/>	<input type="checkbox"/>	74. Bosnia & Herzegovina	<input type="checkbox"/>	<input type="checkbox"/>	131. Egypt	<input type="checkbox"/>	<input type="checkbox"/>
15. Costa Rica	<input type="checkbox"/>	<input type="checkbox"/>	75. Croatia	<input type="checkbox"/>	<input type="checkbox"/>	132. Ethiopia	<input type="checkbox"/>	<input type="checkbox"/>
16. Ecuador	<input type="checkbox"/>	<input type="checkbox"/>	76. FYR Macedonia	<input type="checkbox"/>	<input type="checkbox"/>	133. Libya	<input type="checkbox"/>	<input type="checkbox"/>
17. El Salvador	<input type="checkbox"/>	<input type="checkbox"/>	77. Slovenia	<input type="checkbox"/>	<input type="checkbox"/>	134. Morocco	<input type="checkbox"/>	<input type="checkbox"/>
18. Guatemala	<input type="checkbox"/>	<input type="checkbox"/>	<b>E. MIDDLE EAST</b>			135. Niger	<input type="checkbox"/>	<input type="checkbox"/>
19. Guyana	<input type="checkbox"/>	<input type="checkbox"/>	80. Afghanistan	<input type="checkbox"/>	<input type="checkbox"/>	136. Somalia	<input type="checkbox"/>	<input type="checkbox"/>
20. Honduras	<input type="checkbox"/>	<input type="checkbox"/>	81. Bahrain	<input type="checkbox"/>	<input type="checkbox"/>	137. Sudan	<input type="checkbox"/>	<input type="checkbox"/>
21. Mexico	<input type="checkbox"/>	<input type="checkbox"/>	82. Cyprus	<input type="checkbox"/>	<input type="checkbox"/>	138. Sub Sahara <sup>1</sup>	<input type="checkbox"/>	<input type="checkbox"/>
22. Nicaragua	<input type="checkbox"/>	<input type="checkbox"/>	83. Iran	<input type="checkbox"/>	<input type="checkbox"/>	139. Tunisia	<input type="checkbox"/>	<input type="checkbox"/>
23. Panama	<input type="checkbox"/>	<input type="checkbox"/>	84. Iraq	<input type="checkbox"/>	<input type="checkbox"/>	<b>H. CENTRAL AND SOUTHERN AFRICA</b>		
24. Paraguay	<input type="checkbox"/>	<input type="checkbox"/>	85. Israel	<input type="checkbox"/>	<input type="checkbox"/>	140. Angola	<input type="checkbox"/>	<input type="checkbox"/>
25. Peru	<input type="checkbox"/>	<input type="checkbox"/>	86. Jordan	<input type="checkbox"/>	<input type="checkbox"/>	141. Benin	<input type="checkbox"/>	<input type="checkbox"/>
26. Uruguay	<input type="checkbox"/>	<input type="checkbox"/>	87. Kuwait	<input type="checkbox"/>	<input type="checkbox"/>	142. Botswana	<input type="checkbox"/>	<input type="checkbox"/>
27. Venezuela	<input type="checkbox"/>	<input type="checkbox"/>	88. Lebanon	<input type="checkbox"/>	<input type="checkbox"/>	143. Burkina Faso	<input type="checkbox"/>	<input type="checkbox"/>
28. Suriname	<input type="checkbox"/>	<input type="checkbox"/>	89. Oman	<input type="checkbox"/>	<input type="checkbox"/>	144. Burundi	<input type="checkbox"/>	<input type="checkbox"/>
<b>C. CARIBBEAN ISLANDS</b>			90. Pakistan	<input type="checkbox"/>	<input type="checkbox"/>	145. Cameroon	<input type="checkbox"/>	<input type="checkbox"/>
30. Greater Antilles <sup>1</sup>	<input type="checkbox"/>	<input type="checkbox"/>	91. Qatar	<input type="checkbox"/>	<input type="checkbox"/>	146. Cape Verde Islands	<input type="checkbox"/>	<input type="checkbox"/>
31. Puerto Rico	<input type="checkbox"/>	<input type="checkbox"/>	92. Saudi Arabia	<input type="checkbox"/>	<input type="checkbox"/>	147. Congo Republic	<input type="checkbox"/>	<input type="checkbox"/>
32. Cuba	<input type="checkbox"/>	<input type="checkbox"/>	93. Syria	<input type="checkbox"/>	<input type="checkbox"/>	148. Gabon	<input type="checkbox"/>	<input type="checkbox"/>
35. Lesser Antilles <sup>2</sup>	<input type="checkbox"/>	<input type="checkbox"/>	94. Turkey	<input type="checkbox"/>	<input type="checkbox"/>	149. Gambia	<input type="checkbox"/>	<input type="checkbox"/>
<b>D. EUROPE</b>			95. United Arab Emirates	<input type="checkbox"/>	<input type="checkbox"/>	150. Ghana	<input type="checkbox"/>	<input type="checkbox"/>
40. Albania	<input type="checkbox"/>	<input type="checkbox"/>	96. Yemen	<input type="checkbox"/>	<input type="checkbox"/>	151. Guinea	<input type="checkbox"/>	<input type="checkbox"/>
41. Armenia	<input type="checkbox"/>	<input type="checkbox"/>	<b>F. ASIA/AUSTRALIA</b>			152. Ivory Coast	<input type="checkbox"/>	<input type="checkbox"/>
42. Austria	<input type="checkbox"/>	<input type="checkbox"/>	100. Australia	<input type="checkbox"/>	<input type="checkbox"/>	153. Kenya	<input type="checkbox"/>	<input type="checkbox"/>
