

PERCEPTIONS OF THE DESIGN-BUILD PROJECT DELIVERY METHOD AMONG  
SMALL FLORIDA CONSTRUCTION FIRMS

By

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A THESIS PRESENTED TO THE GRADUATE SCHOOL  
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF SCIENCE IN BUILDING CONSTRUCTION

UNIVERSITY OF FLORIDA

2013

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To the Harrow and Kay Family

## ACKNOWLEDGMENTS

I thank my parents for always supporting me through the odd endeavors I wish to pursue. They have shown me everything, and I can finally start giving something back to them. I thank my brother for being a helpful guide through life and all law associated matters. I thank my sister for coaching me through all business related and life situations that occurred. I thank my great grandparents for showing me how to live a happy and successful life through perseverance and hard work. I thank my grandparents for teaching me how to be resourceful as well as being kind to others. I thank my wonderful boyfriend for always encouraging me to keep going even through the hard times. I thank my boyfriend's family for showing unconditional support. I thank my uncles and aunts, blood and not blood related, for being there to talk to when I need to vent about my crazy family. I thank my friends for their emotional support and always having a shoulder for me to cry on.

I thank my advisor for being calm and helpful especially when I am struggling. I thank the members of my thesis committee for being supportive even though we did not always see eye to eye. I thank the director, director's secretary and the M.E. Rinker, Sr. School of Building Construction for giving me this opportunity to learn what I love. I thank my tutors of statistics who tutored me through odd hours because of my hectic schedule. I thank my editors who show me something new every day. I thank everyone who participated in completing my survey, because without you I wouldn't have data.

I thank everyone who has ever influenced me positively and negatively, because without your motivation, I would not be where I am today.

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## LIST OF ABBREVIATIONS

Bv	Best Value
CII	Construction Industry Institute
CM	Construction Management
CMAR/CMR	Construction Management at Risk
DB	Design-Build
DBB	Design-Bid-Build
DBIA	Design Build Institute of America
FTC	Federal Trade Commission
GMP/GMCPF	Guaranteed Maximum Price
LB	Lowest Bid
PDM	Project Delivery Method
RFP	Request for Proposal
SIC	Intentionally so written
SoQ	Statement of Qualifications
Uk	United Kingdom
Us	United States of America

Abstract of Thesis Presented to the Graduate School  
of the University of Florida in Partial Fulfillment of the  
Requirements for the Degree of Master of Science in Building Construction

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August 2013

Chair: Raymond Issa  
Major: Building Construction

The purpose of this research is to evaluate the Design-Build delivery method and its ethical impacts. Is it possible that this delivery system is in favor of large companies and is unequal to all bidders that submit a bid? This experimental design was based on a common survey method, availability sampling, through email and postal addresses. The techniques used in the questionnaire were simple question and answer responses including yes, no, sometimes, other and extended responses. The major statistical analysis was done by performing Chi-Squared Hypothesis Testing to determine which hypothesis to accept or reject. Based on the Chi-Squared Tests performed, the researcher was able to draw a conclusion that paralleled her hypothesis: Design-build can be used as form of bid-rigging. In the perception of the respondents, Design-Build is illegal and unethical and should be modified or abolished. These findings are limited by the small sample size, the regional limitations to the State of Florida and the small company size of the respondents.

## CHAPTER 1

### INTRODUCTIONARY REMARKS

The purpose of this research is to evaluate the Design-Build delivery method and its ethical impacts. Should society have design-build as a delivery method or should it be illegal because it rigs the bids on a project? Design-Build does have many good attributes, but does that mean society should accept it? What should we accept? This is important to examine because society should be committed to ethical practices. Unethical practices tend to be illegal or detrimental to society as a whole. This study will evaluate the perceptions of survey respondents of design-build project delivery method and evaluate its inner-workings.

#### **Choosing the Topic**

The specific problem in design-build can have detrimental effects on society and may not actually help enough to outweigh these consequences. These negative effects will be elaborated on later in this thesis. The author's father is involved in real estate construction and has had many conflicts relating to design-build bids and the anti-small contractor bias in the criteria in the Request for Proposal (RFP). This inspired the author to research the topic in order to help her father in future conflicts and help other landowners and contractors with bidding ethics.

#### **Background of Topic**

Design-Build is a project delivery method that allows the owner to have one contract with one entity instead of multiple contracts. The contractor, engineer, architect, and designers all work within one unit. The contractor is typically the team leader and holds all the responsibility including communicating with the owner. Not all contractors

use design-build as a delivery method, which will allow for a comparison in this research.

### **Motivation of Study**

This topic was selected because of the author's interest level in design build delivery methods. The author's goal is to find out if design build is bid rigging. In most of the literature review, there are no studies on design build regarding bid rigging.

### **Scope of the Study**

The direction of the thesis is to figure out whether design-build is the right choice for our society. The Haskell Company, based solely on design-build delivery process, believes that Design-Build is the best delivery process because it puts the entire team under the same roof and would therefore give the company a competitive edge (Jackson 2011). On the other hand, if Design-Build is not the ideal choice, we need to come up with another solution that's new or use existing delivery processes like Design-Bid-Build, Construction Management, or Construction Management at Risk which will be discussed later on in the thesis.

### **Gaps/Limitations of Previous Studies**

There have been numerous studies that investigate the effect of design build on construction. However, there have been few studies on design build as it relates to its ethical dilemma, bid rigging. The main study, based on case studies, that is the most relative to this research is by Guyer (2012). He describes how DB is based on subjective criteria rather than objective criteria and shows through RFP's how it can be easily bid rigged, and therefore illegal and unethical.

## **Contribution of Study**

This research can be performed continuously in different areas to evaluate the design build delivery method and how ethical/legal its practices are compared to current laws. This study could be repeated again in multiple, different locations to ensure reliability and then possibly change the current laws that support DB. This study will prove the perceptions of Design-Build as it relates to bid rigging by construction related firms.

## **Aims and Objectives**

Should DB be the main delivery method of the future or should it be outlawed so society uses only objective criteria for bids? Should the judicial board just leave DB alone or promote it? Should the judicial board decide the delivery methods used for public and/or private bids? Should they abandon the DB delivery method completely and use something that is more objective and equal for all bidders?

## **Hypothesis**

The author's hypothesis is that the negative impacts will outweigh the positive benefits of Design-Build. This delivery method should be abandoned and replaced with a delivery method that treats all bidders and more equally and is more effective for all the parties involved. The main focus of the bidding process should be based on objective criteria rather than subjective criteria.

## CHAPTER 2 LITERATURE REVIEW

There are different types of project delivery methods (PDMs): Design-Bid-Build, Design-Build, and Construction Project Management (2011). “The Construction Industry Institute (CII) maintains that there are really only three fundamental PDMs: design-build-build (DBB), design-build (DB), and construction manager-at-risk (CMR)” (Touran et al. 2011). These are not the only types of delivery methods; there are other less popular methods and combinations of methods also (2011). “In relatively recent years there has emerged a striving among clients for a hybrid method of procurement which:

1. Recognizes the importance of quality as well as price;
2. Gives the client the requisite degree of control over quality;
3. Avoids confrontation; and
4. More accurately reflects the way that buildings are build (sic), recognizing the benefits in terms of cost and quality of getting all parties in the construction process on board as soon as possible”(Mosey 1998).

“The PDM is the process by which a construction project is comprehensively designed and constructed for an owner including project scope definition, organization of designers, constructors and various consultants, sequencing of design and construction operations, execution of design and construction , and closeout and start-up”(Touran et al. 2011). “An owner’s primary goal in choosing a delivery method is to ensure that it will meet the project objectives and at the same time allow the project to be delivered on time and within budget” (2011).

## **Define Delivery Methods**

### **Design-Bid-Build, Traditional Delivery Method**

"DBB is the traditional PDM in which an owner retains a designer to furnish complete design services and then advertises and awards a separate construction contract based on the designer's completed construction documents. In DBB, the owner 'owns' the details of design during construction and as a result, is financially liable for the cost of any errors or omissions encountered in construction, called the 'Spearin doctrine'" (Touran et al. 2011). "The drawings and specifications and other documents form part of the final building contract, but the contractor is not responsible for the design content of the drawings and specifications, only for constructing the works in accordance with them"(Mosey 1998).

### **Advantages of Design-Bid-Build**

Some of the advantages of DBB are:

1. "Low-price competition that takes place on a design the owner has commissioned and approved;
2. Owners want independent contracts with their design professionals and no potential conflict of interest between the design and construction team members; and
3. From a liability and process perspective, the design-bid-build model has the added benefit of predictability" (Robert F. Cushman 2001).

### **Disadvantages of Design-Bid-Build**

"The fundamental flaw in traditional procurement is that the contractor does not necessarily have an understanding of the design process by which the drawings and specifications have been arrived at. He is required to price against them but not to adopt them as if they were his own. Typically, this can lead to the following problems:

1. Differences of opinion and interpretation between the design team and the contractor regarding implementation of the designs;

2. Claims by the contractor as regards late provision of any further details to be prepared by the design team after the building contract has been entered into and after works have commenced on site;
3. Further claims by the contractor for variations to the original drawings and specifications, with consequent additional time and cost, whenever these documents are adjusted in any way by the design team, even if the design team believe that they are providing clarification rather than variation”(Mosey 1998).

### **Construction Management (CM as Agent)**

“The CM covenants with the Owner to furnish his best skills and judgment for obtaining a quality controlled project on time and within budget. The CM agrees to provide the leadership for integrating all of the project participants into a team for purposes of providing efficient business administration and management of the project. An ‘Agent’ is in fiduciary relationship with the Owner, which obligates the CM to a high duty of care and loyalty on the part of the CM to the Owner” (Juliana 2005).

The contractual duties of the CM are as followed:

- “Keep the Owner advised and informed
- Disclose information relevant to the Owners interest
- Make recommendations for Owner actions
- Often, responsible for scheduling and overall coordination of the project
- Proactively assess construction progress and the Contractors performance toward achieving timely completion within the budget” (Juliana 2005).

### **Advantages of CM**

“One of the primary advantages of CM as Agent is utilizing the CM’s construction expertise during the Pre-Construction Phases, to advise on design constructability, scheduling, cost and budget control, contract and bid document preparation, and other issues” (Juliana 2005). This delivery method benefits projects that are considered to be fast paced projects (Juliana 2005).

## **Disadvantages of CM**

The major disadvantage of CM is that whether the Construction Manager individual has sufficient knowledge and experience on the project that they are contracted to (Juliana 2005). The owner is dependent on the Construction Manager's expertise and services they can provide (Juliana 2005).

## **Construction Management at Risk (CMAR)**

CMAR projects are projects with a “contract between an owner and construction manager who will be at risk for the final cost and time of construction” (Touran et al. 2011). This delivery method keeps the contracts separate just like the traditional method and it releases the set of plans and specifications to the CMAR (Touran et al. 2011). “Typically, CMR contracts contain a provision in which the CMAR stipulates a guaranteed maximum price above which the owner is not liable for payment” (Touran et al. 2011).

## **Advantages of CMAR**

There are two major reasons for choosing the CMAR delivery method: constructability and faster phasing of construction (Touran et al. 2011). This method of procurement requires “the contractor only to manage these sub-contractors and suppliers, but not to accept full responsibility for their default or insolvency ('management contracting'), or for the construction client itself to engage these sub-contractors and suppliers under separate direct contracts, with no single main contractor but instead another independent professional (not usually a designer) engaged by the client to programme (sic), manage and coordinate the project ('construction management')”(Mosey 1998).

## **Disadvantages of CMAR**

“Using this approach the CMAR takes on the considerable risk of unforeseeable design development or added work. Disputes often arise to the degree of design development, or detailed design work, the CMAR has undertaken” (Juliana 2005). However, the CMAR’s performance risk can be relocated to the subcontractors if the CMAR allows subcontractors and suppliers to aid and provide bids (Juliana 2005).

## **Design-Build**

“DB is a PDM in which the owner procures both design and construction services in the same contract from a single, legal entity referred to as the design.builder. This method typically uses request for qualifications/ request for proposal procedures rather than the DBB invitation for bids procedures” (Touran et al. 2011). Due to the fact that design-build is becoming popular, the firm that is contracting with the owner is usually a construction firm and the primary leader would be the general contractor (Guyer 2012). “No doubt this pattern will continue in the future because

1. General contractors have demonstrated over many decades that they are better marketers than professional engineers, and
2. State laws provide generally that only a licensed construction contractor can enter into a contract with an owner to provide construction services” (Guyer 2012).

“Design and build is the term used to describe one way of achieving the completion of building or engineering works, including works of construction, alteration, repair and demolition, and whether they relate to residential, commercial or industrial buildings (‘building works’) or infrastructure works such as roads, bridges, pipelines, harbors or decontamination of land (‘engineering works’)”(Mosey 1998). The DB team becomes liable for all costs including design and construction (Touran et al. 2011). Similarly with CMR, the builder in DB is allowed to input advice in the early stages of constructability

for the design process in order to produce the most efficient construction process (Touran et al. 2011). “As a result, DB is the delivery method which has the greatest ability to compress the project delivery period and as a result is often used for ‘fast-track’ projects” (Touran et al. 2011).

### **Advantages of Design-Build**

“One of the fundamental advantages of design and build and develop and construct is the requirement for the contractor to buy into the design process, to adopt precontract designs as if they were his own and to have full knowledge of the design process by developing the detail of those designs. Hand in hand with this knowledge comes responsibility for making sure that those designs can successfully be turned into the completed works” (Mosey 1998).

Design-build allows for “buildability (an experienced contractor can spot practical problems in a design that might make it difficult to build) and value engineering (an experienced contractor can work out a cheaper way of achieving the same end result)” (Mosey 1998).

### **Disadvantages of Design-Build**

Some of the disadvantages of DB are:

1. “Time and cost of implementing a competitive design-build process. The time and cost to prepare the scope of work definitions for Requests for Proposals can be substantial, depending on how much design the owner wants to establish itself. Often the owner will need to have a consultant assisting it in this process.
2. Owner interference. Owners who are used to having full control and oversight over each and every aspect of the design may have problems in successfully implementing a design-build program. An overly involved owner may impact the efficiency of the design-builder’s progress, delaying the work and increasing the design-builder’s costs. It may also impose design constraints on the design-builder, potentially damaging the single point of responsibility protection.

3. Incomplete design definition. The counterpoint to the benefit of early price guarantee is the fact that many owners are accustomed to having 100% complete design package before obtaining a construction price. Depending on the procurement method used for design-build, price may be set at an early stage of design, leaving the potential for disputes over what is and is not within the scope of the contract.
4. Reliance on the design-builder's A/E. Some owners do not like the idea of having the A/E of record financially tied to the contractor.
5. Evolving licensing and public procurement laws. Substantial progress has been made toward facilitating the use of design-build for public agencies. However, it still remains difficult in many jurisdictions for public agencies to use design-build effectively. Likewise, many of the licensing laws around the country are not friendly to alternative project delivery and can force parties to use creative contract arrangements to obtain the single point of responsibility.
6. Lack of substantial judicial precedent. Because the design-build system is relatively new in modern times, and because of the lack of conflict to date, few cases exist to describe to the parties their respective rights, responsibilities, and liabilities. This can be unsettling to those who have been involved in other delivery systems, where these issues have been well-established for many years" (Mosey 1998).

## **Hybrids**

Hybrids, a new combination procurement method that has come about known as Design-manage-construct; which is a combination of construction management and design-build (Mosey 1998). "The contractor in this process is asked to submit an offer to perform the role of construction manager during a pre-construction period and then convert to design and build contractor when the design of the works has been completed and lump sum price has been agreed"(Mosey 1998). There are two parts under this procurement method, phase 1, preconstruction, and phase 2, construction (Mosey 1998). "Almost every implementation, however, of design-build has been done by altering traditional competitive bidding laws, regulations, policies and practices to permit contract award to be based on subjective criteria"(Guyer 2012).

## **Advantages of hybrids**

“From the design and build contractor’s point of view, there are also significant advantages in this mixture of construction management with design and build:

1. The contractor can be confident of subcontract prices received, without conducting accelerated or informal subcontract tenders during a limited main contract tender period;
2. The contractor can assess accurately and price the design development risk, having been involved in the design process together with the design team throughout;
3. The contractor can assume responsibility on an informed basis for a design with which he has been involved from the outset;
4. Most importantly, the contractor can enjoy the prospect of a negotiated job at a sensible price, rather than a main contract won by tendering a lump sum price at a cut-throat margin in the hope that this may be made up with variations or other claims at a later stage in the works”(Mosey 1998).

## **Similarities**

“Under both design and build and traditional procurement, the main contractor will be heavily reliant on a significant number of other parties engaged by it to perform specific parts of the works (‘sub-contractors’) and to supply specific materials and goods required for the purpose of the works (‘suppliers’)” (Mosey 1998).

## **Differences**

“The Design Build Institute of America (DBIA) defines the difference between design/build delivery and traditional delivery methods, where an architect/engineer prepares a set of plans and specifications for competitive bid, in terms of the warranty. In design/build the design builder warrants to the owner that the end product is free of defects” (Connor 2003). The only way that changes can occur is if there are blatant changes in the scope of the project (Connor 2003). “The design builder is not allowed claims for design errors” (Connor 2003).

“By contrast, in design-bid-build the owner warrants to the contractor that the design is free of defects. This is the key to other competitive bid environment and this the reason for change orders when designs are incomplete or contain errors—the owner is making good on the warranty” (Connor 2003).

Another difference between DB and DBB procurement is their relationship of the owner’s professional agent (if applicable) which depends on what type and quantity of directions is given from the owner and the consequences that ensue (Mosey 1998). Furthermore, it would be unsafe to just reduce each method to their pros and cons because each procurement method should be evaluated on an individual basis that considers the owners needs and priorities (Mosey 1998).

### **Differences between Procurement and Delivery Process**

“A construction delivery process defines:

- Contractual relationships between participants in the project
- Authorities, processes and reporting relationships

A construction procurement process defines:

- Criteria for award of contract
- Process for award of contract” (Guyer 2012).

Design-bid-build is a combination of the delivery and the procurement process (Guyer 2012).

For public and private owners, “there are two types of criteria for awarding contracts, including design-build contracts; subjective and objective” (Guyer 2012).

### **History**

To achieve optimum success, the delivery method should be chosen based on the specific project; followed by selecting the right people to maximize the efficiency of

the delivery method (Lucas 2013). One way an owner may choose a delivery method is based on past failures throughout history (2011).

Design-Build could be considered “the oldest method dating back to the Pharaoh’s master builders whose works have survived the test of time” (Connor 2003). The traditional design-bid-build approach is, surprisingly, a new system that has only been around for about 160 years (Cushman 2001). However, the design-build system has been around for four millennia, and is known as the ‘master-builder’ concept (Cushman 2001). “Historically, the master builder took on his palace or cathedral commission knowing that he had to complete it and that the client body would be in no mood to hear the explanation if any part fell off or did not work. The risk of incarceration or excommunication may have been more compelling than modern commercial incentives, but there was no doubt in anyone’s mind as to who carried the can” (Mosey 1998). The master builder would take full credit and responsibility for the project (Cushman 2001). The master builder was able to integrate “conceptual design with functional performance” all the way through the medieval times (Cushman 2001).

History not only provides failures to improve upon but also it provides the circumstances that started the desire for new delivery methods. The industrial revolution created new materials, which in turn needed more design information in order to construct (2011). This started the separation between designer and contractor (Lucas 2013). This gap grew larger as the inventions increased, and profit became the primary goal for construction (2011). But, “The common law concept of the lump-sum contract relying on the traditional trade practices gradually eroded” (2011). Now, construction is

becoming a more knowledgeable trade with educated workers and the industry is looking for a new delivery method to maximize efficiency.

