

REVERSE AUCTION BIDDING - A STUDY OF INDUSTRY PROFESSIONALS

A Thesis

by

ROBERT BRADLEY PIPER

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Chair of Committee,	John M. Nichols
Committee Members,	Leslie P. Feigenbaum
	Shelley Holliday
Head of Department,	Joseph Horlen

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ABSTRACT

This research project into Reverse Auction Bidding is the first of the twenty studies completed to this time to use professional contractors. Previous case studies used students at Texas A&M University as the subjects of the research. Reverse Auction Bidding is a new form of bidding using the internet as the bidding mechanism. A purchaser requests bids through a web site, typically a commercial site. Invited bidders can respond under a standard set of timed conditions to the bidding documents on the web site. This TAMU based research program has a SQL Server based web site, which uses house slabs in Houston as a bidding game. This study of The Reverse Auction Bidding method used four individuals from a supply company as the subjects of the work. The methods remained essentially unchanged from the earlier case studies, except that an ASP.NET MVC4 website has been developed to improve the response time and to permit data analysis as the game is played. Each bidder has capacity to bid on three sites at any time, a bidder can purchase additional capacity from the bank to increase the number of allowed simultaneous bids. Each game lasts for twenty minutes, fifteen minutes of game play followed by a five minute break to simulate the work week. Each individual was given a personality test for the review of bidding performance with personality type. The conclusions were that the professional bidders were more competitive than subjects in prior studies, the bidder who made the most aggressive use of the bank loan performed best as has been consistently shown, but the personality results did not match prior findings. Further work with professionals is recommended.

DEDICATION

To all my family, friends, and teachers.

ACKNOWLEDGEMENTS

I would first like to thank my committee chair Dr. John Nichols for his guidance and support during the course of this research and my time at Texas A&M University. Also, a special thanks to the other members of my committee, Professor Leslie Feigenbaum and Professor Shelley Holliday.

Thanks also to my friends of the Construction Management program class of '13. I hope our time together was as exciting for you as it was for me.

I would also like to thank all parties that were involved in accepting me into Texas A&M University and the Department of Construction Science. It has always been a dream of mine to earn a degree from Texas A&M and I will forever be grateful for this opportunity.

Finally, thanks to my parents and wife for always pushing me to excel and achieve at the highest level and not to settle on being average. I would also like to thank my son. He was just six months old when I started the Master's program in August 2011. Though he does not understand it now, he was and is each day, my drive and inspiration to be the best father, leader, and professional I can be.

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CHAPTER I

INTRODUCTION

BACKGROUND

This report summarizes the literature review prepared for the work, the methodology used for the study is presented, the results are analyzed using standard statistic techniques, and a summary of the results is provided in the conclusions section.

Reverse auction bidding was first studied by van Vleet in 2004 at Texas A&M University (van Vleet, 2004). Since then, numerous experimented studies have been conducted on Reverse Auction Bidding, each building on and adding data to the past experiments. This study is the first using professionals in place of graduate students as the subjects. A typical construction job procurement method used today is most commonly known as competitive sealed proposals. This process begins with an invitation to bid followed by a due date for all companies to submit their bids to either Owner or Architect. All bids are reviewed and lowest bid is typically chosen and awarded a contract to complete the contract work. No prior knowledge of price is known by the fellow competitors trying to obtain a contract during the bidding process. Other systems are also popular, such as Construction Manager at Risk.

There are however several key issues that may arise when using this procurement method. Firstly, the lowest price is not always guaranteed to be awarded the contract with this type of process. A points system is often used to assess the offer, the team, and

the proposal. With this type of review process, even though a company does submit the lowest price, the Owner and/or Architect will have the final say of who is awarded the contract, often with scant regard to the lowest price. Another issue is that the bidders do not get a chance to re-evaluate their bid. If they find out at a later date that something was left out on their bid, they typically cannot do anything to fix it once the contract has been signed. Also, bidders do not get a chance to see the bids submitted from other bidders until after the due date of the proposals. Complaints about the hard bid system are as old as the hard bid system, unfortunately there is no easy resolution, because of the human elements involved in contracts.

A recent technique developed to solve these issues, is a internet game using the Reverse Auction Bidding method to select contractors. This process allows bidders to constantly view real-time bids that are being submitted by their competition, allowing them to reduce their price, with hopes of being awarded a contract. As these events occur, the initial price is driven down by competitive bidders causing the total price of the contract to decrease. The theory is that the Owner is in the driver's seat and with every counter bid submitted, in is saving that much in the contract amount that is to be awarded. The method assures that the method clearly favors the Owner and also drives construction costs down. Gupta (2010) shows that this is not necessarily true for all bidding contractors.