43. Azerbaijan	<input type="checkbox"/>	<input type="checkbox"/>	101. Bangladesh	<input type="checkbox"/>	<input type="checkbox"/>	154. Lesotho	<input type="checkbox"/>	<input type="checkbox"/>
44. Belarus	<input type="checkbox"/>	<input type="checkbox"/>	102. Brunei	<input type="checkbox"/>	<input type="checkbox"/>	155. Liberia	<input type="checkbox"/>	<input type="checkbox"/>
45. Belgium	<input type="checkbox"/>	<input type="checkbox"/>	103. Myanmar(Burma)	<input type="checkbox"/>	<input type="checkbox"/>	156. Malawi	<input type="checkbox"/>	<input type="checkbox"/>
46. Bulgaria	<input type="checkbox"/>	<input type="checkbox"/>	104. China (P.R.C.)	<input type="checkbox"/>	<input type="checkbox"/>	157. Mozambique	<input type="checkbox"/>	<input type="checkbox"/>
47. Czech Rep.	<input type="checkbox"/>	<input type="checkbox"/>	104a. Macau	<input type="checkbox"/>	<input type="checkbox"/>	158. Nigeria	<input type="checkbox"/>	<input type="checkbox"/>
48. Denmark	<input type="checkbox"/>	<input type="checkbox"/>	105. Diego Garcia	<input type="checkbox"/>	<input type="checkbox"/>	159. Rwanda	<input type="checkbox"/>	<input type="checkbox"/>
49. Estonia	<input type="checkbox"/>	<input type="checkbox"/>	106. Hong Kong (P.R.C.)	<input type="checkbox"/>	<input type="checkbox"/>	160. Senegal	<input type="checkbox"/>	<input type="checkbox"/>
50. Finland	<input type="checkbox"/>	<input type="checkbox"/>	107. India	<input type="checkbox"/>	<input type="checkbox"/>	161. Sierra Leone	<input type="checkbox"/>	<input type="checkbox"/>
51. France	<input type="checkbox"/>	<input type="checkbox"/>	108. Indonesia	<input type="checkbox"/>	<input type="checkbox"/>	162. South Africa	<input type="checkbox"/>	<input type="checkbox"/>
52. Georgia	<input type="checkbox"/>	<input type="checkbox"/>	109. Japan	<input type="checkbox"/>	<input type="checkbox"/>	163. Swaziland	<input type="checkbox"/>	<input type="checkbox"/>
53. Germany	<input type="checkbox"/>	<input type="checkbox"/>	110. Kazakhstan	<input type="checkbox"/>	<input type="checkbox"/>	164. Tanzania	<input type="checkbox"/>	<input type="checkbox"/>
54. Greece	<input type="checkbox"/>	<input type="checkbox"/>	111. Korea, South	<input type="checkbox"/>	<input type="checkbox"/>	165. Uganda	<input type="checkbox"/>	<input type="checkbox"/>
55. Hungary	<input type="checkbox"/>	<input type="checkbox"/>	111a. Korea, North	<input type="checkbox"/>	<input type="checkbox"/>	166. D.R.Congo (Zaire)	<input type="checkbox"/>	<input type="checkbox"/>
56. Ireland	<input type="checkbox"/>	<input type="checkbox"/>	112. Kyrgyzstan	<input type="checkbox"/>	<input type="checkbox"/>	167. Zambia	<input type="checkbox"/>	<input type="checkbox"/>
57. Italy	<input type="checkbox"/>	<input type="checkbox"/>	113. Malaysia	<input type="checkbox"/>	<input type="checkbox"/>	168. Zimbabwe	<input type="checkbox"/>	<input type="checkbox"/>
58. Latvia	<input type="checkbox"/>	<input type="checkbox"/>	114. Nepal	<input type="checkbox"/>	<input type="checkbox"/>	<b>I. 180. ANTARCTIC/ARCTIC</b>		
59. Lithuania	<input type="checkbox"/>	<input type="checkbox"/>	115. New Zealand	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. Moldova	<input type="checkbox"/>	<input type="checkbox"/>	116. Pacific Islands	<input type="checkbox"/>	<input type="checkbox"/>	<b>FOOTNOTES</b>		
61. Netherlands	<input type="checkbox"/>	<input type="checkbox"/>	117. Papua New Guinea	<input type="checkbox"/>	<input type="checkbox"/>	(1) Includes The Dominican Republic, Haiti and Jamaica. (2) Includes The Bahamas, The Lowland and Windward Islands, Trinidad and Tobago and the Virgin Islands. (3) Includes Chad, Eritrea, Mali, Mauritania, Niger, Somalia and The Sudan.		
62. Norway	<input type="checkbox"/>	<input type="checkbox"/>	118. Philippines	<input type="checkbox"/>	<input type="checkbox"/>			
63. Poland	<input type="checkbox"/>	<input type="checkbox"/>	119. Singapore	<input type="checkbox"/>	<input type="checkbox"/>			
64. Portugal	<input type="checkbox"/>	<input type="checkbox"/>	120. Sri Lanka	<input type="checkbox"/>	<input type="checkbox"/>			
65. Romania	<input type="checkbox"/>	<input type="checkbox"/>	121. Taiwan	<input type="checkbox"/>	<input type="checkbox"/>			
66. Russia	<input type="checkbox"/>	<input type="checkbox"/>	122. Tajikistan	<input type="checkbox"/>	<input type="checkbox"/>			
			123. Thailand	<input type="checkbox"/>	<input type="checkbox"/>			