### **DBIA**

The Design-Build Institute of America (DBIA) changed the way some professionals view design-build (Cushman 2001). “Formed in 1993, DBIA is a nonprofit organization dedicated to expanding the use of design-build and promulgating the best design-build practices” (Cushman 2001). DBIA would try to reassure the public and private sector regarding concerns about this delivery process, when it was established (Cushman 2001). DBIA created a Manual of Practice that detailed the process and addressed these concerns, while also demonstrating how to use this process properly and efficiently (Cushman 2001). This manual not only shows publications regarding design-build but also contains a “cookbook” for how to approach this delivery system (Cushman 2001). “DBIA’s outreach program with owners, as well as its active involvement in procurement and licensing reform, has had a major impact on how the industry perceives the process”(Cushman 2001).

### **Does It All Work?**

“Design and build should work. It allows the designers to design and the builders to build. In this sense every partner in the project is doing what they do their best, and each contributes to the fullest in the project” (Mosey 1998). On the other hand, Design-Bid-Build’s major flaw is the delays associated with the process. These delays are attributed to the step by step process because each step relies on the completion of the previous step. In order to fix this problem, the delivery method, Design-Build, was created to reduce the major players to just the owner and design-builder (2011). But not all jurisdictions allow this to happen. “While design-build attempts to simplify and hasten

building construction, it is not the answer to every owner's prayer for a well-designed and well-built building for a fair and economical price" (2011). There are always going to be conflicts when two people are negotiating, they just vary in the degree of conflicts (Lucas 2013).

"As with designers and their consultants, the more persons involved in a project the greater the potential for disagreements, disputes, and problems, especially in placing responsibility for deficiencies in the work. Design-Build does little to change this fact" (2011). "Many commercial developers continue to prefer traditional procurement, working in close cooperation with design teams and contractors, often engaged under partnering arrangements on a series of projects"(Mosey 1998).

Another factor that may persuade an owner into contracting with a design-build firm is what type of reputation the company has established (Lucas 2013). If the company has a good reputation, then the owner may be more inclined to choose the design-build firm even if that is their first time using design-build (Lucas 2013).

"Design-build is seen by many as a way to reduce or eliminate such problems and inefficiencies. But there is no sure an overriding reason why it should, because the same problems can exist within the design-build team: It depends on the key persons and the relations and differences among them" (2011). Furthermore, it should "promote better communication and trust between contractor and designer since their goals are mutual; however, it can do nothing radically new or special for trust and communication between contractor and owner" (2011). That is why it is very important that the owner and design-builder must have an outstanding positive relationship (2011). But to be

successful in any construction job delivery method you should have an outstanding positive relationship with the owner (2011).

Design-Build is supposed to be a great new delivery system that solves almost all the current problems of construction. However, it can only solve these problems by placing the owner in a disadvantageous position (2011). The only way to fix this problem for the owner is to hire a professional advisor or agent that supports you, as the owner and gives cost and selection feedback (2011). This professional advisor or agent that is in between the owner and the design-builder, also known as bridging, in turns creates the original traditional design-bid-build delivery method relationships (2011).

But if the costs savings are supposed to be produced by cutting the middle man out, the professional advisor or agent, how can you obtain both? “In design-build project some possible ways of reducing the total costs include the following (with likely alternatives or counter-arguments added):

- Making a design-build contract that stipulates either a fixed or a guaranteed maximum cost (GMCPF) to the owner; a fixed cost for a commonplace building or a GMCPF for an unusual one (This can be done also in a traditional arrangement.)
- Saving project time and related indirect costs by overlapping designing and building (This can be done also in a traditional arrangement by having several sub-projects, several separate contractors, and a construction manager.)
- Saving project time and costs by more direct communications (This too can be achieved in a traditional project.)
- Saving direct costs through innovative design and building methods (This can be achieved by value engineering and by involving either a building contractor, a construction manager, or a cost consultant in the design process leading to a traditional contract)” (2011).

From these cost saving items, it appears to show that the same advantages achieved by design-build can be achieved with the traditional method as well (2011).

Therefore, even at first glance, design-build appears to reduce problems in deficiencies in work and delegation of powers, where in fact “the potential problems not only extends to design-build; a design-build project may make the potential problem for an owner even larger because contractor and designer now are together in seeking to share the same profit” (2011). The only way to make this profit sharing work is to have the designer and the contractor in one cohesive unit within the same design-build company (2011). “Often, however, that is not the case, in part because in many jurisdictions a registered architect cannot provide architectural services from within construction company, or because a construction company cannot provide what are seen legally as architectural services” (2011).

“The fact remains that dealing with a diverse group of designers and/or a diverse group of contractors leaves the construction client feeling uncomfortable as to who carries the ultimate responsibility for delivering the end product”(Mosey 1998).

### **Jurisdictions**

In the court system, it is very difficult to figure out who is at fault when it comes to disputes in the construction industry. In the traditional contract method, the division of responsibility is highly detailed and laid out in the “AIA Document A201 or Document CCD2 and their means of communication are much more direct, immediate and informal” (2011).This makes it a little easier for the court system to find out who is truly at fault and who needs to compensate whom and for how much. However, in design-build contract method, everything is opposite. Design-Build contracts put all the responsibilities as one single responsibility for many professionals under that single umbrella (Ellis 2008). Furthermore, this hinders the court system from finding out who is at fault and how to compensate the owner for problems found (2011). However, “the

consolidation of legal right and responsibilities can, and in my experience generally does, greatly reduce the temptation to pursue imaginative claims" (Mosey 1998).

The construction industry still separates design and construction mostly, because the U.S. government developed public contract laws continuing the separation of design and construction (Cushman 2001). "Construction contracts were to be awarded on the basis of 'lowest responsible bidder'—to protect the public from corruption" (Cushman 2001). However, the construction industry wanted a "better mousetrap", and therefore came up with design-build, where the design and construction are together (Cushman 2001).

### **In the Beginning**

"The AIA's first code of ethics, adopted in 1909, forbade its members from participating in design-build projects due to a perceived conflict of interest in protecting the owner while at the same time profiting from the construction labor and materials" (Solomon 2005). The local and national laws were made based on design-bid-build contracting method so that no other method could be utilized (Solomon 2005). Design-build has shifted its legality status recently. "...the landscape of construction agreements has changed considerably as construction projects have become more complex and the development of building systems designed by members of our Society are called to perform at ever increasing levels"(Connor 2003). "AIA adopted a new Code of Ethics in 1986 that no longer forbade design-build; the federal government has gradually come to embrace the process; and—according to G. William Quatman, FAIA, a licensed architect and attorney with the law firm of Shughart Thomson and Kilroy in Kansas City, Missouri—currently all but six states have laws that permit some level of design-build for public projects" (Solomon 2005).

## **Why the Change?**

Over the years, design-build enthusiasts believe that design-bid-build builds separation and conflicts between the parties involved since they have separate contracts with the owner (Solomon 2005). “Owners are fed up with design-bid-build; they are demanding design-build because it saves time and money and reduces conflict” (Solomon 2005).

## **Faces of Design-Build**

“One of the first things architects need to understand is that there are many permutations of design-build” (Solomon 2005). The contractor does not have to lead the project, even though that is how it is run most of the time (Solomon 2005). In addition, design-build can have an agent working on behalf of the owner to ensure the owner gets what they are asking for (Lucas 2013). “The service, for example, can be provided by a project-specific joint venture between an architecture firm and a contracting company, a single company that has both designers and builders on staff, or an individual developer, builder, or architect who subcontracts the other necessary expertise and skills for a given project”(Solomon 2005). Another author, Michael C. Connor, noted that “Design-Build can be delivered in one of two ways: Contractor-led design-build or Designer-led design-build” (Connor 2003).

According the Design-Build Contracting Handbook (Cushman 2001), there are more than just two faces of Design-Build. However, the researcher will be explaining the primary faces of Design-Build in a subsequent section.

### **Contractor-led Design-Build**

In contractor-led design-build, the contractor is responsible for hiring all employees and subcontractors and creating the contracts between them for the project

(Connor 2003). Design firms that joint venture with the contractor may not realize that there is a lot of liability behind this type of partnership (Connor 2003). “Contractors carry performance bonds on most projects and have significant financial resources to control losses on an isolated project. Design firms typically do not maintain such financial resources” (Connor 2003). If the joint venture should fail, the design firm does not have financial resources as stated above or financial backing in order to finish the job, which could result in financial troubles for the design firm (Connor 2003). In order to make it work for the design team, designers will limit their input to just documents with respect to the design development (Connor 2003). “Most two-part design-build contracts allow for the contractor to be paid for developing this level of documentation to formulate a guaranteed maximum price (GMP) as Phase One. If the price and/or terms of the final construction contract are not agreeable, the parties will separate” (Connor 2003). The GMP was created by the contractor with the designer’s documents and these documents should have little modifications (Connor 2003). If the project moves forward, the modification will be sorted out through the shop-drawing phase by the contractor (Connor 2003).

### **Designer-led Design-Build**

Designer-led design build “should only be undertaken if the designer has construction experience in-house and has a relationship with the bonding companies commensurate with a contractor. Designers also may be faced with large general liability or umbrella insurance premiums due to taking on construction liability where exposure to loss of life is much higher under the care of the prime” (Connor 2003). In this case, a construction safety incentive program is necessary (Connor 2003). “However, if a design firm desires to go into design-build, creating a separate company

(usually a limited liability company) to perform the construction tasks might shield the design firm from construction liability”(Connor 2003). Another problem the designers may run into is state licensing laws because “all states license architects and engineers, but not all states license contractors” (Connor 2003).

### **Selection Process**

“Selection of the appropriate alternative PDM is a complex decision-making process” (Touran et al. 2011). Trust is a major factor of completing a project with any delivery method (Connor 2003). “An effective design and build contract requires an increased level of trust between the client and contractor in any event, and should be less dependent on regular and intrusive monitoring of the contractor’s performance”(Mosey 1998). “The owner must rely upon the contractor to provide the quality the owner expects without cutting corners and the contractor must rely upon the owner not to abuse the ‘no change order’ environment. When this ingredient is in place and competent people do the work, design-build can be a wonderful experience for all parties” (Connor 2003). “The most successful design-build projects that William Hellmuth, AIA, president of HOK, has been associated with are those that are selected through a competition in which the submissions are judged on value, not just the lowest price”(Solomon 2005).

The best value (BV) practice is also known as design-build and lowest bid (LB) procurement is known as the traditional method or design-bid-build (Yu and Wang 2012). “In a number of cases, the government procurement officers are confronted with liability of illegally favoring a contractor when BV is adopted instead of LB because of the concern that the contracted values of BV procurements are usually higher than those of LB procurements”(Yu and Wang 2012). Because of this concern, there are

many barriers in order to stop personnel from adopting the BV procurement method (Yu and Wang 2012). “Unfortunately, there has yet to be any objective model developed to support a BV decision” (Yu and Wang 2012).

### **Why BV Rather Than LB?**

“BV refers to the procurement method that selects the contractor most advantageous to the client by contemplating prices and other factors. Advantages of LB over BV methods include a simplified process of solicitation preparation and review, a simplified selection process, and the difficulty of protest by the bidders. Their disadvantages comprise ignorance of quality, assumption of perfect (unambiguous) plans and specifications, and assumptions of minimum requirements meeting client’s need” (Yu and Wang 2012). In order to decide which method is best for the owner, “researchers have developed different evaluation methods, such as simple weighting, multicriterion decision making (including multi-attribute utility theory, analytical hierarchy process), cluster analysis, fuzzy set theory, discriminant analysis, and etc.” (Yu and Wang 2012). In BV procurements, the best contractor is that of which the contractor is unique in such a way as to distinguish him/herself from the competition (Yu and Wang 2012). “That is, the contractors should be heterogeneous in providing their works (or products), meeting the criteria that are more beneficial to the client” (Yu and Wang 2012). This will be the prerequisite for deciding BV or LB (Yu and Wang 2012). “If a client can measure the heterogeneity of the contractors, he or she should be able to determine whether to adopt BV or LB” (Yu and Wang 2012). The heterogeneity is “the different quality (conceived by the consumers and measured by a set of predefined selection criteria) of contractors (in a bid competition) that reaches equilibrium of price in the market” (Yu and Wang 2012). “The price equilibrium in the market is a state in which

economic forces are balanced and, in the absence of external influences, the (equilibrium) values of economic variables remain constant" (Yu and Wang 2012).

"The contractor will offer a bid-price on the basis of the performance of work he or she commits (in the plans) to provide to the client. As a result, the heterogeneity of contractors is associated with the combination of bid-price and the performance they offer" (Yu and Wang 2012).

### **Why Disputes?**

"The apportionment of responsibility between designers and contractors, as well as between designers themselves, has been the cause of many complex construction disputes. This is in turn has encouraged the renaissance of a procurement arrangement under which the contractor accepts responsibility for the design of the works as well as their execution" (Mosey 1998).

In the past decade, there has been a "pendulum shift in the industry from 'design-build doubters' to 'design-build advocates'. For example:

- Some in the industry have come to believe that using design-build is the way to solve any problem on any project. They forgot that design-build is simply a delivery method, and that other key issues—including procurement approach, proper contractual risk allocation, and perhaps most importantly, the owner's willingness to pay a reasonable price for what they are asking—are vital to project success as the delivery system.
- The design-build process is being misused by many owners. Consider the owner who uses design-build simply as a way of avoiding liability for improper design. The owner might design the project to a significant extent (from 30% to as much as 90% of the design) and then solicit 'design-build' proposals, with the low bidder winning the award. This is a 'design-bid-build' approach based on incomplete plans and specifications; it does not have the characteristics of a properly developed design-build process.
- Given the largely positive 'press' that design-build has received, many owners fail to think carefully about whether it is the best delivery system to achieve their unique project needs. This may be as problematic as those owners in past years who would not even consider design-build because of their commitment to other

project delivery systems. The reality is that some projects are not suitable for design-build—particularly when an owner needs broad control and has a high level of distrust as to whether the design-builder should have discretion over project design parameters”(Cushman 2001).

Due to these limitations and disputes, it is important to analyze the project before choosing the appropriate delivery system (Cushman 2001).

### **How Many Design-Builds?**

“Currently, we are told that design and build takes up nearly 40 percent of the UK construction market share, and the attractions of greater cost and time certainty as well as a single point responsibility are hard to deny”(Mosey 1998).

### **How Many Design Builds in Lawsuits?**

“When asked for his views, one of my clients immediately pointed out the alternative title ‘Design and Build Inaction’, and of course it is true that not every D&B project is a runaway success. However, of the several hundred design and build contracts which my firm has drafted and negotiated over the last decade, less than ten to my knowledge have ever found their way to court or arbitration”(Mosey 1998).

### **So Why is Design-Build, Bid Rigging?**

“This situation raises the ethical issues for professional engineers (and architects). It also raises ethical issues for public agency managers (many of whom may be professional engineers). And it raises business issues for private owners that they would be wise to consider” (Guyer 2012).

### **Subjective Criteria**

“The concepts underlying the criteria are laudable: award the contract to the most qualified competitor; award the contract to the most experienced contractor; award the contract to the competitor who will deliver best value to the awarding agency or

company. However, in making a judgment about which competitor is best qualified, most experienced, or will deliver the best value, subjective judgments must be made. When subjective judgments are permitted in the award process there is the opportunity for inappropriate covert criteria to be used, such as:

1. Political patronage
2. Exchange of favors (candidly, bribes)
3. Personal relationships" (Guyer 2012).

The criteria is created by managers that are making subjective judgments in order to form a guideline for a bidding process(Guyer 2012).These managers that are in charge of making the weighting criteria, will usually use a point system to evaluate the bids (Guyer 2012). "Such point systems are not objective because subjective judgments must be made in determining how many points to award each competitor on specific subjective criterion" (Guyer 2012). "The weighting of criteria is subjective" (Guyer 2012). "The only way to institutionalize long term integrity of an agency's or company's procurement process is if it is based on the only practicable objective criterion: lowest cost as determined by competitive bidding" (Guyer 2012).

### **Objective Criteria**

An objective criterion does not allow subjective criteria as an option because it would influence the awarding bid process (Guyer 2012). The one and only objective criterion is lowest cost (Guyer 2012).

### **Conflicts in Design-Build Process**

"Where is the dividing line between the engineer's responsibility to the economic interests of the general contractor and the cost, quality and serviceability interests of the building owner"( Guyer 2012)? When using someone else's money, public agencies, the procurement process loses integrity because the government is just utilizing taxpayer's

money, not money directly from their pocket (Guyer 2012). “It is also important in the private sector where stockholders’ money is spent and corporate management has a duty to expand corporate funds wisely and without waste” (Guyer 2012). In other words, the integrity of the procurement process is questionable and becomes an ethical issue (Guyer 2012) “Design-build contracts should not be awarded based on subjective criteria that can be manipulated by managers in order to award contracts to inappropriately favored contractors” (Guyer 2012). There is no reason that design-build has to be based on subjective criteria since “all of the real benefits of the design-build construction delivery process can be realized for the benefit of the owner using a construction procurement process that utilizes objective criteria for award of the design-build contract and thereby protects the integrity of the procurement process” (Guyer 2012). Public and private sectors parallel this statement (Guyer 2012).

### **Bid Rigging**

Bid rigging, similar to price fixing agreements, are illegal under the Sherman Act (Parkman and White 2011). This act states that all forms of bidding schemes are illegal (Parkman and White 2011). Bid rigging refers to competitors that “agree to reduce competition in the bidding process by any number of methods, including submitting artificially high bids or having one firm agree not to submit a bid at all. By preventing the lowest possible bid from being submitted, a bidding firm is able to charge a premium for its services. This deprives the contracting party of the benefit of the competitive bidding process(i.e. performance of the job at the lowest possible cost)” (Parkman and White 2011). With respect to anti-competitiveness, the Sherman act states “Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several states, or with foreign nations, is declared to be illegal”

(Parkman and White 2011). "In sum, under the first section of the Sherman Antitrust Act, in order to show a violation, the prosecution must prove three elements beyond a reasonable doubt. The government must show the existence of an agreement, which unreasonably restrains competition, and affects interstate commerce" (Parkman and White 2011). The U.S. Supreme Court said in Spectrum, Inc v. McQuillan "The purpose of the [Sherman] Act is not to protect businesses from the working of the market; it is to protect the public from the failure of the market. The law directs itself not against conduct which is competitive, even severely so, but against conduct which unfairly tends to destroy competition itself. This focus of U.S. competition law, on protection of competition rather than competitors, is not necessarily the only possible focus or purpose of competition law" (Spectrum Sports, Inc v. McQuillan 506. U.S. 447 1993).

### **Some Solutions to Design-Build**

The primary legal alternatives for Design-Build are Design-Bid-Build, Construction Management, and Construction Management at Risk that are based on objective criteria such as lowest cost (Guyer 2012). These solutions have been detailed in the beginning of this Chapter.