Recent studies conducted using the Reverse Auction Bidding method at TAMU have tied personality types to each participant trying to determine if a certain personality type is more successful in terms of profit at the end of the game. Once a personality type

has been discovered as the most successful, companies could look to hire individuals of a specific personality in hopes to increase their profit as a company. The Keirsey Temperament Sorter test has been the tool used in determining personality types (Keirsey, 1998).

This study used professional estimators from a midsize company, rather than the traditional graduate student participant. This study used four participants from the construction industry and this paper compared their performance using the Reverse Auction Bidding method to other participants. This will be the first time industry professionals have been chosen to complete a study using the Reverse Auction Bidding game. A total of eight rounds of bidding are completed by the bidders. Each round will consist of between eight and ten jobs to bid on. Each player will have to decide on which jobs they can bid on depending on bank loan amounts, profit margins, and their work in progress. Each participant will also be given the Keirsey Temperament Sorter test to determine their personality. The idea is to see how industry professionals react to this type of bidding, which is different from their norm, and if personality types that excelled in past studies match those of this study. The only difference being that past studies used college-aged students with some industry experience and this study will use individuals that are in bidding on work day to day.

HYPOTHESIS

The hypothesis which was considered for this study was that personality will not impact the ability to win bids for professional bidders.

LIMITATIONS

The limitations for this study are:

1. Four professionals from a mid-size company were the participants
2. Each participant is assumed to act professionally

CHAPTER II

LITERATURE REVIEW

BACKGROUND

This chapter of the report provides an overview of the Reverse Auction Bidding system, considers the issue of the lowest price, common procedures, and how the process is used by construction contractors.

REVERSE AUCTION OVERVIEW

Reverse Auction Bidding is a process in which a buyer of goods and services continues to solicit bids from sellers until the buyer is satisfied it has received an acceptably low price. As used in construction, the process usually entails using a dedicated internet web site. At a scheduled time, the bidding for a project opens and all interested bidders submit their prices to the web site. The host web site then posts the prices on the site for all bidders to observe. The bidders' identities usually remain anonymous. Bidders are then given a certain period in which to offer any lower price that they may choose to submit. Thus, the auction proceeds as the "reverse" of a typical auction in the sense that bids are expected to go down rather than up. Once no further bids are received after a certain period following the receipt and posting of the last bid, the auction is closed. Award is then made to the lowest bidder (Shankar, 2005)

Reverse Auctions try to get the lowest possible bid for products or services. Unlike traditional auctions in which the price goes up, reverse auctions drive down the cost until a specified deadline is passed in the game. This form of bidding requires the bidders to disclose their prices. The owner or general contractor may look only at one element of the construction - bid or price, without taking into account the bidders' work history, experience, or other related qualifications, but as purchases using Reverse Auction Bidding are usually price sensitive, to overcome the problem of quality, we prequalify the bidders. As Guhya (2010) stated the system has some advantages, generally however, lowering the price for the purchasing is not one of them.

Reverse auctions are classified as one-sided, descending, or open-bids (Bieberstein, 2002). The term 'one-sided' refers to the one-to-many relationship, i.e. one buyer invites many sellers. The term 'descending' refers to the falling bid prices as bidders continue to compete in underbidding the current lowest bid until auction time expires or prices do not fall any further. The term 'open' refers to the bid prices being publicized to all participants (Horlen, Eldin, & Ajinkya, 2005).

The Associated General Contractors supports this type of competition (Associated General Contractors, 2003, 2004). Reverse online auction bidding, however, can be a mistaken application of technology, and may suggest an incorrect promise of lower costs (Gennett, 2005). Being that this is a new technique, one can expect new challenges and issues to arise.

Reverse auctions became accepted when General Electric (GE), claimed phenomenal savings from using the method. GE Chief Information Officer (CIO) Gary

Reiner claimed the company saved approximately \$600 million by using reverse auctions in 2001 (Sawhney, 2003). In its 2001 annual report, the leading auction software and services company FreeMarkets reported that it had saved its customers an estimated 20 percent on a total of \$30 billion worth of purchases since 1995. These numbers are convincing; however they can be deceptive. When reverse auction is used correctly, they can suggest significant value. If it is used in the wrong way, it could ruin relationships between suppliers and contractors or even amongst themselves (Sawhney, 2003). Anecdotal evidence suggests that purchasing can pay a surcharge for using a Reverse Auction Bidding system when compared to hard bid.

LOWEST PRICE GUARANTEE

The Reverse Auction Bidding process does not always produce the lowest cost. Consider the thought experiment, Bidder 1 is prepared to accept \$50,000 for his piece of a contract but Bidder 1 starts the bidding at \$80,000 because the bidder can lower this price later in the process. Other bidders submit their numbers, and Contractor 1 submits a lower bid at \$60,000. None of the other bidders enter a number before time expires, and the \$60,000 bid wins. The owner now pays \$10,000 more than the bidder's base bid.