*Please double check:*

- Totals should include domestic + international work unless specified otherwise.
- Do not include contracts for construction management on a fee-only basis (Question 6B) with either CM-at-risk (Question 6A) or gross revenue (Question 3C)
- Do not include design-related program management revenue (Question 5F) with your direct design revenue (Question 5A-C)
- Lines 3D + 6A should not exceed line 3C
- Lines 3C + 5C + 6B(2) + 6(C) should not exceed total company revenue reported in your corporate financial statement.

Who is your chief executive officer?

Name [ ] Title [ ]

Who is your chief operating officer?

Name [ ] Title [ ]

Who is your chief financial officer?

Name [ ] Title [ ]

Who is your business development officer?

Name [ ] Title [ ]

Who is your public relations officer?

Name [ ] Title [ ]

Who is your human resources officer?

Name [ ] Title [ ]

**VERY IMPORTANT: Who should we contact for inquiries concerning this survey?**

Name [ ] E-Mail address [ ]

Title [ ] Telephone number [ ]

Company [ ] Fax number [ ]

Address [ ]

City, state, zip [ ]

Alternate Name [ ] Alternate E-Mail address [ ]

Alternate Title [ ] Alternate Telephone number [ ]

**IMPORTANT: HOW SHOULD YOUR COMPANY'S NAME AND LOCATION BE LISTED ON ENR'S TOP LISTS AND DIRECTORIES?**

Company name [ ]

Address [ ]

City, state, zip [ ]

Main E-Mail [ ] Home page [ ]

Main phone # [ ] Main fax # [ ]

**VERY IMPORTANT: PERSONAL PLEDGE OF ACCURACY**

Independent verification of my firm's construction revenue and/or billings is not available in time for ENR's deadline. As a result, I personally attest to the accuracy of the numbers reported.

(Signed) \_\_\_\_\_

Chief executive officer

\_\_\_\_\_

Date

Please Email or fax this form to Gary Tulacz, Senior Editor, ENR, at gary.tulacz@mhfi.com, fax: (212) 904-2265 by February 17, 2014. The address is Gary Tulacz, Senior Editor, ENR, Two Penn Plaza, 9th Floor, New York, NY 10121.

**REMINDER: IF YOU DECLINE TO FILE ONLINE AND FILE ONLY THE PAPER COPIES OF THE SURVEY, THE FORMS ARE DUE FEBRUARY 17, 2014  
THE EXTENDED DEADLINE FOR ONLINE SURVEY FILING IS MARCH 3, 2014**

### **ADDITIONAL OPTIONAL QUESTIONS**

As part of ENR's examination of the global construction market, we have added the following nine questions to understand our survey participants' views on issues and trends in the construction industry. While these questions do not affect your ranking on ENR's lists and are not required, we ask you to answer them to help ENR provide a more thorough presentation of the global construction industry. Your answers to these questions will not be published or distributed and will be used only in the aggregate

15. How do you see the prospects for the Global construction market in the next 12 months?

- Improving     Worsening     Little/no change

16. Do you foresee your firm increasing its international work in the next three to five years?

- Yes     No

17. If yes, which regions do you foresee as the most active for your firm?

(Check all that apply)

- United States  
 Canada  
 Asia/Australia  
 Latin America  
 Caribbean  
 Europe  
 Middle East  
 North Africa  
 Central and Southern Africa  
 Antarctic/Arctic

18. Is your firm considering any merger or acquisition activity in the next 12-24 months?

- Yes     No

19. Do you see usage of Public-Private Partnerships or other private financing arrangements for public sector projects increasing or decreasing over the next three to five years?