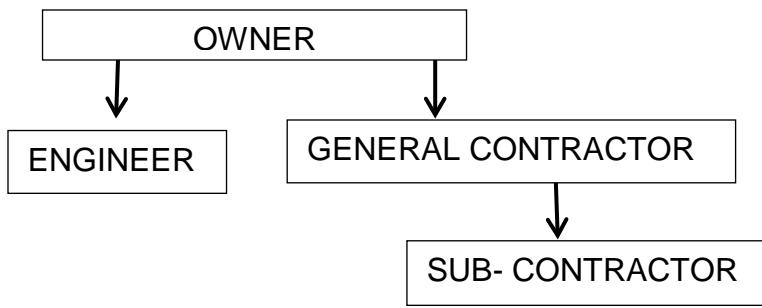


Figure 2-1. Design-Bid-Build: Construction Delivery Process [Adapted from Guyer, P. E., R.A. (2012). "Ethical Issues in Design-Build."]

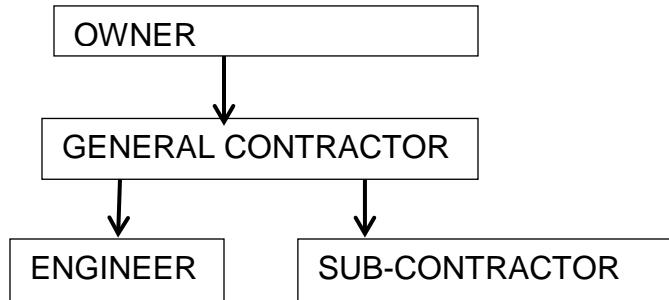


Figure 2-2. Design-Build: Construction Delivery Process [Adapted from Guyer, P. E., R.A. (2012). "Ethical Issues in Design-Build."]

## CHAPTER 3 METHODOLOGY

The research will examine the design-build survey data collected and will determine what, if any, consensus there is on design build. Many different players in the industry were contacted to fill out the survey questionnaire in an attempt to provide a variation, large number of responses. The goal of this experiment is to determine whether companies view design-build as bid rigging, a process considered illegal and unethical. These responses to the survey will be organized to facilitate review and study of their relation to the subject of design-build, and its practices and ethical dilemmas. Once all of the opinions of the responding companies have been analyzed, the researcher will compare them to the demographic data to test whether there are significant trends related to location, size of company, monetary units, type of company, employee count, project type and amount, RFP requirements, preference of delivery method, and protestation of bids.

### **Measures**

The researcher used a survey to conduct her experiment. The survey used surface mail as well as a website survey link sent to the recipients so they could fill out the survey whichever method they preferred. For the recipients that were only contacted via email, the researcher attached a copy of the survey and had the same link for the survey website.

To ensure unbiased results the survey was returned anonymously through the website or postal addressed with no return address. All surveys mailed contained a pre-postage stamped envelope with the researchers address in order to encourage the

recipient to fill it out and to make sure that they did not have to perform any extra work that would deter them from completing and returning the survey.

No personal interviews were conducted in an attempt to minimize any bias due to predisposition of the researcher's beliefs on the subject. The researcher did provide contact information in the letter to the recipients in case they needed any assistance or had any concerns. In one case, the researcher was contacted regarding a subject's suitability for the survey. The researcher remained unbiased during this phone call and explained the purpose of the survey was to gather opinions from a wide range of firms.

The survey was written without question bias of all types. To ensure that it was unbiased, the researcher had the survey reviewed by multiple people, including professional editors and her advisor.

The survey consisted of twenty-two questions, with a majority being multiple choice with an extended response to contribute qualitative data as well, especially if they had filled out "other". The answers were tabulated by frequency of answers selected. For example, ten yes's, twelve no's, zero some time's, five not applicable, and some no responses. The first few questions were informative in order to compare them to the main bid rigging question regarding Design-Build. The frequency scores indicated the number of times each answer option was selected. Some questions allowed the respondent to circle all that apply.

The questionnaire measured whether design-build could be used as a form of bid rigging and if it should be allowed for public and/or private projects.

### **Validity and Reliability**

The reliability of the research cannot be proven because the researcher has only performed this survey one time according to the non-probability sampling method.

Therefore, there is no evidence of reliability available unless the researcher is able to conduct this survey more times and in other locations.

The validity of this data is that we are measuring what the researcher hopes to measure. This research is valid because it does stack up with other variables in the data.

Therefore, currently the research is valid but no reliable. A depiction of this meaning is shown in Figure 3-1.

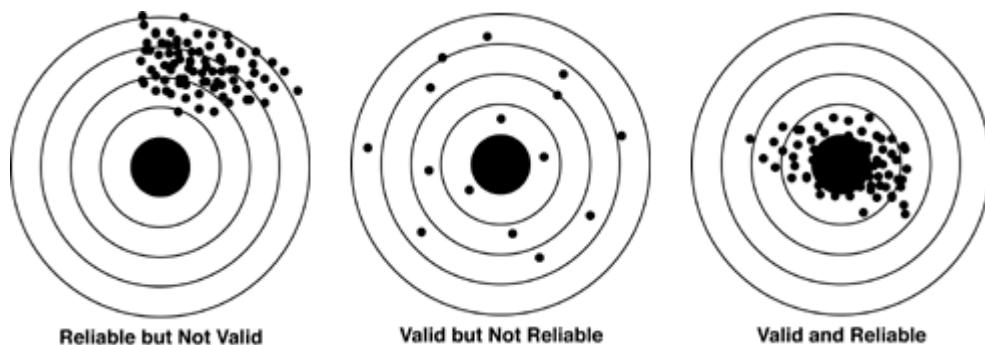


Figure 3-1. Validity vs. Reliability [Adapted from Sosulski, P. C. W. a. K. (2002). "Quantitative Methods in Social Sciences." QMSS e-Lessons, <[http://ccnmtl.columbia.edu/projects/qmss/measurement/validity\\_and\\_reliability.html](http://ccnmtl.columbia.edu/projects/qmss/measurement/validity_and_reliability.html)>. (June 9, 2013).]

### **Subjects/ Participants**

The researcher did a comprehensive search on Google and other search engines to find contractors and people involved with the bidding process, such as architects, lawyers, owners, and landlords. The majority of survey recipients were contractors as they are the most familiar with delivery methods including design-build. The researcher collected recipients from the Southeast with a focus on major cities in Florida.

Nonprobability sampling, Availability Sampling, was the method that was chosen for this research. This method was chosen because it was a large-scale social survey and the researcher could not select the kinds of probability samples. Using this method, the results will not show the likelihood that any element of a population will be selected for the study which is the main drawback of this type of method. This method's primary advantage is that it is very easy for the researcher to find subjects for the study. Also, it is used good for using as a preliminary survey to figure out if the questions make sense to the respondents. Since this is the first survey discussing this information, this is the appropriate method to use.

Also, since there are always new firms getting established in construction, the researcher would not know the population or an estimate of it. Therefore, the drawback to this method is relevant no matter the situation.

Another drawback to nonprobability sampling is that it does not involve random selection whereas probability sampling does. This does not mean that it is not representative of the population though. It just means that the researcher cannot depend upon the rationale of the probability theory. Again, we cannot perform probability sampling because it is not feasible in this type of survey since its social research.

### **Preparations**

In preparation of this thesis, the researcher conducted a literature review, to make sure that her topic was original and to analyze the data that was previously done with respect to her topic. Through this literature review, the researcher found that her topic was original, and that there was very little data or papers regarding a correlation

between design-build and bid rigging. This meant the researcher would have to conduct her own in depth research as described throughout this methodology.

### **Data Collection**

The researcher sent out 505 surveys which includes a combination of emails and postage mailings. The researcher received forty-four survey responses. Not all of the respondents completed the whole survey so most of the total responses for the questions varied. The surveys were sent out through mail and email on March 15, 2013. The researcher started receiving responses that day on surveymonkey.com, which is the survey website the researcher used in order to collect the data. Mailed responses started to arrive the following week. No follow-up emails or mailings were used since it was an anonymous survey and there would be no way to figure out who did/ did not fill out the survey in order to only send the follow up letters to them. The end date for data collection was June 9, 2013.

The materials were sent to recipients via email or mailed. Each package contained a letter to the recipient, the survey, a self-addressed stamped envelope (if mailed via post office), and a definition list of useful terms relevant to the survey. This made sure that all recipients could answer the question on a level playing field with no discrepancies which could reduce the response errors made by participants. The letter to the recipient is located in Appendix A. This letter introduced the survey and gave instructions to either fill out and return through mail with the self-addressed stamped envelope or fill out the survey online with the link provided. The letter also contained the researchers contact information just in case a recipient had any concerns, questions or comments. The letter encouraged the recipient to fill out the survey to the best of their abilities, while remaining anonymous. Anonymity was used to ensure unbiased results.

A copy of the survey is located in Appendix C. The self-addressed stamped envelope was also provided to encourage participation.

### Timeline

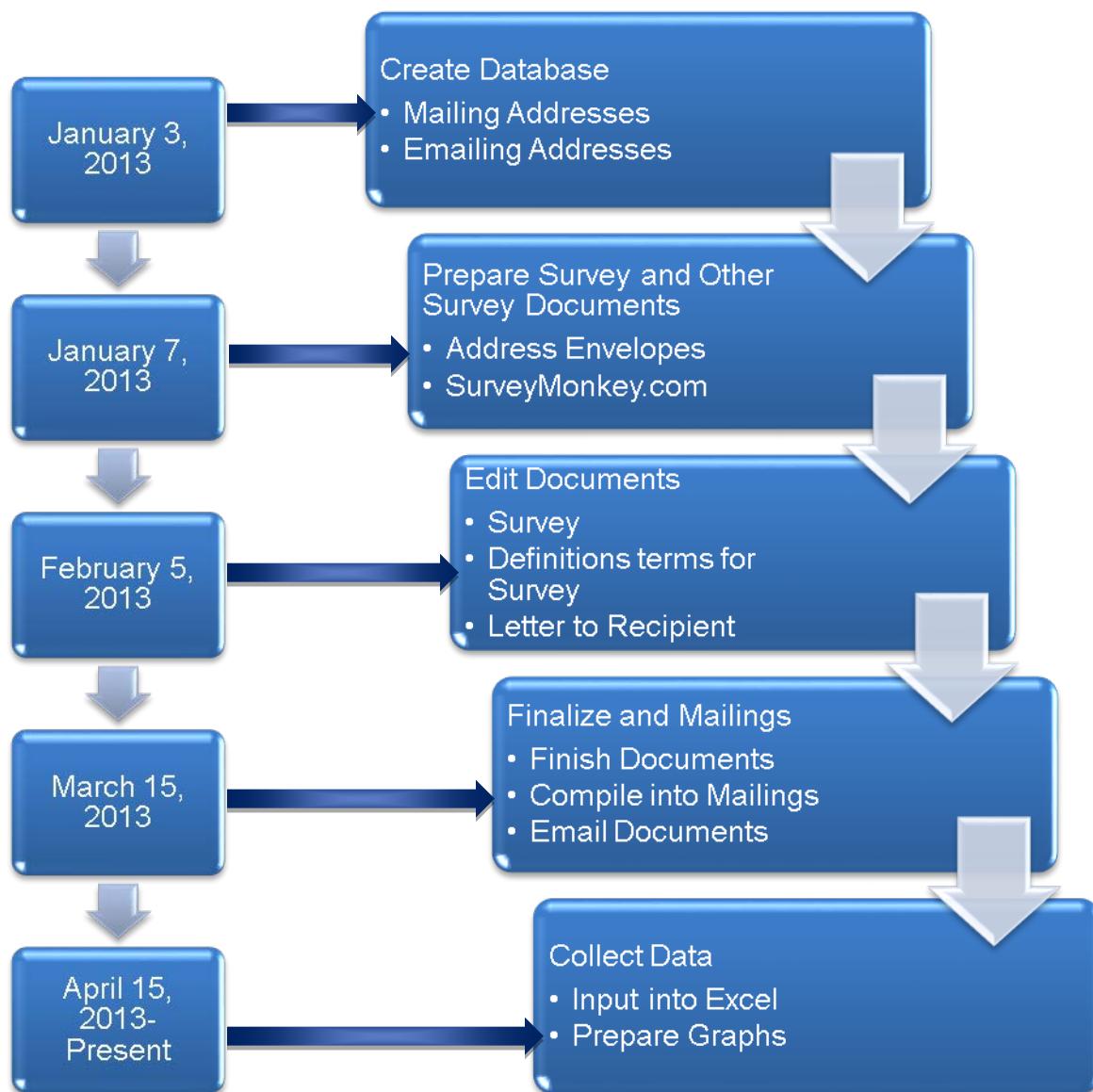


Figure 3-2. Timeline of Data Collection

### Data Analysis

Several research questions are being addressed; therefore, the researcher will describe the data analysis that will be used for each research question as follows:

1. A response to research question one, regarding the business the recipient is in, will be generated by recording frequencies, graphing the frequencies, calculating the P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
2. A response to research question two, regarding the type of business of the recipient, will be generated by recording frequencies, and graphing the frequencies in a bar and pie chart.
3. A response to research question three, regarding the amount of employees the recipient has, will be generated by recording frequencies in terms of bins and graphing them in a histogram.
4. A response to research question four, regarding the annual volume of business, will be generated by recording frequencies in terms of bins and graphing them in a histogram.
5. A response to research question five, regarding location of recipient, will be generated by recording frequencies in terms of bins and graphing them in a table and a map.
6. A response to research question six, regarding the type of project delivery method preferred, will be generated by recording frequencies, graphing the frequencies, calculating the P-Value, comparing the P-value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
7. A response to research question seven, regarding the amount of projects bid on over past five years, will be generated by recording frequencies in terms of bins and graphing them in a histogram.
8. A response to research question eight, regarding the amount of DB projects bid on, will be generated by recording frequencies in terms of bins and graphing them in a histogram.
9. A response to research question nine, regarding the amount of DB projects awarded, will be generated by recording frequencies in terms of bins and graphing them in a histogram.
10. A response to research question ten, regarding the amount of DB projects awarded in public projects, will be generated by recording frequencies in terms of bins and graphing them in a histogram.
11. A response to research question eleven, regarding preference on DB projects, will be generated by recording frequencies, graphing the frequencies, calculating the P-Value, comparing the P-value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis. Also, a response to this extended answer results will be generated by coding the data and organizing it in bullet points.

12. A response to research question twelve, regarding DB for public projects, will be generated by recording frequencies, graphing the frequencies, calculating the P-Value, comparing the P-value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis. Also, a response to this extended answer results will be generated by coding the data and organizing it in bullet points.
13. A response to research question thirteen, regarding DB for private projects, will be generated by recording frequencies, graphing the frequencies, calculating the P-Value, comparing the P-value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
14. A response to research question fourteen, regarding the amount of RFP criteria, will be generated by recording frequencies and graphing the frequencies. Also, a response to this extended answer results will be generated by coding the data and organizing it in bullet points.
15. A response to research question fifteen, regarding meeting the RFP's criteria, will be generated by recording frequencies and graphing the frequencies. Also, a response to this extended answer results will be generated by coding the data and organizing it in bullet points.
16. A response to research question sixteen, regarding not meeting criteria in RFP, will be generated by recording frequencies and graphing the frequencies. Also, a response to this extended answer results will be generated by coding the data and organizing it in bullet points.
17. A response to research question seventeen, regarding DB in reference to bid rigging, will be generated by recording frequencies, graphing the frequencies, calculating the P-Value, comparing the P-value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
18. A response to research question eighteen, regarding protests of bids not awarded, will be generated by recording frequencies and graphing the frequencies.
19. A response to research question nineteen, regarding bonds for protesting a bid, will be generated by recording frequencies and graphing the frequencies.
20. A response to research question twenty, regarding amount of bonds to protest a bid, will be generated by recording frequencies and graphing the frequencies.
21. A response to research question twenty-one, regarding amount of bonds lost to protest a bid, will be generated by recording frequencies and graphing the frequencies.
22. A response to research question twenty-two, regarding DB in reference to equal opportunity for bidders, will be generated by recording frequencies, graphing the frequencies, calculating the P-Value, comparing the P-value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.

23. Question 17 vs. Question 1: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
24. Question 17 vs. Question 3: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
25. Question 17 vs. Question 6: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
26. Question 17 vs. Question 7: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
27. Question 17 vs. Question 8: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
28. Question 17 vs. Question 9: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
29. Question 17 vs. Question 10: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
30. Question 17 vs. Question 11: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
31. Question 17 vs. Question 12: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
32. Question 17 vs. Question 13: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value,

comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.

33. Question 17 vs. Question 15: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
34. Question 17 vs. Question 22: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
35. Question 11 vs. Question 9: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
36. Question 11 vs. Question 12: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
37. Question 11 vs. Question 13: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.
38. Question 11 vs. Question 15: A comparative response to these two questions will be generated by determining frequencies in comparison, calculating P-Value, comparing the P-Value to the alpha value, and explaining the outcomes in terms of the null and alternative hypothesis.

## CHAPTER 4 RESULTS

The survey response rates were low overall. The researcher mailed and emailed a plethora of surveys, but unfortunately a low number of participated due to uncontrollable forces like non-response bias.

The respondent demographic is detailed in the methodology section. The researcher did not use common demographics as they would not be relevant to the survey. The author deleted some of the question results that did not correspond to the primary purpose of this research. These questions are 18, 19, 20, and 21 and are available to view in Appendix C. These results could be used as a secondary source to further investigate DB as they have to do with monetary volumes for protesting awards of bids.

### **Assumptions**

The researcher made a preliminary assumption in order to do the following representation of data and statistical analysis. This assumption was to not include the participants that answered “Not Applicable” or did not answer.

### **Limitations**

One main limitation with the Chi-Squared Tests performed in this data analysis is if more than 20% of the expected values are less than five, then the Chi-Squared Test will not perform at a 100% confidence level. Therefore, some of the data will not perform at a 100% confidence level unless more samples were retained to increase the expected values. The researcher will note which data this applies to.

According to the results, the majority of respondents dealt with residential and commercial projects. The other industries are highly underrepresented due to the limitations of the survey.

### **Potential Sources of Error**

Figure 4-1 shows the potential sources of error in a diagram to show the hierarchy of errors.

#### **Random Sampling Errors**

Random Sampling Errors are the variations between the population mean and the sample mean. The responses the researcher received were overwhelmingly from residential and commercial businesses; the sample did not return many from other types of businesses.

#### **Non-Sampling Errors**

Non-sampling errors found in this research are the approach, lack of incentives, questionnaire design, scales, and interviewing method. A primary limitation is the survey model itself; there is very little incentive for individuals to fill out this survey. They do not receive any compensation nor does it further them in their career so they see little motivation except for the fact that they are helping a master's student complete her thesis. The scale of this thesis was large in terms of surveys sent but was small since the respondent quantity was so limited.

#### **Response errors**

Response errors are inaccuracies, mis-analyzed, or mis-recorded that can be made by the researcher, interviewer, and/or participant. These are broken down in more detail below.

### **Researcher errors**

- Measurement
- Population definition and sampling
- Data analysis

### **Interviewer errors**

- Participant selection
- Questioning and recording

### **Participant errors**

- Inability
- Unwillingness

### **Non-response errors**

A non-response error occurs when the recipients do not respond at all or when they have no obligation to fill out entire survey.

## **Question Response Analysis**

The main reason for the research is to figure out if the Design-Build delivery and procurement method is legal and/or ethical in the form of bid rigging. The questions will be analyzed in order of their relevance and importance to the study, with demographic analysis and additional qualitative data to follow.

### **Question 17**

This question of the survey was posed in order to find if DB could be used as form of bid rigging. The responses from the survey indicated that the majority of the sample population agreed that DB delivery method could be used as a form of bid rigging. Figure 4-2 shows that more than 50% agreed that the DB delivery method could be used as a form of bid rigging. Table 4-1 are the results from the survey, which breaks down the sample population into their respective answer choices.