Reverse auctions also create an environment in which "bid discipline" is critical yet difficult to maintain because of multiple bidding in a short time, which does not allow adequate time for reassessment (Gennett, 2005). When using sealed bidding, you only have one chance of being awarded a project. For this reason, when price is the only concern AGC believes that sealed bidding, is better for the owner than reverse

auctioning. Reverse Auction Bidding does not focus on one of the components to successful construction, which is communication. The negotiation processes helps to obtain the best value for the owner by taking in considerations such as quality, system performance, time to complete and overall value. In fact, current studies of Reverse Auctions between buyers and suppliers have found that Reverse Auctions often have a deleterious effect on the relationship between buyer and seller (Gennett, 2005).

REVERSE AUCTION PROCEDURES

Many products and services are being procured through reverse auction.

Therefore, buyers need to contemplate a couple of issues before they conduct an auction.

1. Decide what product or service will be auctioned
2. Decide what tool / device to utilize when conducting the reverse auction

Figure 1 outlines the reverse auction procedure. The process is continuous and the total bidding period can be as long as the owner wishes.

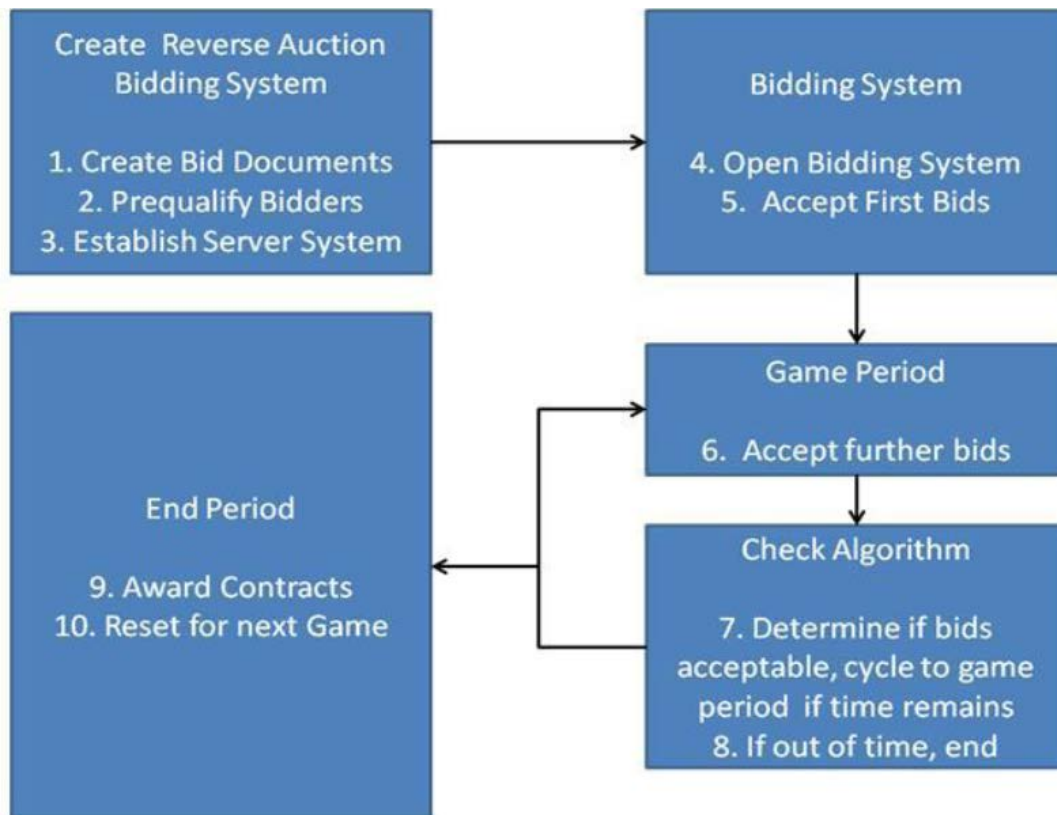


Figure 1 Reverse Auction Bidding Process (Guhya, 2010)

The items are first picked for auction. The buyer then has to carry out the auction through an Application Service Provider (ASP) model or by using third party. Using a ASP model, the buyer can obtain the work at a considerably lower cost than using a service through a third party provider. Third party providers can offer knowledge in markets that the buyer may be unfamiliar with or where secrecy is important.