- Increasing     Decreasing     Unchanged

20. What have been the most effective methods to recruit new employees to your firm:

(Check all that apply)

- Working directly with high schools and colleges  
 Working with industry organizations  
 Working with government organizations  
 Working with trade unions  
 Interns/Externships  
 Online job listings  
 Professional recruiters  
 International Recruitment  
 Other \_\_\_\_\_

21. What do you perceive will be the most influential factors in product/materials specification/selection over the next 12 to 24 months?

(Check all that apply)

- Availability  
 Cost  
 Ease of installation  
 Owner preference  
 Past performance  
 Past relationship with manufacturer/supplier  
 Reputation of manufacturer  
 Product literature

- Advice from reviews or peers
- Other \_\_\_\_\_

22. How influential do you think these trends will be to your business in the next 3-5 years? (Scale of 1-10 where 1 is not influential at all and 10 is very influential)

- [ ] Green Building
- [ ] Globalization
- [ ] Construction cost escalation
- [ ] Workforce availability
- [ ] Interoperability
- [ ] Building Information Modeling
- [ ] Energy efficiency
- [ ] Building or structure security
- [ ] Adaptive re-use
- [ ] Other \_\_\_\_\_

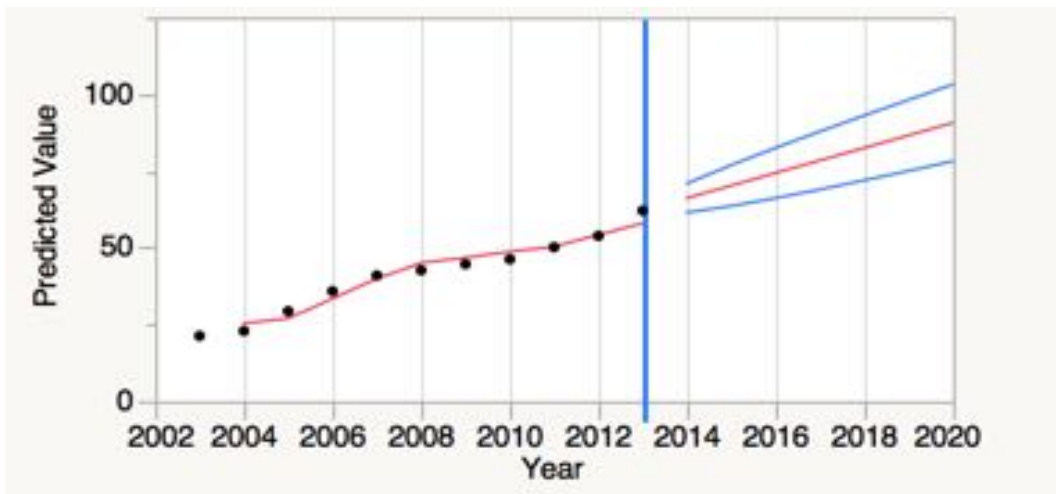
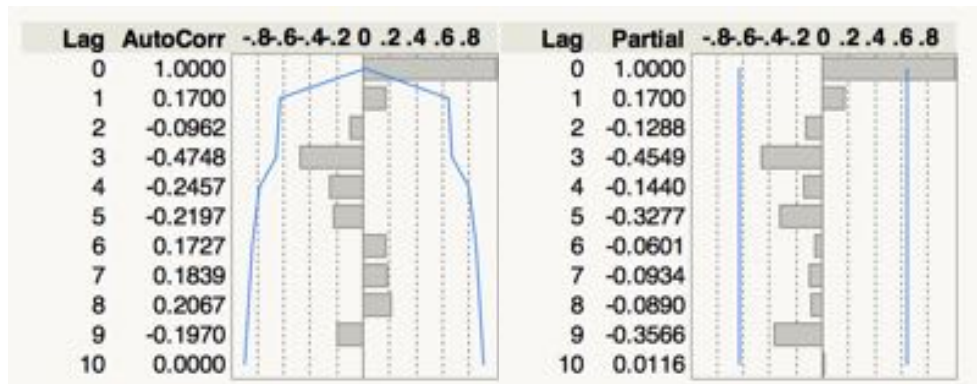
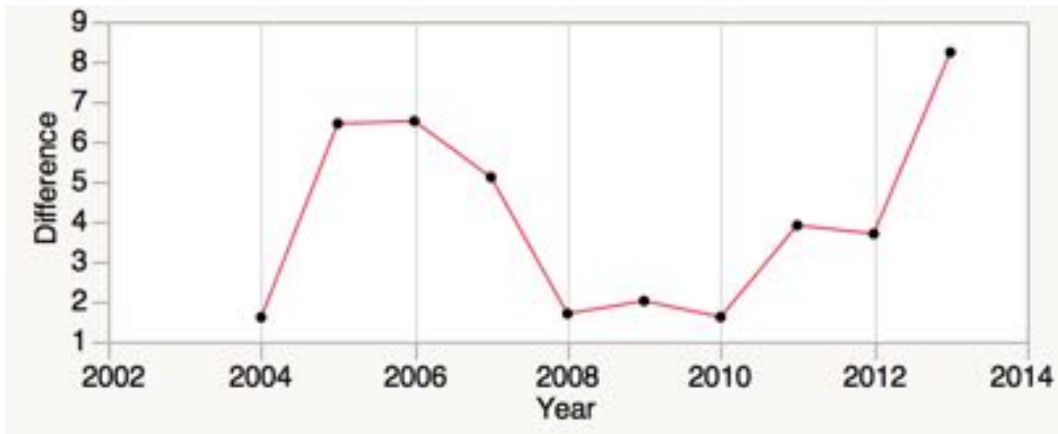
23. What percentage of your projects do you expect to be green in next 3-5 years?