## Numerical results

Table 4-1. Numerical Results of Question 17

A Yes	B No	C Sometimes	D Not applicable
17	5	6	2

## Hypotheses

Null Hypothesis: There is no difference in observation frequencies and expected frequencies. There is not a significant difference. Variables are independent.

Alternative Hypothesis: There is a difference between observation frequencies and expected frequencies. There is a significant difference in the respondent's responses. Variables are related.

## Analysis

The null hypothesis is rejected and we accept the alternative hypothesis according to Table 4-2. There is a difference between observation frequencies and expected frequencies. We can say with 99% certainty that there is a significant difference in the respondent's responses. More respondents chose "Yes" over any other answer. Just by looking at the histogram Figure 4-2, the level of significance, is quite large, as we have proven in the statistics analysis.

These results show that almost all the respondents believe that design-build is a form of bid rigging. The researcher would like to remind you that bid rigging is illegal and unethical. Bid rigging is illegal under the Sherman Act and is defined as when "competitors agree to eliminate competition for some piece of defined business, whether it be a sale, a contract, or a project" (Justice 2005).

## Chi-squared test

Table 4-2. Chi-squared test table

Sample		
	Observations	Expected
Yes	17	9.33333333
No	5	9.33333333
Sometimes	6	9.33333333
P value		0.0086517

P value <  $\alpha$  (Alpha = 0.05) 95% Confidence

P value <  $\alpha$  (Alpha = 0.01) 99% Confidence

## Question 12

This question on the survey was posed in order to find out if the DB project delivery method should be allowed for public projects. The responses from the survey indicated that more respondents believe that DB should be allowed for public projects.

In Figure 4-3, the answer choice “Yes” more than doubles answer choices no, and sometimes.

## Numerical results

The numerical results are given in Table 4-3 to show the distribution of answer choices.

Table 4-3. Numerical Results of Question 12

A	B	C	D
Yes	No	Sometimes	Not Applicable
17	7	8	3

## Hypotheses

Null Hypothesis: There is no difference in whether the respondents believe DB should be allowed for public projects.

Alternative Hypothesis: There is a difference in whether the respondents believe DB should be allowed for public projects.

## **Analysis**

The P-Value is less than the alpha value (0.05) so we reject the null hypothesis which is there is no difference in observed and expected as shown in Table 4-4. Therefore, there is a significant difference in the values presented. Reviewing the results presented, these respondents believe that DB should be allowed to be utilized in public projects.

### **Chi-squared test and results**

Table 4-4. Chi-Squared Test and Results

	Observed	Expected
Yes	17	10.666667
No	7	10.666667
Sometimes	8	10.666667
P-Value		0.058207

### **In depth**

Of these responses, the researcher asked the respondents the reasoning for their answers. The following are the reasons:

#### **Preferential towards Design Build in Public Projects**

- Lower Costs
- Less Complicated Communications
- Owner Relationship

#### **Opposed to Design Build in Public Projects**

- Unfair Advantages to Large Companies
- Labor Intensive
- Financial Risk all on Contractor
- Bids Based on Subjective Criteria (Performance and Prescriptive Specs)

#### **Conditionally Preferential towards Design Build in Public Projects**

- Keeps costs Reasonable

Not Applicable

### **Question 13**

This question on the survey was posed in order to find out if the DB project delivery method should be allowed for private projects. The responses from the survey indicated that more respondents believe that DB should be allowed for private projects. This is overwhelming shown in Figure 4-4 and Table 4-5, since over 75% of the respondents voted “yes”.

### **Numerical results**

Table 4-5. Numerical Results to Question 13.

Yes	No	Sometimes	Not Applicable
29	2	3	0

### **Hypotheses**

Null Hypothesis: There is no difference in whether the respondents believe DB should be allowed for private projects.

Alternative Hypothesis: There is a difference in whether the respondents believe DB should be allowed for private projects.

### **Analysis**

The P-Value is less than the alpha value (0.05 and 0.01). So we can say that we reject the null hypothesis and accept the alternative hypothesis according to Table 4-6. The alternative hypothesis states that there is a significant difference in the observed versus the expected outcome. In fact we can say that with not only 95% confidence but also with 99% confidence.

## Chi-squared test and results

Table 4-6. Chi-Squared Test and Results

	Observed	Expected
Yes	29	11.33333333
No	2	11.33333333
Sometimes	3	11.33333333
P value		0.0000000010

## Question 22

This question of the survey was posed in order to find out if DB bids are structured to provide equal opportunity for all bidders. The responses form the survey indicated that the majority of the sample population believe that DB bids are not or are sometimes structured to provide equal opportunities for all bidders, as shown in Figure 4-5 and Table 4-7.

## Numerical results

Table 4-7. Numerical Results of Question 22

A	B	C	D
Yes	No	Sometimes	Not Applicable
3	8	8	5

## Hypotheses

Null Hypothesis: There is no difference in whether the respondents believe DB is structured to provide equal opportunity for all bidders.

Alternative Hypothesis: There is a difference in whether the respondents believe DB is structured to provide equal opportunity for all bidders.

## Analysis

The P-Value is greater than the alpha value (0.05) according to Table 4-8. Therefore, we fail to reject the null hypothesis and reject the alternative hypothesis. The

null hypothesis states that there is no difference in the observed frequencies versus the expected frequencies.

Although there is no statistical difference in responses, there is a visual difference in responses shown through the graph and the frequencies. In this question, respondents explain that design-build projects sometimes or do not provide an equal opportunity environment for all bidders. The responses of sometimes and no answers were identical and over double the yes answer choice.

### **Chi-squared test and results**

Table 4-8. Chi-Squared Test and Results

	Observed	Expected
Yes	3	6.33
No	8	6.33
Sometimes	8	6.33
P-Value		0.26826245

### **Question 3**

This question of the survey was posed in order to show the number of employee's in the company. As shown by Figure 4-6, Table 4-9, and Table 4-10, the number of employee's is skewed right with an average of thirty-two employees per company. This data will be compared with other question data later to discover if there are any relationships.

### **Numerical results**

Table 4-9. Numerical Results for Question 3

Bin	Frequency
0	1
40	28
80	4
120	3
160	0
200	1
More	1

## Description

Table 4-10. Description of Numerical Results

Mean	32.8421053
Standard Error	8.27905258
Median	13

## Question 4

This question of the survey was posed in order to find the annual volume of business, in dollars, of each company. As shown by Figure 4-7, Table 4-11, and Table 4-12, the quantity of project's data is skewed right with an average of \$29,578,717.9 annual volume of business. This data will be compared with other question data later to discover if there are any relationships.

## Numerical results

Table 4-11. Numerical Results of Question 4

Bin	Frequency
\$45,000,000	29
\$90,000,000	7
\$135,000,000	0
\$180,000,000	2
\$225,000,000	0
\$270,000,000	1
\$315,000,000	0
More	0

## Description

Table 4-12. Description of Numerical Results

Mean	\$29,578,717.9
Standard Error	\$8,826,328.7
Median	\$5,000,000.0

## Question 7

This question of the survey was posed in order to find the quantity of projects bid on over the past five years. As shown by Figure 4-8, Table 4-13, and Table 4-14, the

quantity of project's data is skewed right with an average of 938 projects bid on per company over past five years. This data will be compared with other question data later to discover if there are any relationships.

### **Numerical results**

**Table 4-13. Numerical Results of Question 7**

Bin	Frequency
4000	36
8000	1
12000	0
16000	0
20000	0
24000	0
28000	1
More	0

### **Description**

**Table 4-14. Description of Numerical Results**

Mean	938.684211
Standard Error	661.305512
Median	100

### **Question 8**

This question of the survey was posed in order to find the quantity of DB projects bid on over the past five years. As shown by Figure 4-9, Table 4-15, and Table 4-16, the quantity of project's data is skewed right with an average of eighty-nine DB projects bid on per company over past five years. This data will be compared with other question data later to discover if there are any relationships.

### **Numerical results**

**Table 4-15. Numerical Results of Question 8**

Bin	Frequency
300	35
600	1

Table 4-15 Cont.

900	0
1200	0
1500	0
1800	0
More	1

### Description

Table 4-16. Description of Numerical Results

Mean	89.1621622
Standard Error	54.3012467
Median	10

### Question 9

This question of the survey was posed in order to find the quantity of DB projects awarded over the past five years. As shown by Figure 4-10, Table 4-17, and Table 4-18, the quantity of project's data is skewed right with an average of 47 DB projects awarded per company over past five years. This data will be compared with other question data later to discover if there are any relationships.

### Numerical results

Table 4-17. Numerical Results of Question 9

Bin	Frequency
200	34
400	1
600	0
800	0
1000	0
1200	1
1400	0
More	0

## Description

Table 4-18. Description of Numerical Results

Mean	47.5555556
Standard Error	33.4837664
Median	5

## Question 10

This question of the survey was posed in order to find the quantity of DB projects that have been awarded, over the past five years that were public projects. As shown by Figure 4-11, Table 4-19, and Table 4-20, the quantity of project's data is skewed right with an average of five DB projects awarded per company over past five years were public projects. This data will be compared with other question data later to discover if there are any relationships.

## Numerical results

Table 4-19. Numerical Results of Question 10

Bin	Frequency
25	36
50	0
75	0
100	0
125	0
150	0
175	1
More	0

## Description

Table 4-20. Description of Numerical Results

Mean	5.08108108
Standard Error	4.45049148
Median	0

## **Question 1**

This question of the survey was posed in order to find what type of business the firm was in. According to Figure 4-12, and Table 4-21, more than 50% were commercial and residential companies that responded to the survey.

### **Numerical data**

Table 4-21. Numerical Data of Question 1

A (Residential)	B (Commercial)	C (Industrial)	D (Heavy Civil)	E (Environmental)	F (Other)
19	25	3	2	2	6

### **Hypotheses**

Null Hypothesis: There is no difference between the numbers of firms from each industry that responded to the survey.

Alternative Hypothesis: There is a difference between the numbers of firms from each industry that responded to the survey.

### **Analysis**

The P-Value is less than the alpha value (0.05 or 0.01) according to Table 4-22. Therefore, we can reject the null hypothesis and accept the alternative hypothesis with a 99% confidence level. This means there is a difference between the numbers of firms from each industry that responded to the survey. The main difference is that more residential and commercial recipients responded over other industries. This is clearly visible in figure 4-12.

Just as a reminder, the limitation in this question is that some of these industries are underrepresented due to the convenience sampling method.

## Chi-squared test

Table 4-22. Chi-squared test

Type	Frequency	Expected
Residential	19	9.5
Commercial	25	9.5
Industrial	3	9.5
Heavy Civil	2	9.5
Environmental	2	9.5
Other	6	9.5
P-Value	0.0000000005	

## Question 2

This question of the survey was posed in order to find out what type of business the firm was. According to Figure 4-13 and Table 4-23, more than 50% were S-corporations and Corporations that responded to the survey.

## Numerical data

Table 4-23. Numerical Data for Question 2

A Sole Proprietorship	B Corporatio n	C Partnershi p	D S- Corporatio n	E Trust	F Non-Profit Organizatio n	G Other
0	16	2	20	1	3	0

Figure 4-14 illustrates that almost half of the respondents are S-Corporations.

## Analysis

A limitation to this question is that the business types are not equally distributed over all types of businesses. This could possibly provide skewed data results as discussed further in the potential sources of error subsection in the results section.

## Question 5

This question of the survey was posed in order to find where each firm was located. According to Figure 4-15 and Table 4-24, more respondents were from

Gainesville, Florida and the near-by surrounding area than any other respondents. Only one respondent was from Georgia; we will disregard the Georgia respondent.

### Numerical data

Table 4-24. Numerical Data of Question 5

City, State	Frequency
Gainesville, Florida	18
Newberry, Florida	2
Tampa, Florida	3
Orlando, Florida	2
South Florida	4
Florida (Other)	7
Peachtree, Georgia	1

### Analysis

A majority of the participants were located in Gainesville, Florida. The range location of participants is from Georgia to Florida. Some participants only wrote “South Florida” or “Florida” even though they were asked to write a specific city. This may hinder the major results in comparison with locations.

### Question 6

This question of the survey was posed in order to find out what project delivery method the firm preferred. As shown in Figure 4-16 and Table 4-25, more respondents prefer DB over the other delivery methods. About 50% of the respondents chose “Design-Build” as their preference.

### Numerical data

Table 4-25. Numerical Data of Question 6

A Design-Build	B Construction Management (CM)	C CM @ Risk	D Design-Bid- Build	E Not Applicable
24	10	4	4	4

## Hypotheses

Null Hypothesis: There is no difference between what type of delivery method is preferred by contractors.

Alternative Hypothesis: There is a difference in what type of delivery method is preferred by contractors.

## Analysis

The P-Value is less than alpha value (0.01), therefore we reject the null hypothesis and accept the alternative hypothesis according to Table 4-26. The variables (answers) are related to one another. With 99% confidence, contractors do have a preference for delivery method. Looking at the data, it is clear that DB is preferred method.

## Chi Squared Test and Results

Table 4-26. Chi-Squared Test and Results

Answer	Observed	Expected
Design Build	24	10.5
CM	10	10.5
CM @ Risk	4	10.5
DBB	4	10.5
P-Value		0.00001256

## Question 11

This question of the survey was posed in order to find out if the firm preferred working on DB projects. As shown by Figure 4-17 and Table 4-27, more respondents chose yes, that they prefer working on DB projects. This question is not directly in comparison with any other delivery method, it is just an independent question.

## Numerical data

Table 4-27. Numerical Data for Question 11

A	B	C	D
Yes	No	Sometimes	Not Applicable
21	7	9	2

## Hypotheses

Null Hypothesis: There is no difference between preferences of DB by respondents.

Alternative Hypothesis: There is a difference between preferences of DB by respondents.

## Analysis

Since the P-Value is less than the alpha value (0.05 and 0.01), we can reject the null hypothesis and accept the alternative hypothesis according to Table 4-28. Therefore, contractors do prefer DB projects in general, not just in comparison to other delivery methods as described in question six.

## Chi squared test and results

Table 4-28. Chi-Squared Test and Results

	Observed	Expected
Yes	21	12.333333
No	7	12.333333
Sometimes	9	12.333333
P-Value		0.0095745

## In depth

The researcher also asked why or why not, to this question. The following are the results of the qualitative data:

Preferential towards Design Build

- Single Responsibility to Owner
- Flexibility

- Owner Relationship

Opposed to Design Build

- Too much competition
- Too much risk on GC

Conditionally Preferential towards Design Build

- As long as we are in control
- Proper Zoning
- Profitable
- If the client has the Capitol

Not Applicable

#### **Question 14**

This question of the survey was posed in order to find out how many criteria were present in the RFP on average, in their DB projects and what the criteria was that were present. Table 4-29 shows numerical data that represents each respondent's quantity of the average number of criteria. Only a few respondents answered this question, instead they responded to the open-ended question, "What were the criteria listed?"

#### **Numerical data**

Table 4-29. Numerical Data for Question 14

Numerical Answers	
20	
7	
20	
30	
12	
Average	
17.8	

#### **In depth**

1. Criteria Vary Per Project
  - Multiple subcontractors with different criteria
  - Verbal requests from clients
2. RFP's are the Criteria

- The Entire RFP
  - Too many to list
3. Not Applicable

### **Question 15**

This question of the survey was posed in order to find out if the firm has always been able to meet the criteria required in the DB RFP. As shown in Figure 4-18 and Table 4-30, more respondents were able to meet or at least sometimes meet the criteria required by the DB RFP.

### **Numerical data**

Table 4-30. Numerical Data for Question 15

A Yes	B No	C Sometimes	D Not Applicable
13	2	9	9

### **In depth**

1. Always able to meet the Criteria
  - Depends on Project
2. Not always able to meet the Criteria
  - Otherwise we do not participate
3. Sometimes able to meet the Criteria
  - Yes Mostly, However sometimes RFP contains errors
  - Unforeseen Circumstances Prevent Meeting Criteria
4. Not Applicable

### **Question 16**

This question in the survey was posed in order to find out what they have done if the firm has not been able to meet all the criteria required in the DB RFP.

### **In depth**

This is a breakdown of the answers given by coding qualitative data.

1. No Participation

- Decline to Bid / Pursue
2. Not Applicable
  3. Attempt to meet Criteria
- Hire employee in the needed field(s)

### **Question vs. Question Analysis**

#### **Question 17 vs. Question1**

This question analysis was posed in order to find the relevance between what type of project the firm builds and how they view DB in terms of bid rigging.

#### **Analysis**

Since the P-Value is less than the alpha (0.05), we can reject the null hypothesis and accept the alternative hypothesis according to Tables 4-31, and 4-32. The alternative hypothesis is stating that there is meaning based on what type of project the firm builds, is how they view DB in terms of bid rigging. Furthermore, residential and commercial view DB more as bid rigging over the other types of projects built. Of all the answers, bid rigging was a more popular answer for all projects over not bid rigging or sometimes bid rigging.

Table 4-31. Question 17 vs. Question 1 Observed Data

		Observed			
		Bid rigging	Not bid rigging	Sometimes	Totals
Residential		8	1	3	12
Commercial		6	5	7	18
Other		2	5	0	7
Totals		16	11	10	37

Table 4-32. Question 17 vs. Question 1 Expected Data

	Expected		
	Bid rigging	Not bid rigging	Sometimes
Residential	5.189189189	3.567567568	3.24324324
Commercial	7.783783784	5.351351351	4.86486486
Other	3.027027027	2.081081081	1.89189189
P-Value		0.025549382	

## Hypotheses

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and the types of projects that participants build.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and the types of projects that participants build.

## Limitations

Of the nine expected values six of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## Question 17 vs. Question 3

This question analysis was posed in order to find the relevance between number of employees and how the firms view DB in terms of bid rigging.

## Analysis

Since the P-Value is less than the alpha (0.10), we can reject the null hypothesis and accept the alternative hypothesis according to Tables 4-33 and 4-34. The alternative hypothesis suggests there is a relationship between number of employees and how the firms view DB in terms of bid rigging. Therefore, the smaller the company ( $X < 25$ ), the more likely it is for them to agree that DB is bid rigging. This is true for the

opposite, as in for larger companies ( $X>75$ ), the less likely it is for them to agree that DB is bid rigging.

Table 4-33. Question 17 vs. Question 3 Observed Data

# of Employees	Observed			Totals
	Bid rigging	Not bid rigging	Sometimes	
$X<25$	12	2	5	19
$25 \leq X \leq 75$	3	1	1	5
$X>75$	1	3	0	4
Totals	16	6	6	28

Table 4-34. Question 17 vs. Question 3 Expected Data

	Expected		
	Bid rigging	Not bid rigging	Sometimes
$X<25$	10.857143	4.071428571	4.0714286
$25 \leq X \leq 75$	2.8571429	1.071428571	1.0714286
$X>75$	2.2857143	0.857142857	0.8571429
P-Value			0.0798839

## Hypotheses

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and number of employees in a firm.

Alternative Hypothesis: There is a statistical difference between views on DB as bid rigging and number of employees in a firm.

## Limitations

Of the nine expected values eight of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## Question 17 vs. Question 6

This question analysis was posed in order to find the relevance between preference of delivery method and how the firms view DB in terms of bid rigging.

### Analysis

Since the P-Value is less than the alpha (0.05), we can reject the null hypothesis and accept the alternative hypothesis according to Tables 4-35 and 4-36. The alternative hypothesis is stating that there is meaning based on preference of delivery method, is how the firms view DB in terms of bid rigging. Although respondents that answered yes to bid rigging where about equal distribution between DB and Non-DB, the respondents that answered no to bid rigging were all DB firms and no respondents answered no to bid rigging that were non DB.

Table 4-35. Question 17 vs. Question 6 Observed Data

	Observed			
	Bid rigging	Not bid rigging	Sometimes	Totals
(A) Design-Build	7	8	4	19
(B) Non design build	8	0	3	11
Totals	15	8	7	30

Table 4-36. Question 17 vs. Question 6 Expected Data

	Expected		
	Bid rigging	Not bid rigging	Sometimes
(A) Design-Build	9.5	5.066666667	4.4333333
(B) Non design build	5.5	2.933333333	2.5666667
P-Value	0.0379807		

### Hypotheses

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and the preference on delivery methods.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and the preference on delivery methods.

## **Limitations**

Of the six expected values three of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## **Question 17 vs. Question 7**

This question analysis was posed in order to find the relevance between view on DB in terms of bid rigging and quantity of projects bid on over past five years.

## **Analysis**

The P-Value is greater than the alpha value (0.10), so we fail to reject the null hypothesis and cannot accept the alternative hypothesis according to Tables 4-37 and 4-38. Therefore, we cannot prove statistically there is a relationship between view on DB in terms of bid rigging and quantity of projects bid on over past five years.

**Table 4-37. Question 17 vs. Question 7 Observed Data**

	Observed			
	Yes	No	Sometimes	Totals
X<50	4	1	2	7
50<=X<=200	6	4	5	15
X>200	5	2	0	7
Totals	15	7	7	29

**Table 4-38. Question 17 vs. Question 7 Expected Data and P-Value**

	Expected		
	Yes	No	Sometimes
X<50	3.620689655	1.689655172	1.689655172
50<=X<=200	7.75862069	3.620689655	3.620689655
X>200	3.620689655	1.689655172	1.689655172
P-Value	0.460735		

## Hypotheses

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and the quantity of projects bid on over past five years.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and the quantity of projects bid on over past five years.

## Limitations

Of the nine expected values eight of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## Question 17 vs. Question 8

This question analysis was posed in order to find relevance between views on DB in terms of bid rigging and amount of DB projects bid over the past five years.

## Analysis

The P-Value is greater than the alpha value (0.10), so we fail to reject the null hypothesis and cannot the alternative hypothesis according to Tables 4-39 and 4-40. Therefore, we cannot prove statistically there is a relationship between views on DB in terms of bid rigging and amount of DB projects bid over the past five years.

Table 4-39. Question 17 vs. Question 8 Observed Data

	Observed			
	Bid rigging	Not bid rigging	Sometimes	Totals
X<10	7	2	3	12
10<=X<=50	5	4	3	12
X>50	2	2	1	5
Totals	14	8	7	29

Table 4-40. Question 17 vs. Question 8 Expected Data

	Observed		
	Bid rigging	Not bid rigging	Sometimes
X<10	5.793103448	3.310344828	2.896551724
10<=X<=50	5.793103448	3.310344828	2.896551724
X>50	2.413793103	1.379310345	1.206896552
P-Value		0.841500769	

### Hypotheses

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and amount of DB projects bid on over past five years.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and amount of DB projects bid on over past five years.

### Limitations

Of the nine expected values seven of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

### Question 17 vs. Question 9

This question analysis was posed in order to find relevance between views on DB in terms of bid rigging and amount of DB projects awarded over the past five years.

### Analysis

The P-Value is greater than the alpha value (0.10), so we fail to reject the null hypothesis and cannot accept the alternative hypothesis according to Tables 4-41 and 4-42. Therefore, we cannot prove statistically there is a relationship between views on DB in terms of bid rigging and amount of DB projects awarded over the past five years.

Table 4-41. Question 17 vs. Question 9 Observed Data

	Observed			
	Bid rigging	Not bid rigging	Sometimes	Totals
X<5	6	1	4	11
5<=X<=10	3	5	2	10
X>10	6	2	1	9
Totals	15	8	7	30

Table 4-42. Question 17 vs. Question 9 Expected Data

	Expected			
	Bid rigging	Not bid rigging	Sometimes	
X<5	5.5	2.933333333	2.566666667	
5<=X<=10	5	2.666666667	2.333333333	
X>10	4.5	2.4	2.1	
P-Value				0.188061396

## Hypotheses

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and amount of DB projects awarded over past five years.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and amount of DB projects awarded over past five years.

## Limitations

Of the nine expected values seven of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## Question 17 vs. Question 10

This question analysis was posed in order to find relevance between views on DB in terms of bid rigging and amount of DB projects awarded over the past five years that were public projects.

## Analysis

The P-Value is greater than the alpha value (0.10), so we fail to reject the null hypothesis and cannot accept the alternative hypothesis according to Tables 4-43 and 4-44. Therefore, we cannot prove statistically there is a relationship between views on DB in terms of bid rigging and amount of DB projects awarded over the past five years that were public projects.

Table 4-43. Question 17 vs. Question 10 Observed Data

	Observed			
	Bid rigging	Not bid rigging	Sometimes	Totals
X<3	2	1	0	3
3<=X<=7	-	-	-	0
X>7	0	0	1	1
Totals	2	1	1	4

Table 4-44. Question 17 vs. Question 10 Expected Data

	Expected			
	Bid rigging	Not bid rigging	Sometimes	
X<3	1.5	0.75	0.75	
3<=X<=7	0	0	0	
X>7	0.5	0.25	0.25	
P-Value				0.40600585

## Hypotheses

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and amount of DB projects awarded over past five years that were public projects.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and amount of DB projects awarded over past five years that were public projects.

## **Limitations**

Of the nine expected values all of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## **Question 17 vs. Question 11**

This question analysis was posed in order to find relevance between preference of DB and how the firms view DB in terms of bid rigging.

## **Analysis**

Since the P-Value is less than the alpha (0.05), we can reject the null hypothesis and accept the alternative hypothesis according to Tables 4-45 and 4-46. The alternative hypothesis is stating that there is meaning based on preference of DB and how the firms view DB in terms of bid rigging.

Table 4-45. Question 17 vs. Question 11 Observed Data

	Observed			
	Bid rigging	Not bid rigging	Sometimes	Total
(A) Yes	8	8	4	20
(B) No	4	0	0	4
(C) Sometimes	2	4	3	9
Total	14	12	7	33

Table 4-46. Question 17 vs. Question 11 Expected Data

	Expected		
	Bid rigging	Not bid rigging	Sometimes
(A) Yes	8.4848485	7.272727273	4.2424242
(B) No	1.6969697	1.454545455	0.8484848
(C) Sometimes	3.8181818	1.909090909	1.9090909
P-Value			0.0535344

## Hypotheses

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and the preference of DB.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and the preference of DB.

## Limitations

Of the nine expected values seven of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## Question 17 vs. Question 12

This question analysis was posed in order to find relevance between view on DB in terms of bid rigging and if DB should be allowed for public projects.

## Analysis

Since the P-Value is greater than the alpha (0.10), we fail to reject the null hypothesis and cannot accept the alternative hypothesis according to Tables 4-47 and 4-48. Therefore, we cannot prove statistically there is a relationship between views on DB in terms of bid rigging and if DB should be allowed for public projects.

Table 4-47. Question 17 vs. Question 12 Observed Data

	Observed			
	Bid rigging	Not bid rigging	Sometimes	Totals
(A) Yes	6	6	3	15
(B) No	4	0	1	5
(C) Sometimes	3	2	3	8
Totals	13	8	7	28

**Table 4-48. Question 17 vs. Question 12 Expected Data**

	Expected		
	Bid rigging	Not bid rigging	Sometimes
(A) Yes	6.964285714	4.28571429	3.75
(B) No	2.321428571	1.42857143	1.25
(C) Sometimes	3.714285714	2.28571429	2
	P-Value	0.36261059	

### **Hypotheses**

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and if DB should be allowed for public projects.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and if DB should be allowed for public projects.

### **Limitations**

Of the nine expected values eight of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

### **Question 17 vs. Question 13**

This question analysis was posed in order to find relevance between views on DB in terms of bid rigging and if DB should be allowed for private projects.

### **Analysis**

Since the P-Value is greater than the alpha (0.10), we fail to reject the null hypothesis and cannot accept the alternative hypothesis according to Tables 4-49 and 4-50. Therefore, we cannot prove statistically there is a relationship between views on DB in terms of bid rigging and if DB should be allowed for private projects.

Table 4-49. Question 17 vs. Question 13 Observed Data

	Observed			
	Bid rigging	Not bid rigging	Sometimes	Totals
(A) Yes	11	5	6	22
(B) No	2	0	0	2
(C ) Sometimes	0	1	0	1
Totals	13	6	6	25

Table 4-50. Question 17 vs. Question 13 Expected Data

	Expected			
	Bid rigging	Not bid rigging	Sometimes	
(A) Yes	11.44	5.28	5.28	
(B) No	1.04	0.48	0.48	
(C ) Sometimes	0	0.24	0.24	
P-Value		0.272959205		

## Hypotheses

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and if DB should be allowed for private projects.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and if DB should be allowed for private projects.

## Limitations

Of the nine expected values six of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## Question 17 vs. Question 15

This question analysis was posed in order to find relevance between views on DB in terms of bid rigging and ability to meet criteria required in the DB RFP.

## **Analysis**

Since the P-Value is greater than the alpha value (0.10), we fail to reject the null hypothesis and cannot accept the alternative hypothesis according to Tables 4-51 and 4-52. Therefore, we cannot prove statistically there is a relationship between views on DB in terms of bid rigging and ability to meet criteria required in the DB RFP.

**Table 4-51. Question 17 vs. Question 15 Observed Data**

Meet Criteria	Observed			Totals
	Yes	No	Sometimes	
Yes	9	3	3	15
No	0	0	2	2
Sometimes	5	0	2	7
Totals	14	3	7	24

**Table 4-52. Question 17 vs. Question 15 Expected Data and P-Value**

	Expected		
	Yes	No	Sometimes
Yes	8.75	1.875	4.375
No	1.1666666667	0.25	0.5833333333
Sometimes	4.0833333333	0.875	2.0416666667
P-Value	0.133111		

## **Hypotheses**

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and ability to meet criteria required in the DB RFP.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and ability to meet criteria required in the DB RFP.

## **Limitations**

Of the nine expected values eight of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the

sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

### **Question 17 vs. Question 22**

This question analysis was posed in order to find relevance between firms view on DB in terms of bid rigging and views on whether the structure of DB is unequal to all bidders.

### **Analysis**

Since the P-Value is less than the alpha value (0.05), we reject the null hypothesis and accept the alternative hypothesis according to Tables 4-53 and 4-54. Therefore, the people who believe DB is bid rigging also believe that the structure of DB is unequal to bidders.

**Table 4-53. Question 17 vs. Question 22 Observed Data**

	Observed			
	Bid rigging	Not bid rigging	Sometimes	Totals
(A) Yes	4	2	0	6
(B) No	8	2	3	13
(C) Sometimes	0	3	4	7
Totals	12	7	7	26

**Table 4-54. Question 17 vs. Question 22 Expected Data**

	Expected			
	Bid rigging	Not bid rigging	Sometimes	
(A) Yes	2.769230769	1.615384615	1.615384615	
(B) No	6	3.5	3.5	
(C) Sometimes	3.230769231	1.884615385	1.884615385	
P-Value				0.042142308

### **Hypotheses**

Null Hypothesis: There is no statistical difference between views on DB is bid rigging and whether DB is equal for all bidders.

Alternative Hypothesis: There is a statistical difference between views on DB is bid rigging and whether DB is equal for all bidders.

## **Limitations**

Of the nine expected values eight of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## **Question 11 vs. Question 9**

This question analysis was posed in order to find relevance between preference of DB and amount of DB projects awarded over the past five years.

## **Analysis**

The P-Value is less than the alpha value (0.01), so we reject the null hypothesis and accept the alternative hypothesis according to Tables 4-55 and 4-56. Therefore, we can prove that there is a statistical relationship between preference of DB and amount of DB projects awarded over the past five years.

Table 4-55. Question 11 vs. Question 9 Observed Data

	Observed			
	Yes	No	Sometimes	Totals
X<3	4	6	2	12
3<=X<=10	4	1	6	11
X>10	11	0	0	11
Totals	19	7	8	34

Table 4-56. Question 11 vs. Question 9 Expected Data

	Expected		
	Yes	No	Sometimes
X<3	6.705882353	2.470588235	2.823529412
3<=X<=10	6.147058824	2.264705882	2.588235294
X>10	6.147058824	2.264705882	2.588235294

P-Value	0.000314969
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## Hypotheses

Null Hypothesis: There is no statistical difference between whether DB is preferred and amount of DB projects awarded over the past five years.

Alternative Hypothesis: There is a statistical difference between whether DB is preferred and amount of DB projects awarded over the past five years.

## Limitations

Of the nine expected values six of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## Question 11 vs. Question 12

This question analysis was posed in order to find relevance between preferences of DB and if DB should be allowed for public projects.

## Analysis

The P-Value is greater than the alpha value (0.10), so we fail to reject the null hypothesis and cannot accept the alternative hypothesis according to Tables 4-57 and 4-58. Therefore, we cannot prove statistically there is a relationship between preferences of DB and if DB should be allowed for public projects.

Table 4-57. Question 11 vs. Question 12 Observed Data

Allow Public Projects	Observed			Totals
	Yes	No	Sometimes	
Yes	12	1	2	15
No	3	2	1	6
Sometimes	4	1	4	9
Totals	19	4	7	30

Table 4-58. Question 11 vs. Question 12 Expected Data

Expected			
	Yes	No	Sometimes
Yes	9.5000	2.0000	3.5000
No	3.8000	0.8000	1.4000
Sometimes	5.7000	1.2000	2.1000
P-Value		0.188730608	

### Hypotheses

Null Hypothesis: There is no statistical difference between whether DB is preferred and if DB should be allowed for public projects.

Alternative Hypothesis: There is a statistical difference between whether DB is preferred and if DB should be allowed for public projects.

### Limitations

Of the nine expected values seven of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

### Question 11 vs. Question 13

This question analysis was posed in order to find relevance between preference of DB and whether DB projects should be allowed for private projects.

### Analysis

The P-Value is less than the alpha value (0.10), so we reject the null hypothesis and accept the alternative hypothesis according to Tables 4-59 and 4-60.

Table 4-59. Question 11 vs. Question 13 Observed Data

Observed				
Allow Private Projects	Yes	No	Sometimes	Totals

Yes	18	3	1	22
No	0	1	0	1
Sometimes	1	1	1	3
Totals	19	5	2	26

Table 4-60. Question 11 vs. Question 13 Expected Data

Expected			
	Yes	No	Sometimes
Yes	16.07692308	4.230769231	1.692307692
No	0.730769231	0.192307692	0.076923077
Sometimes	2.192307692	0.576923077	0.230769231
P-Value			0.072086

## Hypotheses

Null Hypothesis: There is no statistical difference between whether DB is preferred and if DB should be allowed for private projects.

Alternative Hypothesis: There is a statistical difference between whether DB is preferred and if DB should be allowed for private projects.

## Limitations

Of the nine expected values eight of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

## Question 11 vs. Question 15

### Analysis

The P-Value is greater than the alpha value (0.10), so we fail to reject the null hypothesis and cannot accept the alternative hypothesis according to Tables 4-61 and 4-62. Therefore, we cannot prove statistically there is a relationship between preference of DB and ability to meet criteria required in the DB RFP.

Table 4-61. Question 11 vs. Question 15 Observed Data

Meet Criteria	Observed			Totals
	Yes	No	Sometimes	
Yes	9	3	3	15
No	0	0	2	2
Sometimes	5	0	2	7
Totals	14	3	7	24

Table 4-62. Question 11 vs. Question 15 Expected Data

	Expected		
	Yes	No	Sometimes
Yes	8.75	1.875	4.375
No	1.16666667	0.25	0.58333333
Sometimes	4.08333333	0.875	2.04166667
P-Value	0.133111		

## Hypotheses

Null Hypothesis: There is no statistical difference between whether DB is preferred and ability to meet criteria required in the DB RFP.

Alternative Hypothesis: There is a statistical difference between whether DB preferred and ability to meet criteria required in the DB RFP.

## Limitations

Of the nine expected values eight of them were less than five, therefore not meeting the minimum requirements for Chi-Squared Test. Due to the limitations of the sample size our analysis of data assumes the test is valid. However, the lack of responses for several categories makes it difficult to make any firm declarations.

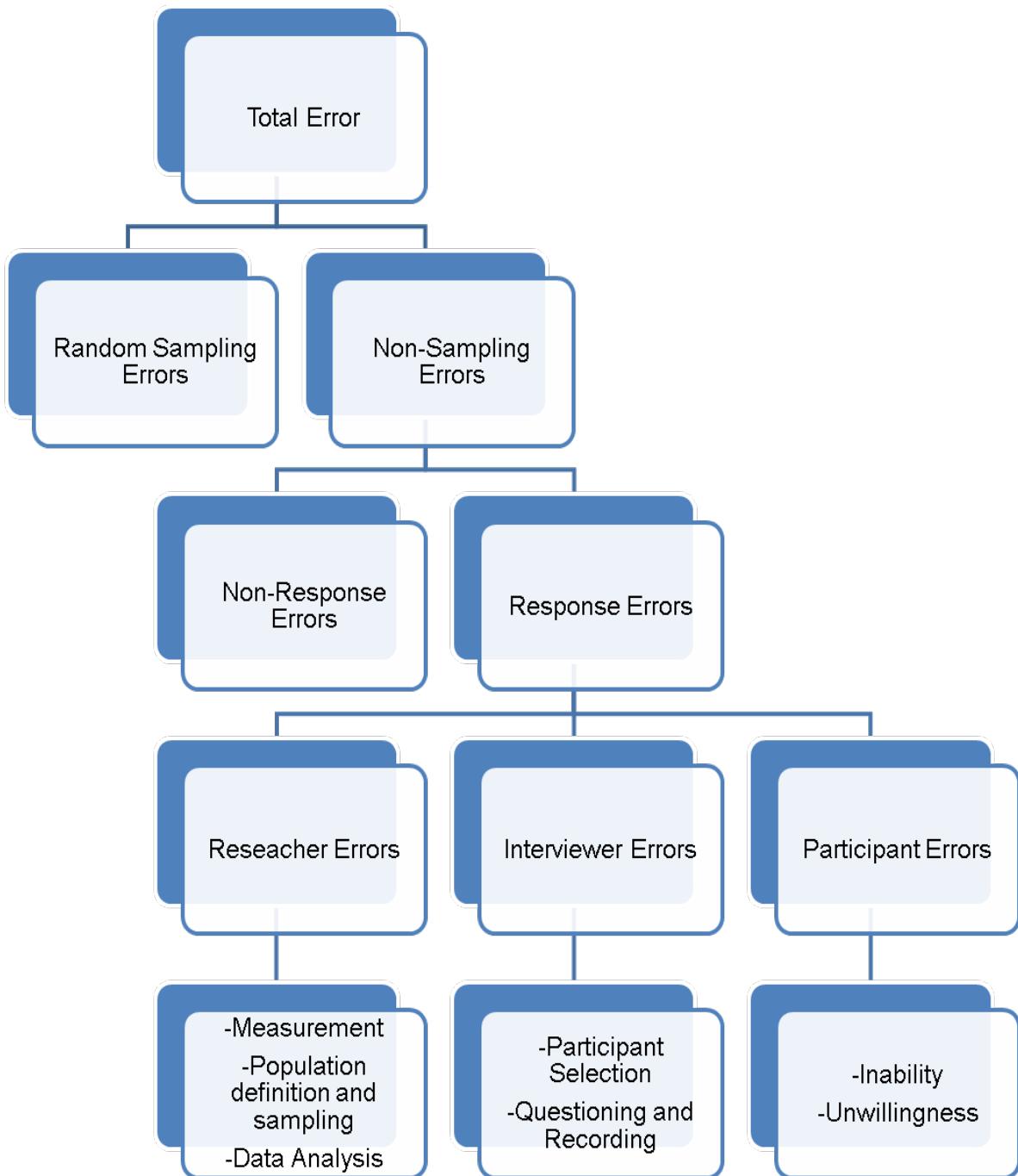


Figure 4-1. Potential Sources of Error [Adapted from Liu, R. F. a. A. (2008). Research Methods for Construction, Wiley-Blackwell. West Sussex, United Kingdom.]