- Less than 5%
- 5% to <10%
- 10% to <15%
- 15% to <20%
- 20% to <25%
- 25% or More

## APPENDIX B

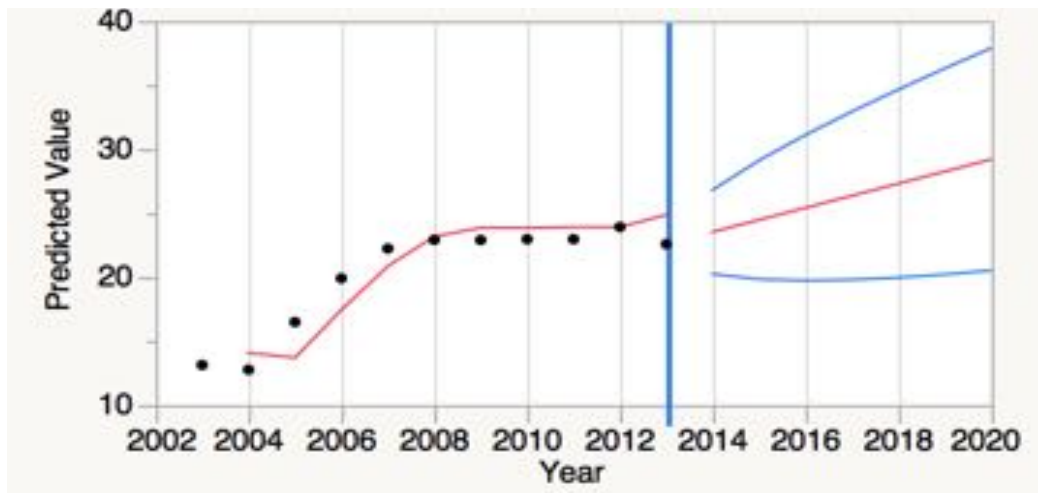
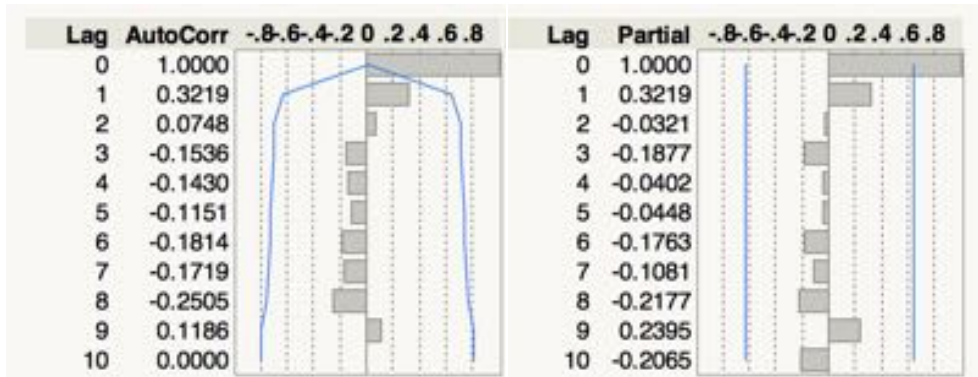
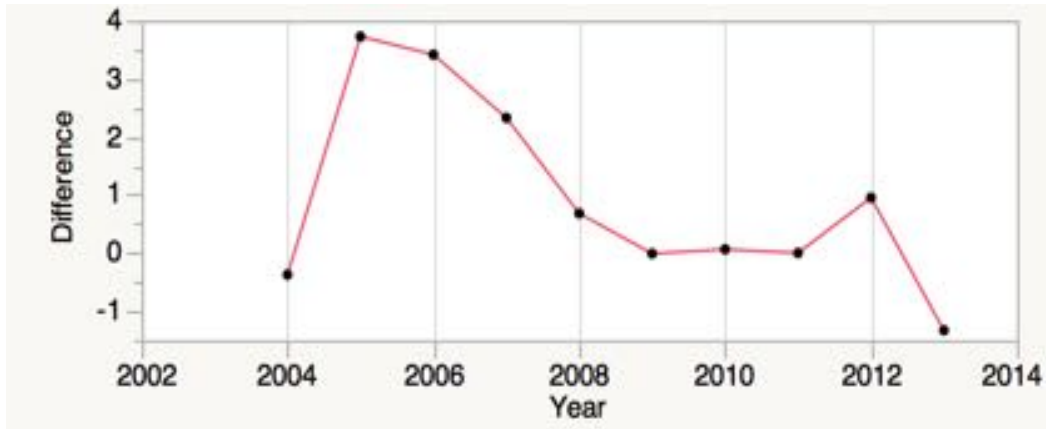
### TIME-SERIES ANALYSIS (DIFFERENT SECTIONS)