## Could DB be used as a Form of Bid Rigging?

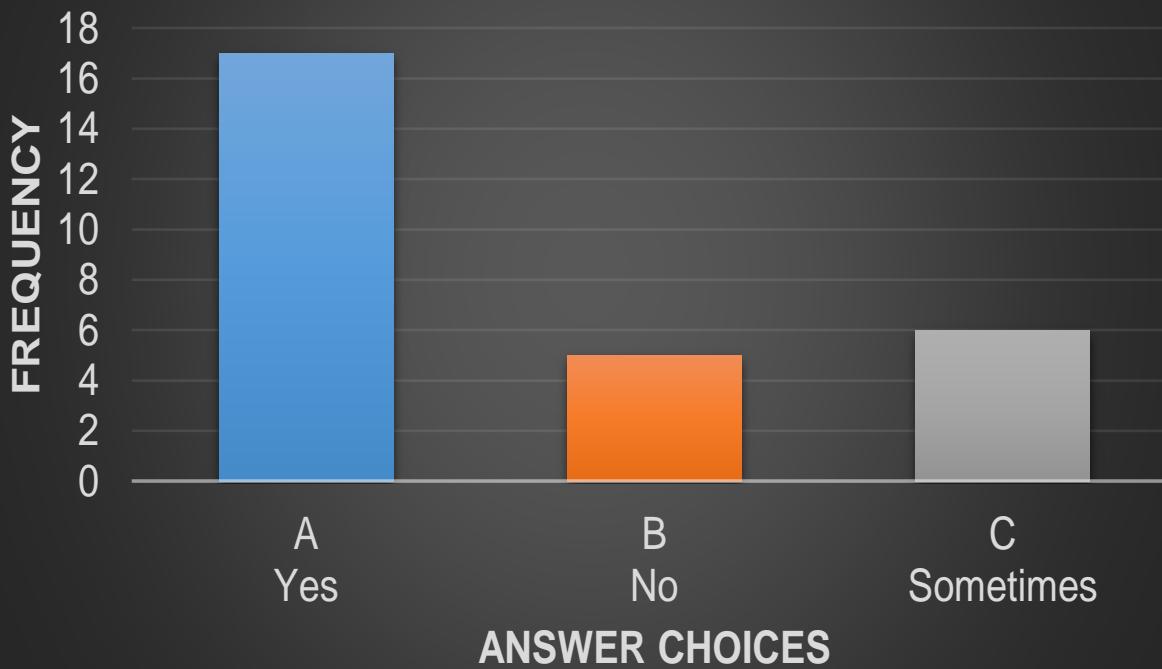


Figure 4-2. Could DB be used as a form of bid rigging?

## Should the DB project delivery method be allowed for public projects?



Figure 4-3. Should the DB project delivery method be allowed for public projects?

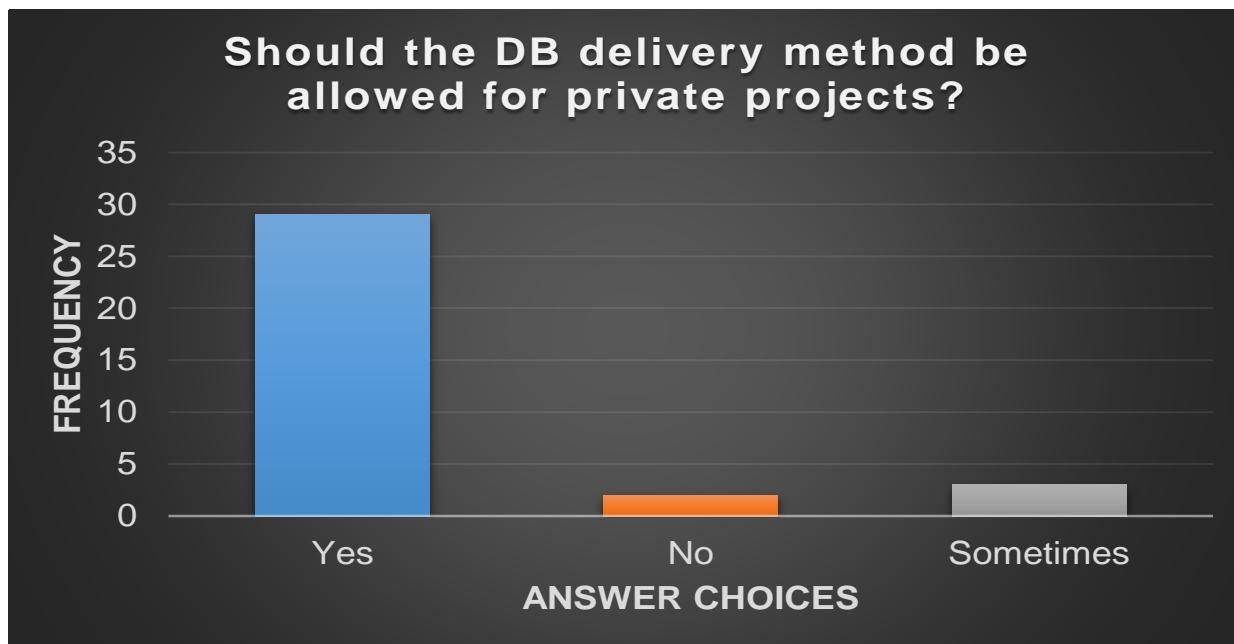


Figure 4-4. Should the DB project delivery method be allowed for private projects?

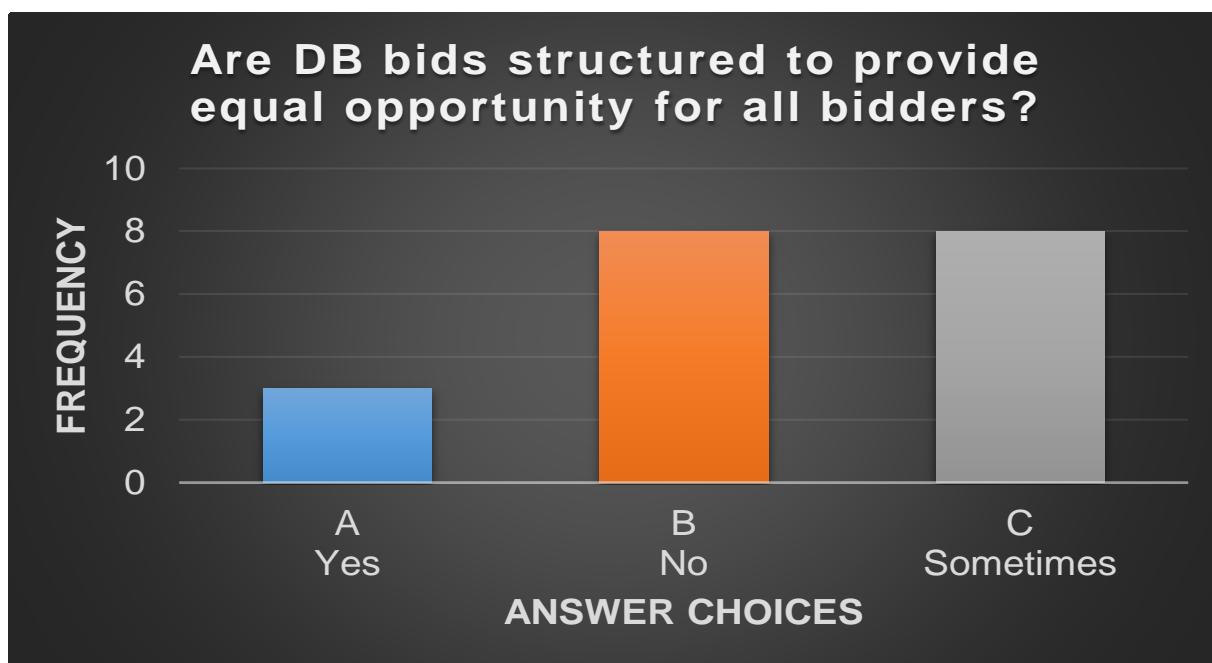


Figure 4-5. Are DB bids structured to provide equal opportunity for all bidders?

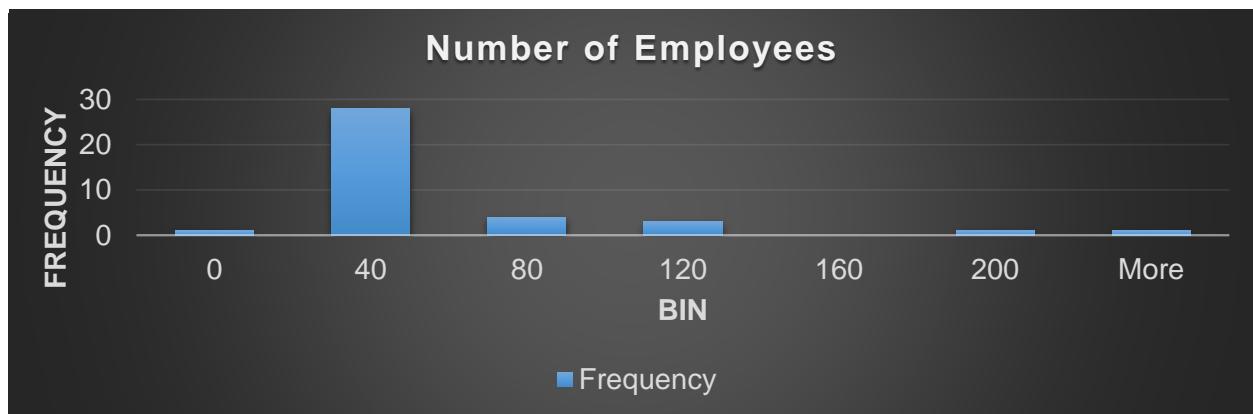


Figure 4-6. Number of Employees

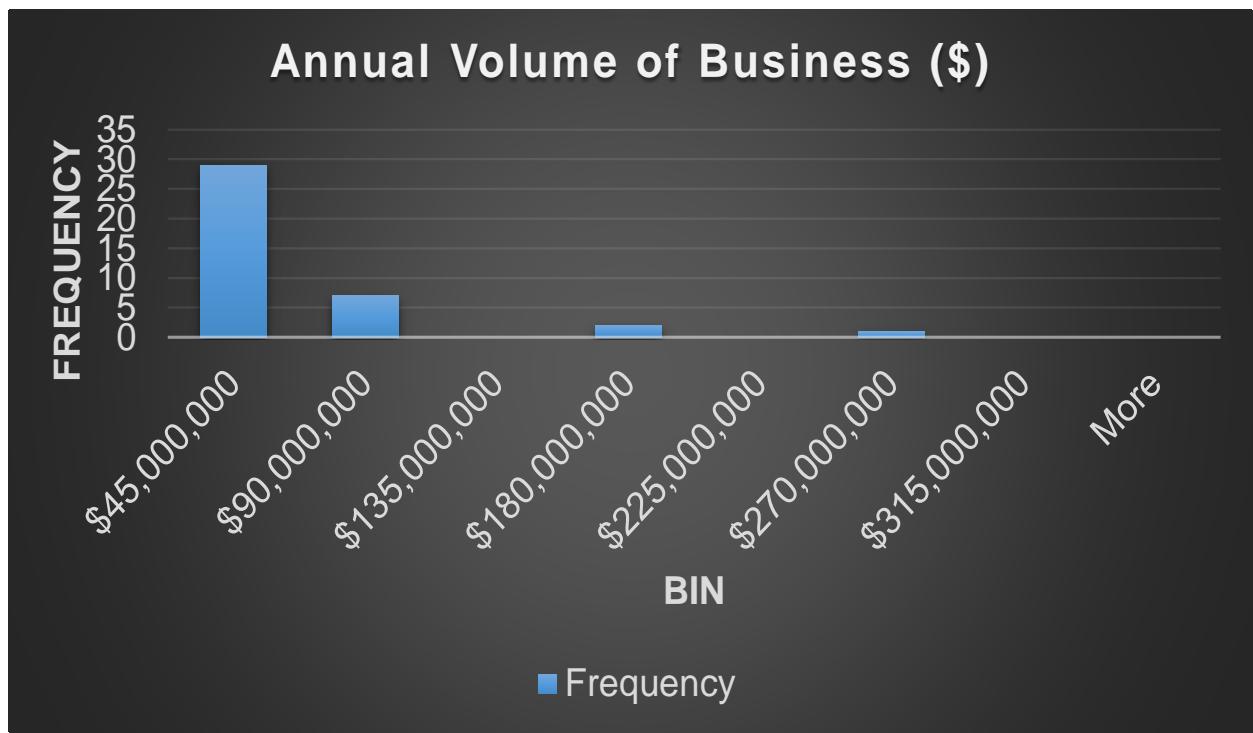


Figure 4-7. Annual Volume of Business

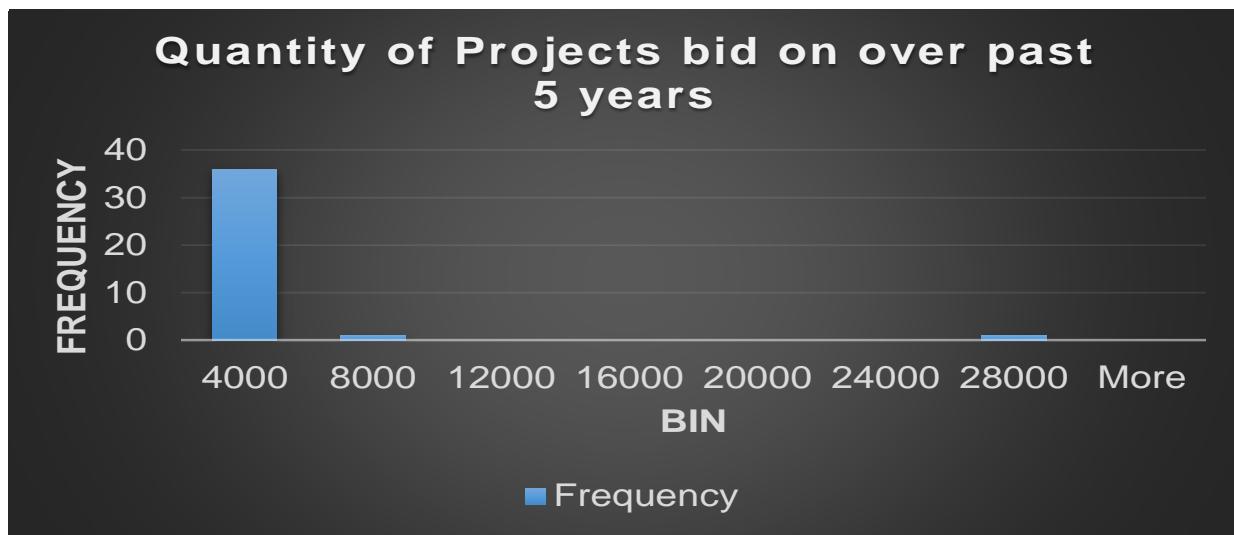


Figure 4-8. Quantity of projects bid on over past five year

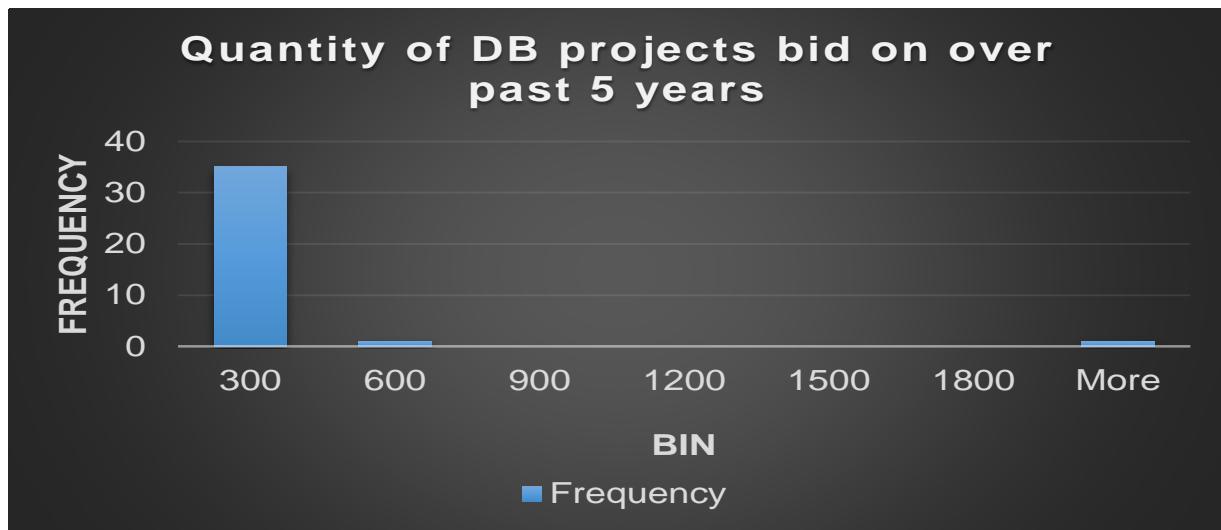


Figure 4-9. Quantity of DB projects bid on over past five years

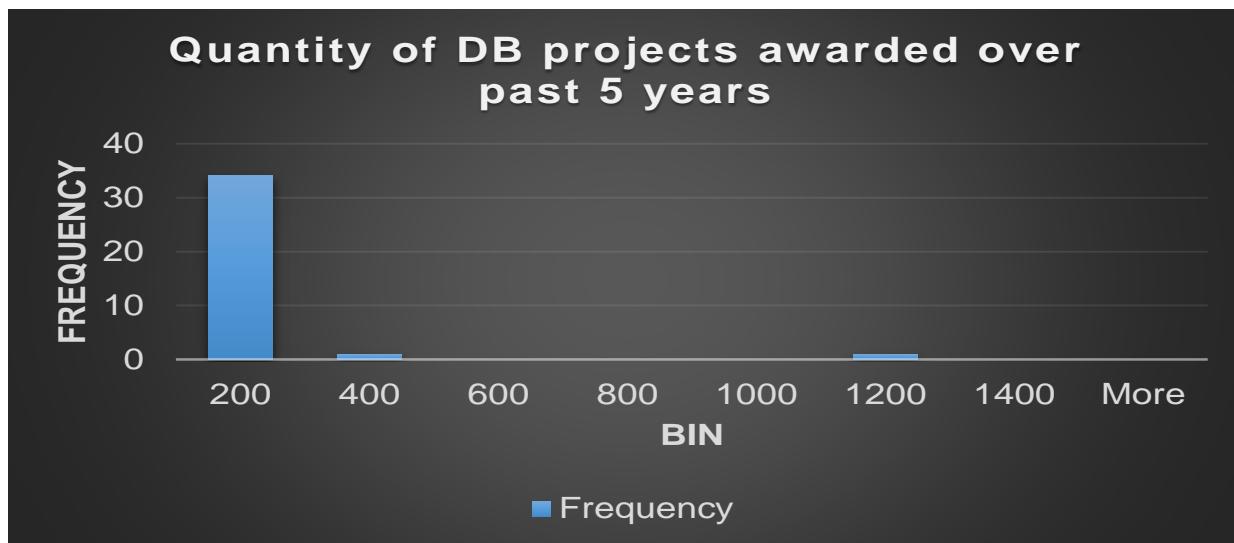


Figure 4-10. Quantity of DB projects awarded over past five years

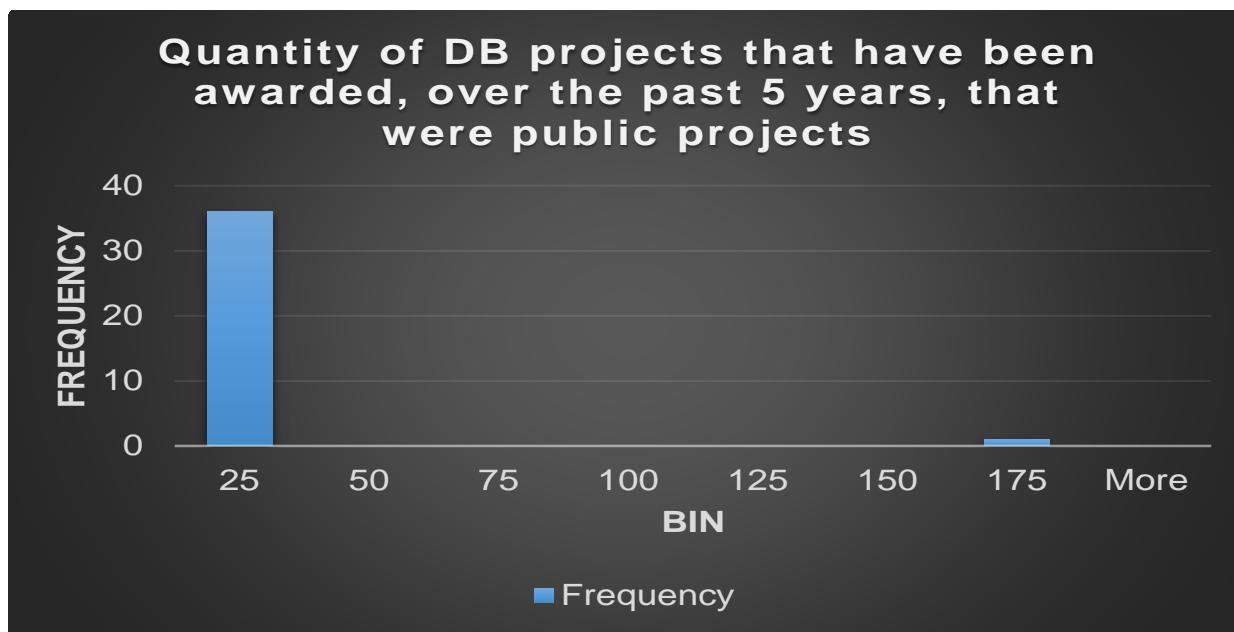


Figure 4-11. Quantity of DB projects that have been awarded, over the past five years that were public projects



Figure 4-12. What business are you in?

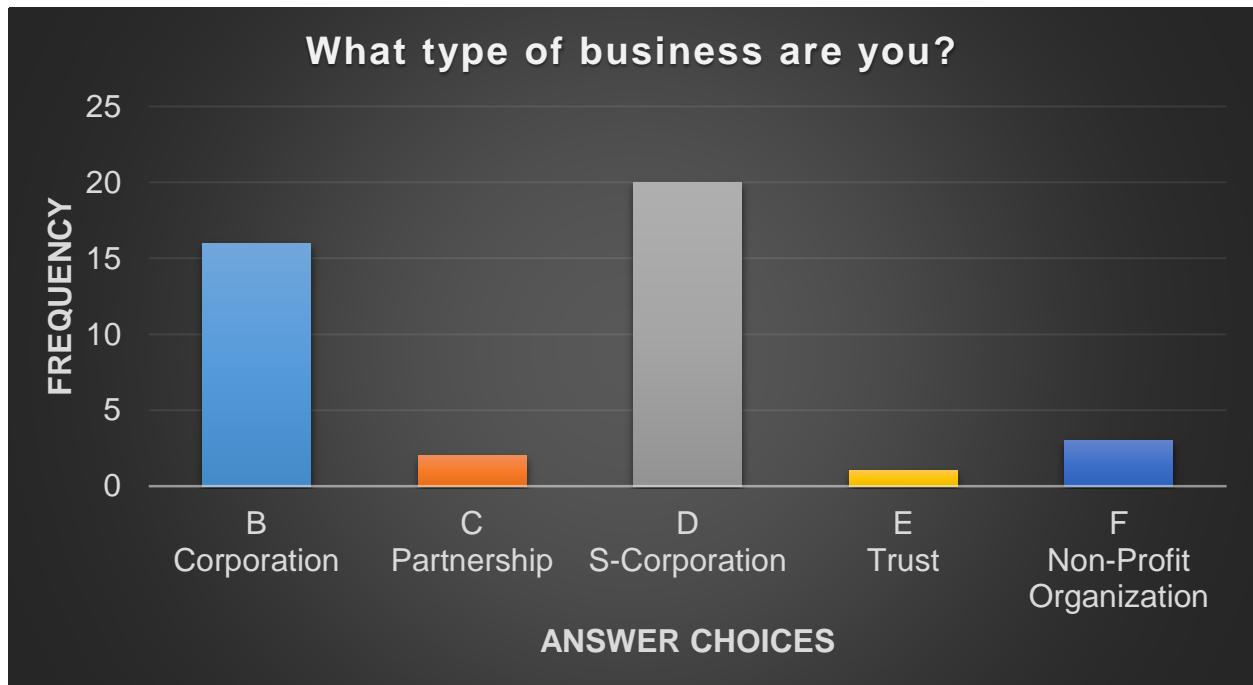


Figure 4-13. What type of business are you?

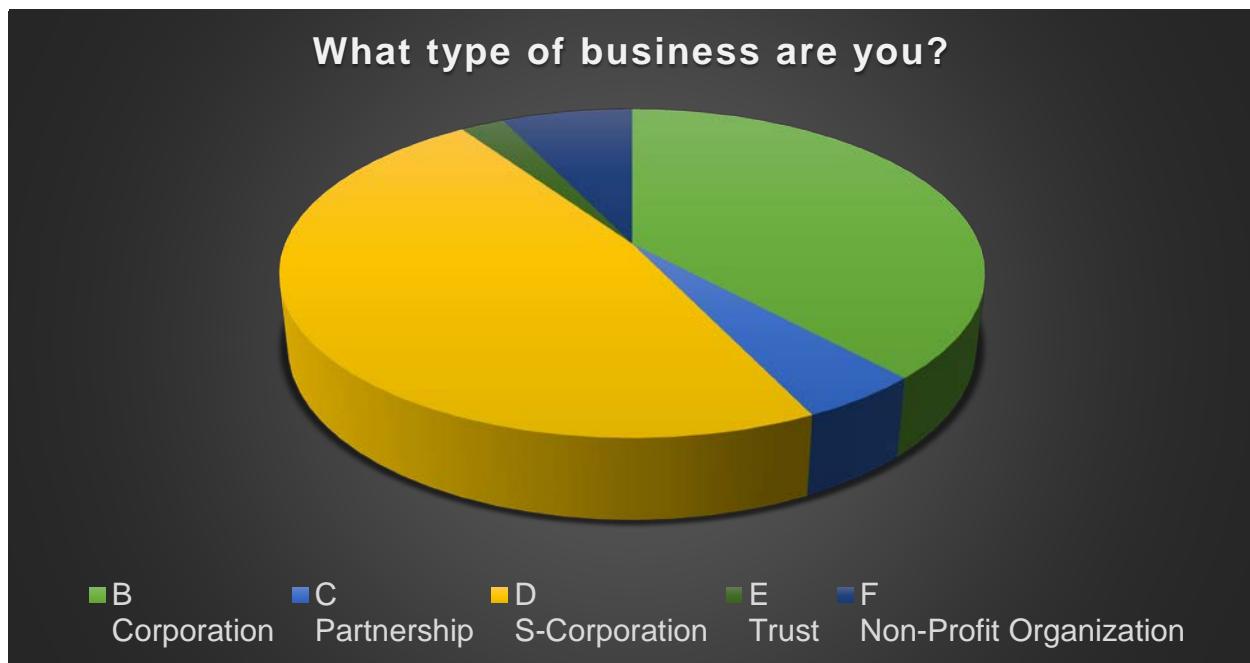


Figure 4-14. What type of business are you?

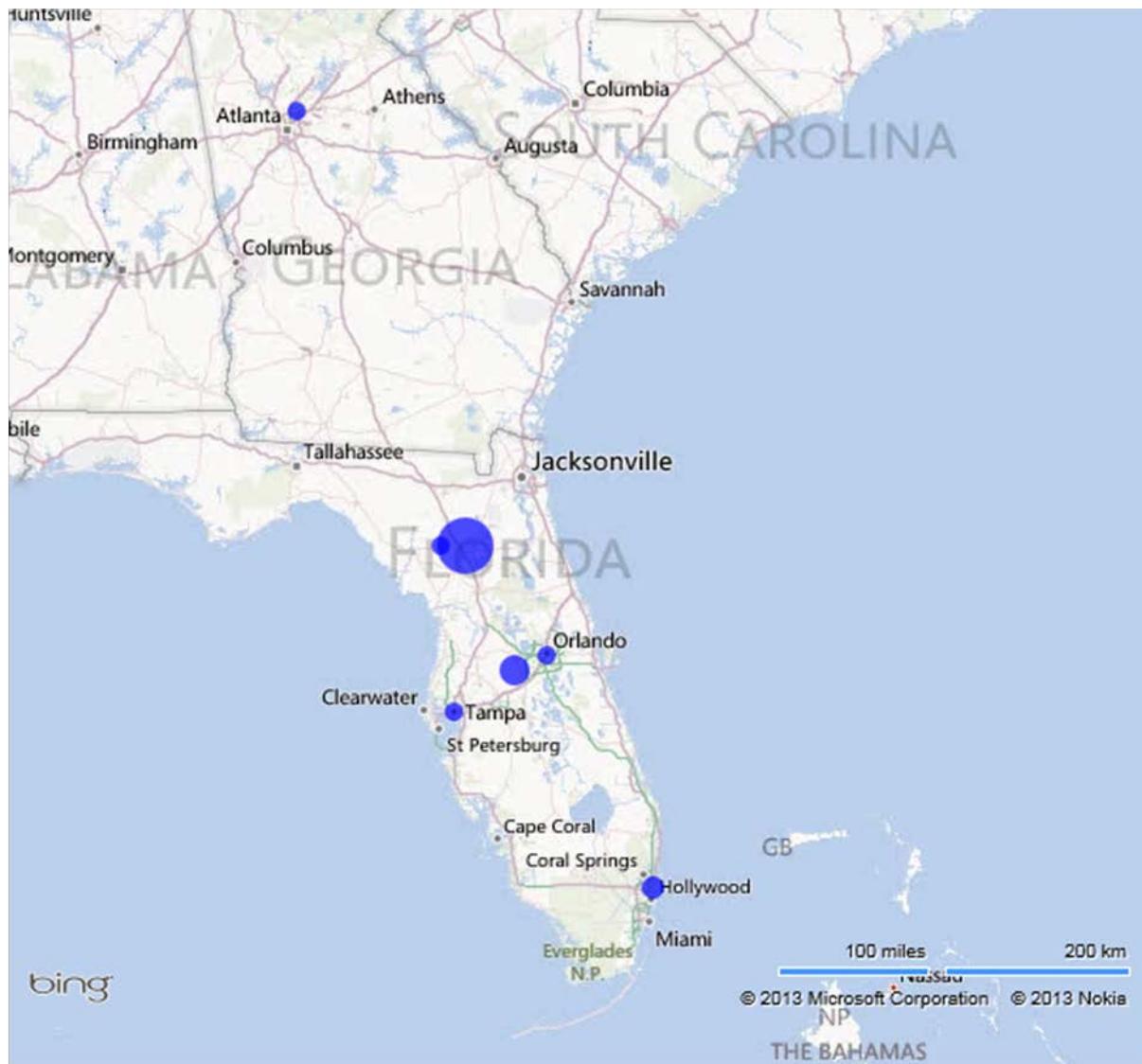


Figure 4-15. Map of city and state respondents are located in

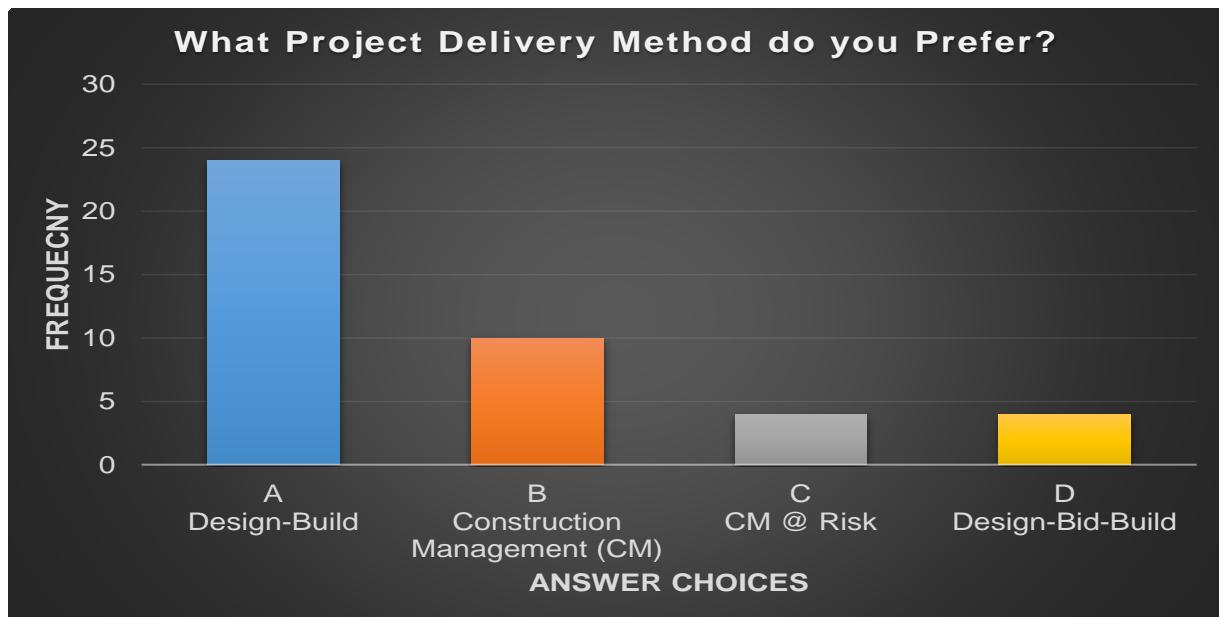


Figure 4-16. What project delivery method do you prefer?

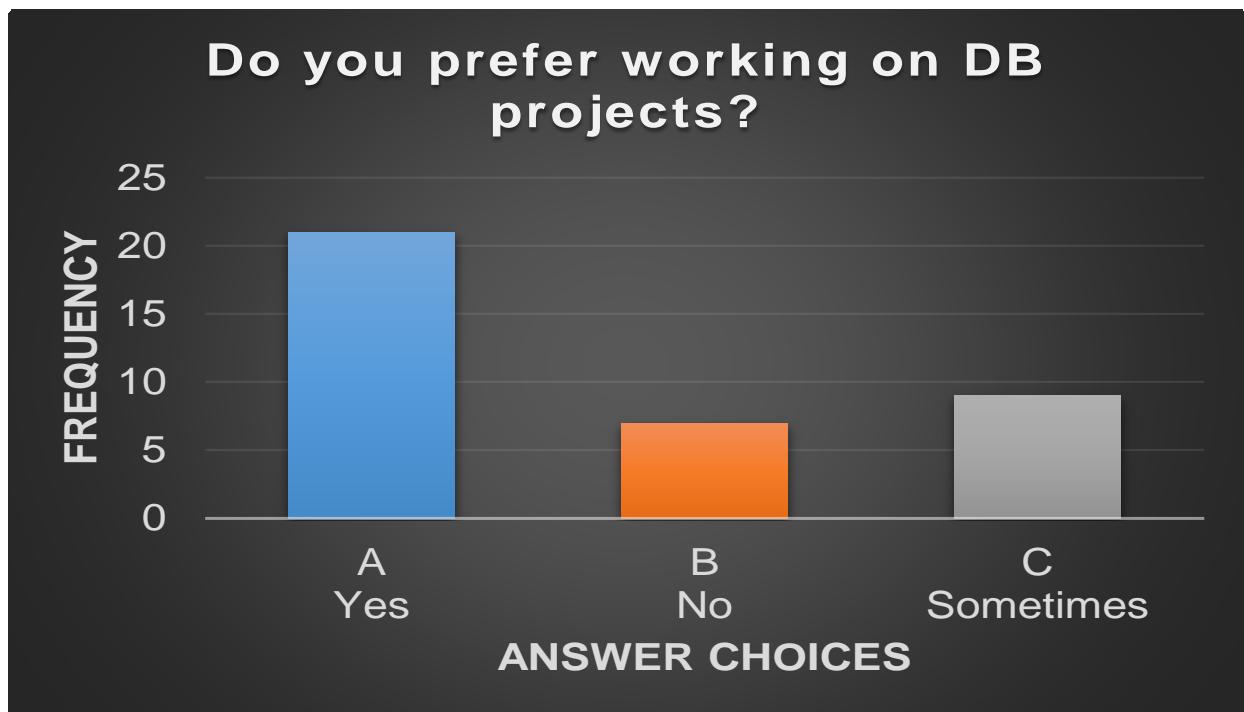


Figure 4-17. Do you prefer working on DB projects?

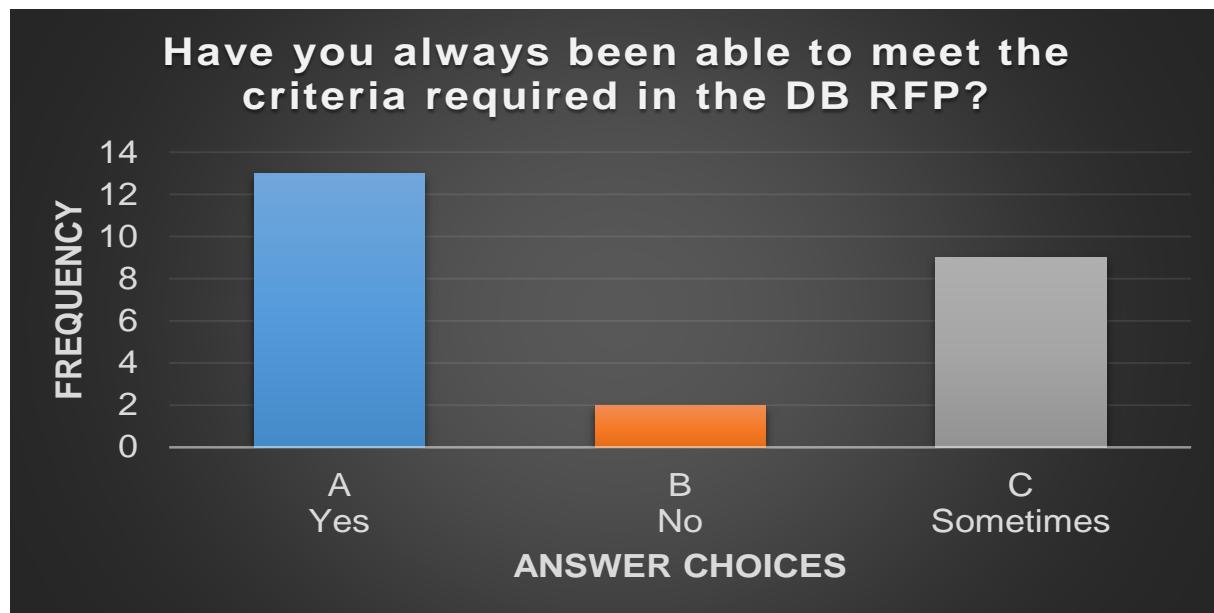


Figure 4-18. Have you always been able to meet the criteria required in the DB RFP?