### Top five firms



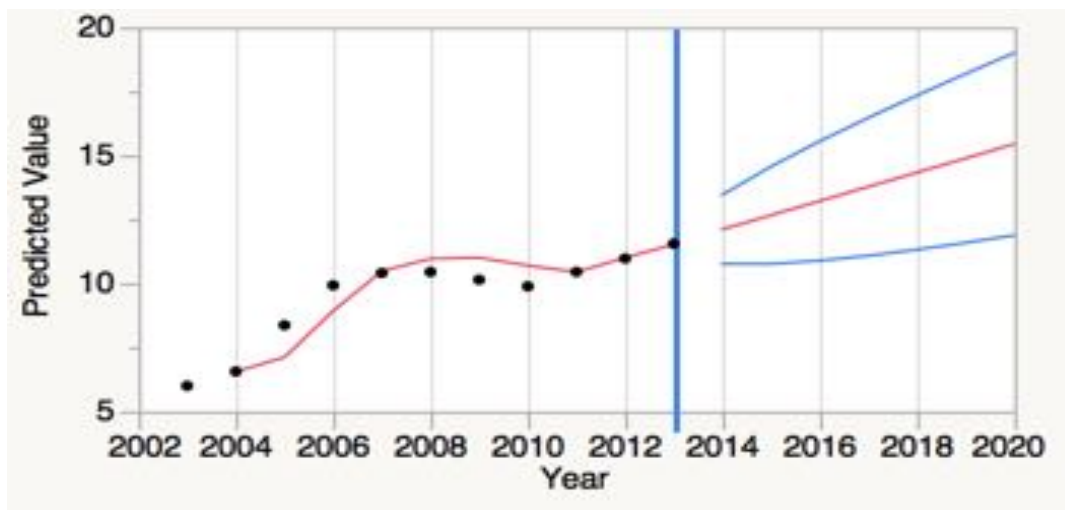
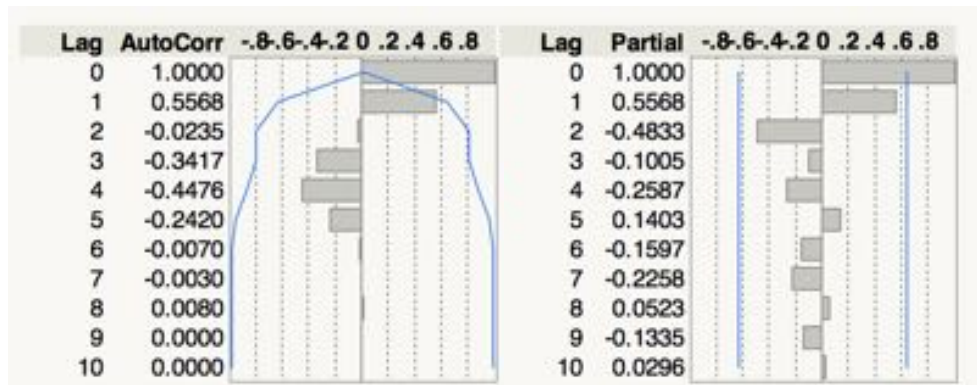
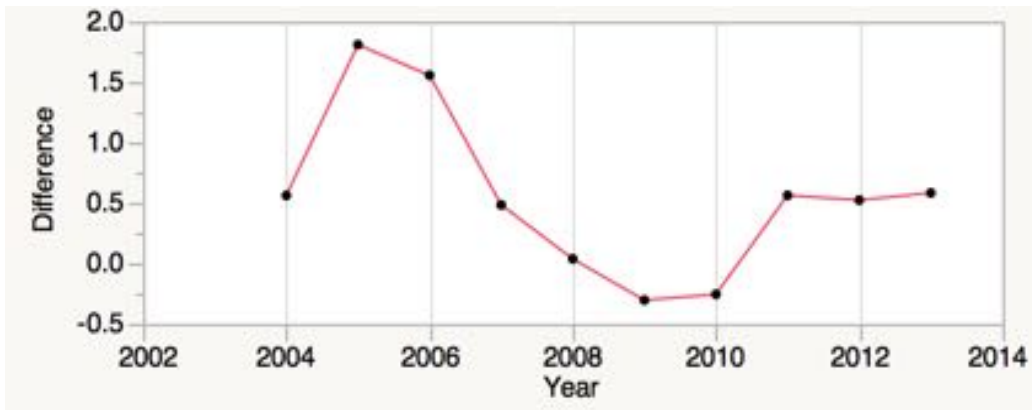