## CHAPTER 5 DISCUSSION

The results of this study show that Design-Build is a form of bid rigging and respondents which are a sample of the population agree with this statement. The research findings support the researcher's initial hypothesis almost completely. The researcher believed there would be a larger opposition to DB in public projects since they are funded by the government, which is funded by tax dollars. Furthermore, tax dollars are being utilized for this more expensive delivery method, rather than using lowest cost to save taxpayers money. However, this was not the case as shown in question # in the results. The author was proven correct in regards to the crux of the hypothesis, design build being considered big rigging.

These findings also show what people perceive as illegal (Design-Build because its bid rigged) are what they prefer in the work place as a construction delivery method. Therefore, respondents' preference is unethical and illegal, yet we continue to allow this process to exist. Do we disregard other laws because we enjoy what they are banning or stating? No, we don't, we enforce them to the fullest ability of law enforcement. For example, Cuban cigars are illegal in the United States but plenty of people in the U.S. prefer them. The U.S. continues to follow its laws and keep these cigars banned. So why are we not banning Design-Build if it's illegal under the Sherman Act? The author believes it could be due to, an idiom, known as the snowball effect. Design-Build was initially of small significance and built upon itself, becoming larger (more serious, more important), and faster at an increased rate. Since this happened it was very hard to step back and evaluate the delivery process properly because of the rapid rate of popularity. Therefore, no authority questioned it, and it became the front

runner for construction delivery methods. Correspondingly, no big firms with verbal and financial power questioned it since it was working in their favor. So they aren't currently concerned as to whether it's bid rigging, which is illegal. On the other hand, small firms, who it mostly affects poorly, can't fight back because they are not big enough since they generally have less monetary resources, have less manpower, and less lawyers on their team. Consequently, big Design-Build firms triumph and Design-Build remains legal.

### **Major Patterns**

One major pattern is that big firms prefer Design-Build unlike smaller firms which don't prefer Design-Build. However, most of both size firms believe that Design-Build is bid rigging. The other primary pattern is that Design-Build is based on subjective criteria. This criteria can be defined in such a way that basically the winner is handpicked, because they were the only contractor/bidder to fit the criteria. How is this not the definition of bid rigging and illegal under the Sherman Act already?

The exception to the pattern is that the respondents believe that public and private projects should be allowed to use design-build even though they agreed it was bid rigging.

### **Comparison of Results**

A potential for residential and commercial businesses being oversampled is there are simply more of those types of businesses in Florida and Georgia. Another reason that this may be the case, is that the search engine, google.com, which was used to find potential businesses to survey, could be biased or have used previous search history to tailor the results. This could have provided skewed results that were more geared toward commercial and residential businesses.

## **What We Know Now**

The main thing that the author now knows or understands that she did not know before was that a lot of people in the industry agree with the author's hypothesis, that design-build can be used as a form of bid rigging. Surprisingly, this DB bid rigging scheme can be performed with little effort by the client, public or private. A hypothetical example of how DB is being utilized illegally is as follows:

An owner who creates the RFP, for bidders to make a Statement of Qualifications (SOQ), can make it so that the criteria, which is subjective in nature, is very narrow with respect to the qualifications desired. This will in turn constrict the bidders from participating because they won't meet this specific criteria that's unimportant to the project completion or how the project would be scheduled or flow. An example of a tapering criteria is having an architect or engineer "in-house" rather than contracting, subcontracting or joint venturing the respective work of these individual professions. If the bidders are being restricted based on these subjective criteria that are not relevant to the performance of the bidder, then these clients/owners are not following fair competitive practices that allow all bidders to apply if they can perform the job correctly within the client's desired budget. The clients can basically handpick the bidder they wish to award the project to, without even considering other bidders. This may be legal in private situations without an official bidding process, but it is definitely illegal for the government or public projects, where it is their responsibility to remain unbiased by hiring the bidder objectively. Besides, how can you hire objectively, if you are using subjective criteria as a basis?

## **Implications**

The implications of this research could be forwarded to the U.S. Supreme Court in order to make this delivery process illegal. This is important to consider because as stated in the Sherman Act, this anti-trust law increases competition fairness and interstate commerce practices that keep society moving effectively. Society needs to move positively and fairly in order for effective competition to exist. The only way to do this is by using lowest cost, an objective criteria, used in the design-bid-build method or other objective criteria based methods.

## CHAPTER 6 CONCLUSION

With all this in mind, there is no way to deny the seriousness of the subjective criteria in DB delivery method and how this is potentially a bid rigging process. The Federal Trade Commission (FTC) prides itself on protecting competitive practices that go against this type of bid rigged process. “The federal trade commission’s bureau of competition champions the rights of American consumers by promoting and protecting free and vigorous competition” (Commission 2008). In the research that was done, there was not a lot of discussion on DB as a bid rigging process. The FTC hasn’t looked into this bid rigging scheme by any means. Hence, the need to present, further investigate and submit these findings to the appropriate government entity.

The researcher has an accepted hypothesis stating that DB could be used as a form of bid rigging since it is based on subjective criteria. The results of the survey clearly show DB is considered bid rigging by members on the construction industry. To extend this thought, if it is bid rigging, then by definition in law, it is illegal.

### **Contribution**

All information gathered from the survey, these corresponding findings, and interpretations derived from them are all contributions of this research. These findings could be further investigated and prove to the U.S. Supreme Court that DB is in violation of the Sherman Act and that other possible methods need to be utilized that are legal. Based on the survey results, delivery methods abiding by objective criteria such as DBB, CM, or CMAR can be used as sufficient replacements. This research signifies the importance of fair competition and reaffirms the foundation for the Sherman Act.

## **Research Results Compared to the Literature Review**

Since there is only one other experiment that looks at this topic, the researcher can only compare to that research as described in the literature review. Since this previous research was based solely on case studies, there is lack of analysis on public opinion of the topic. The new understanding of DB's ethical dilemma is that it's subjective and something needs to be done to abolish or modify the DB delivery method.

## **Limitations of the Research**

While the researcher is confident regarding the scholarly aspect of the research conducted, her findings and the significance of the work, she recognizes that it is still only an in depth study into a very tiny aspect of the field. The researcher will explain limitations of this research which are sample size, possible survey wording, location, and practical realities.

The sample size which represents the population, is too small for this research. Unfortunately, due to a multitude of reasons discussed previously, many recipients did not respond or responded partly. Most of the results couldn't function at 100% confidence level do to the shortage of responses. Therefore, the results are still valid but are not sufficient to be the sole basis of any conclusions. As such, current literature and case studies were used in conjunction to arrive at a more reliable conclusion.

The survey wording may perhaps have been another limitation because it was fashioned by a construction student, not someone employed in the construction field. This may have led to abysses in communication barriers that the researcher could not avoid because she was not employed during schooling. If this is not the cause, perhaps it's due to lack of participant knowledge of the topic. For instance, if the recipient or

participant did not always or ever engage in DB, they may not partake or may mark “Not Applicable” in an effort to avoid coming across as biased.

The location may have influenced the results, since Florida and Georgia are just two states of the whole U.S. Just as in political races, states even cities vary in degrees of preferences. A construction firm in Boise, Idaho might not have the same priorities or views as a similar firm in Tampa, Florida. The researcher would have to expand her sample size to include more than just two states.

The reality of DB is that it is currently ethical, legal and quite increasingly preferred as shown in the results. This may never change, even if it does fall under a violation of the Sherman Act. This popularity, and the fact that big firms benefit from it, would result in a fierce defense during any potential judiciary proceedings.

Besides, even within the most comprehensive and large scale study, there are still limitations by virtue of the possible scope, methodological restrictions, and practical realities. All claims and generalizations therefore, have to be tempered by this knowledge, and should be made using precautionary measures in survey research. The researcher appreciates the limitations of this study and in the future would like to improve upon these shortcomings.

## CHAPTER 7

### RECOMMENDATIONS

#### **First Step**

The first step a follow-up study would be to acquire more samples of the population in order to draw a more reliable conclusion. In order to accomplish this, the researcher would need to collect more contact information from the population, including email and mailing addresses. This search for recipients should go more in depth by getting a more diverse group of business types. The researcher would have to compile a more thorough list that would allow the demographics to be equally distributed.

#### **Second Step**

The instructions in the survey would be more forceful with the goal of increasing completion of the entire survey instead of bits and pieces. The researcher would also eliminate the answer choice “sometimes” as discussed before in the Results Section: Potential Sources of Error. Fewer options to write in answers or give alternate responses will allow for a more concentrated answer pool, and simpler analysis. The researcher would like to add another question to the survey that asks whether the business has ever been a victim to bid rigging from another party from DB.

#### **Third Step**

The researcher would try to come up with an incentive program in order to motivate more recipients to participate. This could ameliorate the small sample size and expected values in turn, allowing the researcher to use the Chi-Squared Test with 100% confidence level. The researcher may decide to go door to door to companies to have

an interview about the survey in order to get more qualitative results as well as more accurate results.

### **Final Step**

The survey would be fine-tuned to include stronger, more concise questions that would allow the participant to make fewer mistakes. The survey letter that explains the instructions would also have a section that explains who is applicable to fill out this survey so there will be no confusion.

APPENDIX A  
LETTER TO RECIPIENTS (EMAIL)

March 14, 2013

To whom it may concern,

Hello, my name is Adrienne Harrow. I am currently a student at the University of Florida's M.E. Rinker, Sr. School of Building Construction and I am conducting a study on Design Build delivery methods. I have attached a questionnaire inquiring about your company's construction operations. While your participation is voluntary, I would appreciate you taking 10 minutes of your valuable time to help me with this research. All of your answers will be confidential, and you do not have to answer any question you do not want to.

To take the survey online, please follow the link below:

<https://www.surveymonkey.com/s/3KFFNCP>

Some questions are open-ended and may require a longer response. There are lines given for written responses. If you have any questions, comments or concerns please feel free to contact me. My contact information is provided at the bottom of this letter. Any contact method is acceptable.

Thank you for your time. I look forward to receiving your questionnaire responses.

Sincerely,

Adrienne Harrow

APPENDIX B  
LETTER TO RECIPIENTS (MAIL)

March 14, 2013

To whom it may concern,

Hello, my name is Adrienne Harrow. I am currently a student at the University of Florida's M.E. Rinker, Sr. School of Building Construction and I am conducting a study on Design Build delivery methods. I have attached a questionnaire inquiring about your company's construction operations. While your participation is voluntary, I would appreciate you taking 10 minutes of your valuable time to help me with this research. All of your answers will be confidential, and you do not have to answer any question you do not want to. There is a postage paid addressed envelope enclosed for your return of the questionnaire.

If you would prefer to take the survey online, please follow the link below:

<https://www.surveymonkey.com/s/3KFFNCP>

Some questions are open-ended and may require a longer response. There are lines given for written responses. If you feel you need more room to write, please feel free to add more paper with your answers.

If you have any questions, comments or concerns please feel free to contact me. My contact information is provided at the bottom of this letter. Any contact method is acceptable.

Thank you for your time. I look forward to receiving your questionnaire responses.

Sincerely,

Adrienne Harrow

**APPENDIX C**  
**SURVEY/ QUESTIONNAIRE**

1. What business are you in? (Please circle all that apply)
  - (d) We build residential.
  - (e) We build commercial.
  - (f) We build industrial.
  - (f) We build heavy civil.
  - (g) We build environmental.
  - (h) Other: \_\_\_\_\_
2. What type of business are you? Please see footnote for explanations.
  - (a) Sole Proprietorship<sup>1</sup>
  - (b) Corporation<sup>2</sup>
  - (c) Partnership<sup>3</sup>
  - (d) S-Corporation<sup>4</sup>
  - (e) Trust<sup>5</sup>
  - (f) Non- Profit Organization<sup>6</sup>
  - (g) Other: \_\_\_\_\_
3. How many employees do you currently have?
4. What is your annual volume of business?  
\$
5. What city and state are you located in?

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6. What type of project delivery method do you prefer? Please see footnotes for explanations.

- (a) Design-Build<sup>7</sup>
- (b) Construction management (CM)<sup>8</sup>
- (c) CM @ Risk<sup>9</sup>
- (d) Design-Bid-Build (Traditional)<sup>10</sup>
- (e) Not applicable

7. How many projects have you bid on over the past 5 years?

8. How many Design-Build projects have you bid on over the past 5 years?

9. How many Design-Build projects have you been awarded over the past 5 years?

10. How many of the Design-Build projects that you have been awarded, over the past 5 years, were public projects?

11. Do you prefer working on Design-Build projects?

- (a) Yes
- (b) No
- (c) Sometimes
- (d) Not applicable

Why or Why not?

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12. Should the Design-Build project delivery method be allowed for public projects?

- (a) Yes
- (b) No
- (c) Sometimes
- (d) Not applicable

Please explain answer.

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13. Should the Design-Build project delivery method be allowed for private projects?

- (a) Yes
- (b) No
- (c) Sometimes
- (d) Not applicable

Please explain answer.

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14. In your Design-Build projects, how many criteria are present in the RFP  
(Request for Proposal) on average? If not applicable, write N/A.

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What were the criteria listed?

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15. Have you always been able to meet the criteria required in the Design-Build RFP?

- (a) Yes
- (b) No

(c) Sometimes

(d) Not applicable

Please explain answer.

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16. If you have NOT been able to meet all the criteria required in the Design-Build RFP, what have you done? If not applicable, write N/A.

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17. Could Design-Build be used as a form of bid rigging?

(a) Yes

(b) No

(c) Sometimes

(d) Not applicable

Please explain answer.

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18. Have you ever protested a bid because you were not awarded the bid?

- (a) Yes
- (b) No
- (c) Other: \_\_\_\_\_
- (d) Not applicable

Please explain answer.

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Did you win the bid after protesting?

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19. Did you ever have to provide a bond in order to protest a bid?

- (a) Yes
- (b) No
- (c) Other: \_\_\_\_\_
- (d) Not applicable

20. Over the past 5 years, how many of your bids required a bond in order to protest?

21. If you did NOT win the protest addressed in Question #18, did you lose the bond if it was required?

- (a) Yes
- (b) No
- (c) Sometimes
- (d) Monetary bond was not required.
- (e) Not applicable

Please explain answer.

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22. Are Design-Build bids structured to provide equal opportunity for all bidders?

- (a) Yes
- (b) No
- (c) Sometimes
- (d) Not applicable

Please explain answer.

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Footnotes:

<sup>1</sup>Sole proprietors are unincorporated businesses. They are also called independent contractors, consultants, or freelancers. There are no forms you need to fill out to start this type of business. The only thing you need to do is report your business income and expenses on your Form 1040 Schedule C. This is the easiest form of business to set up, and the easiest to dissolve. (An LLC with only a single shareholder, a so-called single-member LLC, is taxed as a sole proprietor on a Schedule C.)

<sup>2</sup>Corporations are incorporated businesses. Every form of business besides the sole proprietor is considered a separate entity, and this often provides a measure of legal and financial protection for the shareholders. The shareholders of corporations have limited liability protection, and corporations have full discretion over the amount of profits they can distribute or retain. Corporations are presumed to be for-profit entities, and as such they can have an unlimited number of years with losses. Corporations must have at least one shareholder.

<sup>3</sup>Partnerships are unincorporated businesses. Like corporations, partnerships are separate entities from the shareholders. Unlike corporations, partnerships must have at least one General Partner who assumes unlimited liability for the business. Partnerships must have at least two shareholders. Partnerships distribute all profits and losses to

their shareholders without regard for any profits retained by the business for cash flow purposes. (LLCs are taxed as partnerships, unless they choose to be taxed as corporations.)

<sup>4</sup>S-Corporations have features similar to a partnership. An S-corporation must have at least one shareholder, and cannot have more than 100 shareholders. If any shareholder provides services to the business, the S-Corp must pay that shareholder a reasonable salary. This salary is a separate payment from distributions of profits or losses.

<sup>5</sup>Trusts are usually formed upon the death of an individual and are designed to provide continuity of the investments and business activities of the deceased individual.

<sup>6</sup>Nonprofits are corporations formed for a charitable, civic, or artistic purpose. Nonprofits are generally exempt from federal and state taxation on their income, and so they are often called "exempt organizations." Nonprofits have substantial responsibilities for reporting their activities, income, and assets to ensure that they are in compliance with federal and state laws governing charities.

Explanations are provided by:

[http://taxes.about.com/od/taxplanning/a/incorporating\\_2.htm](http://taxes.about.com/od/taxplanning/a/incorporating_2.htm)

<sup>7</sup> Design/Build

- Owner has one contract - with design/build (D/B) firm.
- D/B firm handles design and construction.
- All subcontractors work for D/B firm

<sup>8</sup> Construction Management (CM)

- Owner has multiple contracts - with Architect, Construction Manager (CM), and contractors
- Architect designs building
- Architect prepares construction documents with the involvement of the CM.
- CM seeks bids from contractors of various trades.
- Owner contracts directly with each tradesman.
- CM schedules and manages the construction.
- CM is responsible exclusively to the owner and acts in the owner's interests at every stage of the project.

<sup>9</sup>Construction Management at Risk (CMAR)

- Allows the owner to interview and select a fee-based firm, based upon qualifications and experience, before the design and bidding documents are fully completed.
- The construction manager and design team work together to develop and estimate the design.
- A guaranteed maximum price (GMP) is provided by the CM, who then receives proposals from and awards subcontracts to subcontractors
- The design team is selected separately and reports directly to owner.
- The CM at Risk contracts directly with multiple subcontractors and has single point of responsibility for the delivery of the project.

- The CM also provides advisory professional management assistance to the owner prior to construction, offering schedule, and budget and constructability advice during the project planning phase.

<sup>10</sup>Traditional Design-Bid-Build

- Owner has two Contracts - one with the Architect and one with the General Contractor
  - Architect designs building and prepares construction documents
  - Owner selects GC(s) for negotiating construction contracts or soliciting bids.
  - General Contractors (GC) submit bids to owner.
  - GC contracts with subcontractors (plumbing, electrical, carpentry, etc.)
  - Upon Architect's certification, Owner makes payments to GC, who pays subcontractors.
  - Design team is selected separately and reports to the owner.

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## BIOGRAPHICAL SKETCH

The author graduated from the Warrington College of Business at the University of Florida in May 2011. Her concentration was Urban and Regional Planning which focused on the planning aspect of construction and zoning. She is currently enrolled in the M.E. Rinker, Sr. School of Building Construction at the University of Florida. She plans to graduate in August 2013.