6<sup>th</sup> to 20<sup>th</sup> firms

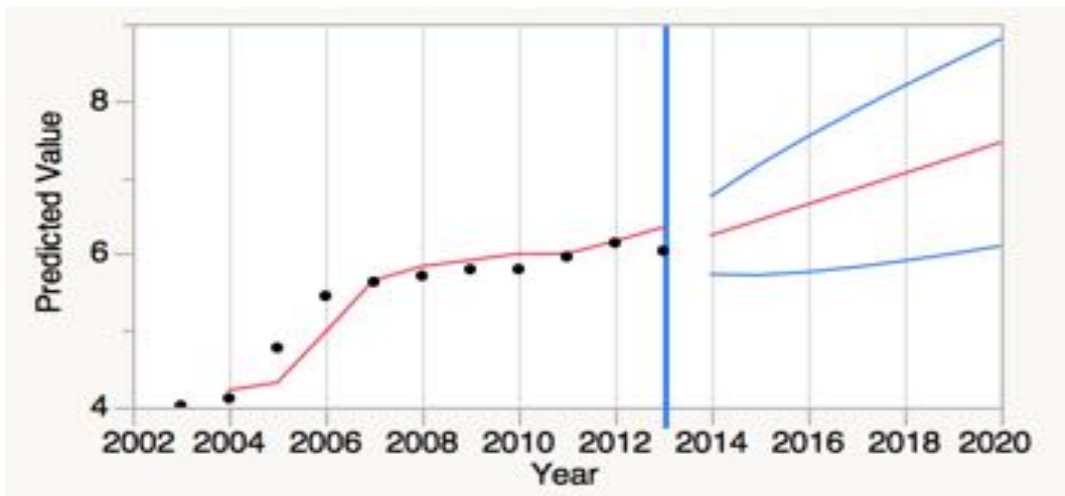
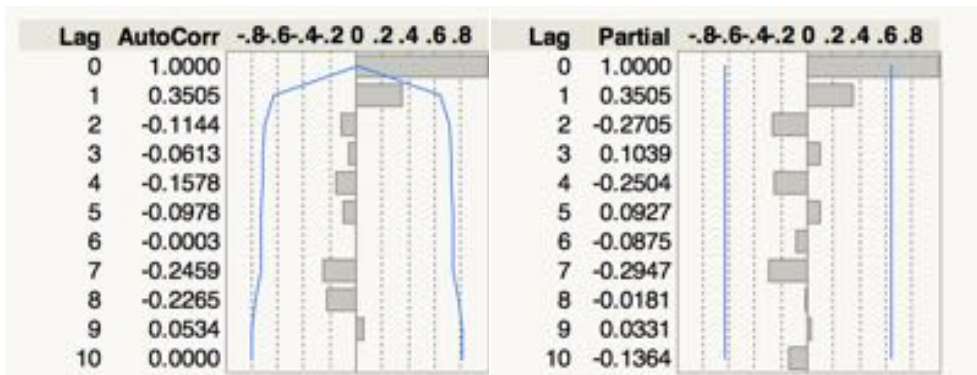
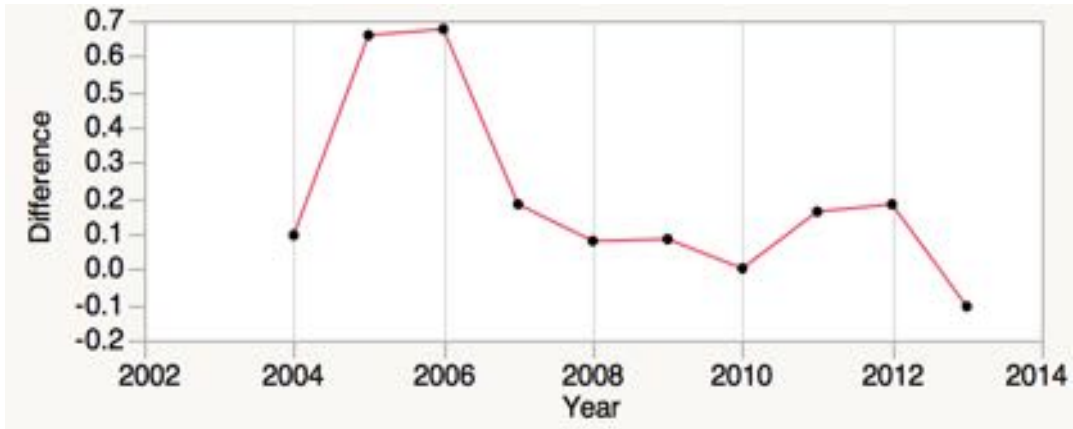




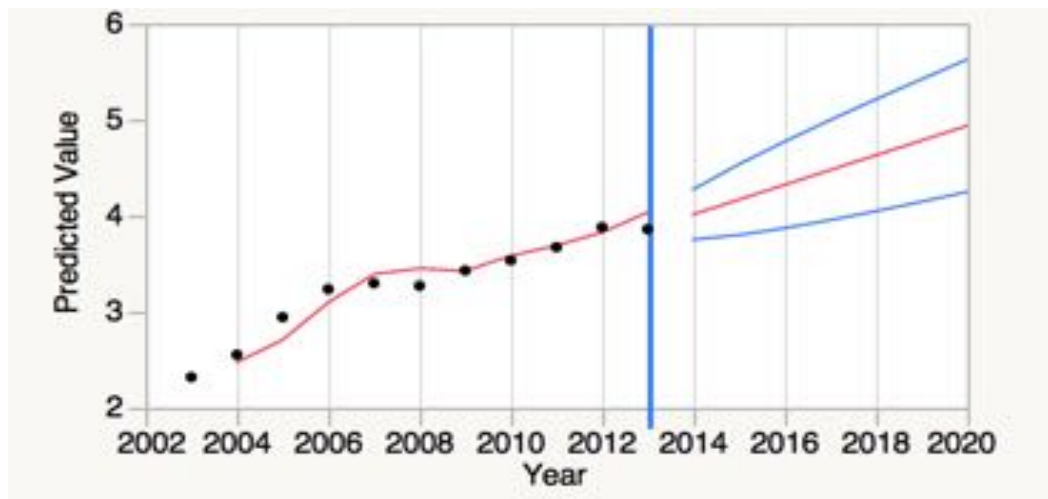
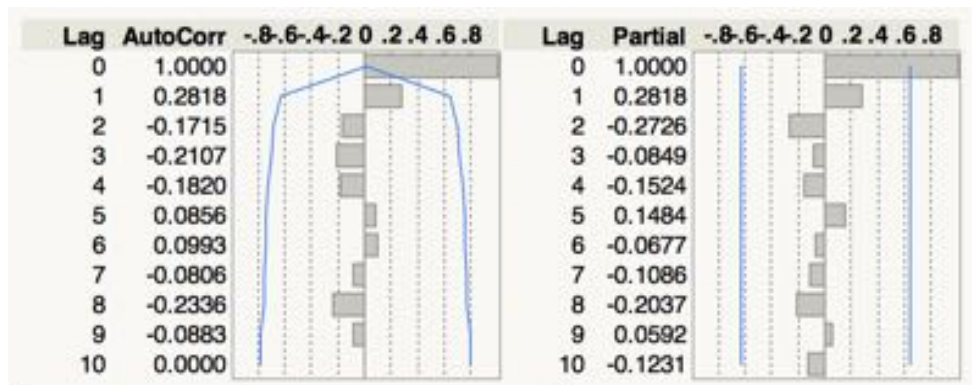
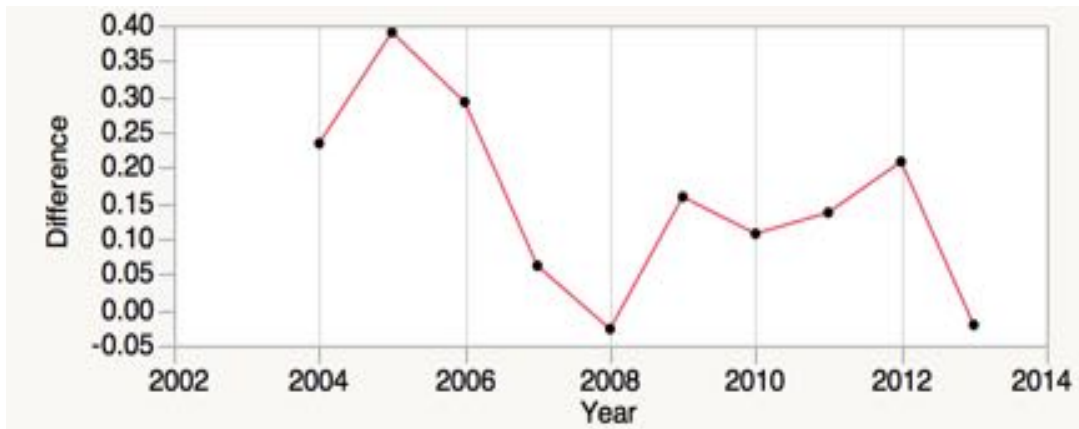
21<sup>st</sup> to 40<sup>th</sup> firms



41<sup>st</sup> to 60<sup>th</sup> firms



61<sup>st</sup> to 80<sup>th</sup> firms



81<sup>st</sup> to 100<sup>th</sup> firms