FUTURE OF REVERSE AUCTION BIDDING

After interviews with several companies involved in reverse auctions, (Smeltzer & Carr, 2003) found that buyers liked the apparent reduced prices. They saw this as a

way to gain higher sales by partaking in auction events with those who had have enhanced knowledge of the market. Reverse online auctions do seem to be a vital device for gaining project needs. In a work on public sector procurement in the United States, (D. C. Wyld & Settoon, 2003) found that reverse auctions yield 93% greater returns for public sector agencies than other e-procurement methods. One fact stated is that immense savings for all levels of the U.S. government are likely and the reverse auction system should be applied. In fact, buyers that partake in online auctions are unwilling to do the same if they become a supplier (NK., 2001). But what about price reduction? Emiliani and Stec (2001) believe that suppliers are now being forced to participate in online auctions because of the fear of losing business. As other suppliers submit their proposals in real time, they are forced to do the same electronically. Several specialists (Deise et al., 2000; D. Wyld, 2000) have entrusted the use Reverse Auction Bidding for purchasing of goods or services. This allows companies the ability to reform their supply chains in alliance with the other supply chain associates. One of the inevitabilities in the e-procurement model, proposed by Wyld (2000) was to construct strategic unions between business allies. This embraces buyers and vendors, working together to offer cost efficiencies and enhance prominence to products and services. Many have confidence that strategic alliance, allowing collaboration, is vital or detrimental in the e-world. The evidence of the Value Trust Network (VTN) is present. Raisch (2001) perceives the supply chain being enhanced by the recognized relationships amongst consumers and suppliers, not just by the reception of Internet technology. If reverse auction e-procurement is to advance enterprise competitiveness, then value must be

conveyed to comfort industry pain points. Trust has to be the influence to enhance the relationships between suppliers and buyer (Emiliani & Stec, 2001, 2004; Jap, 2002, 2007; Raisch, 2001).

How do we evaluate the worth and faith that is funded to reverse online auction? The whole matter of driving costs down to the lowest potential level would appear to present a solemn flaw to the formation of any value or trust (Bartholomew, 2001). The features and talents that buyers show favor to in their suppliers, are placed at a lower primacy to price. Mosar (2002) questions the promotion of cost savings over service offerings, signifying that buyers should be looking for the most equal price for the supplier of choice, rather than the lowest proposal. Of course, human nature is to seek the lowest price for a set of goods; it is the key element of the market place.

THE REVERSE AUCTION PROCESS IN THE CONSTRUCTION INDUSTRY

The construction industry is a diverse and unique business. Every job has a distinct price, schedule, site conditions, and design among other variables. Therefore, are construction services a commodity and should they be subject to reverse auctions? It is this very question that has prompted strong debates between owners, construction contractors and construction industry organizations. The owners of construction services like the idea; conversely, numerous contractors and industry leaders feel it would be a disaster for the industry and the public at large (National Electrical Contractors Association, 2002). The critical element considered by some is that it is bid shopping, under another title.

The emergence of the Internet has made it possible for computer services to infiltrate every industry conceivable; making it a popular e-commerce tool in the construction industry. Since the trend today is speeding up processes, the emphasis has been applied to cutting time on the bidding procedure while at the same time increasing competition among contractors to achieve the best profit.

From the contractor's point of view, most of the Reverse Auction Bidding proponent's initial savings are only short-term and the Reverse Auction Bidding method could actually cost owners and taxpayers more than the traditional sealed bidding process (Thompson & Knoll, 2002). As mentioned earlier, most respectable contractors equate Reverse Auction Bidding as electronic bid shopping and consider it will cause problems for the owner.

It must be pointed out that Reverse Auction Bidding is but a method that is used within the construction system to move a construction project from a concept idea to a finished, full dimensional, operational end product as envisioned by the original concept. The construction system flows from the point of project conception through planning, financing, design, contractor/subcontractor activities (prequalification, bidding, selection, contract formation, contract execution, contract administration, required legal approvals, substantial completion, completion and in some cases operation and/or maintenance). The system also includes manufacturers, suppliers and distributors of any required material. To truly determine the success/detriment of a particular method introduced into a system, clear understanding and full appreciation of the system functions and relationships are required. This includes the obligation /duties of the

parties, both ethical and contractual, at each interrelated element of the system. Any modification in the system may influence the cost and relationships, and may result in ethical and/or legal problems. Therefore, to state that a change in the competitive bidding method within the construction system is ethical, fair or beneficial to the parties, a complete review of the construction system and the impact analysis of the modification are required, there is limited evidence that this type of study has been completed at this stage.

Led by federal and state governments, online bidding has gained a substantial foothold in the construction world. Arizona and Colorado enacted statutes expressly permitting state agencies to invite construction contract bids through the Internet (Berning & Flanagan, 2003). The most obvious beneficiaries of online bidding have been owners, which seek:

- (1) Secure and reliable information exchanges with bidders;
- (2) Elimination of bidding errors through system checks that root out bids with missing data;
- (3) Receipt of bids in a consistent and formatted manner;
- (4) Reduction in the cost of preparing and distributing bid proposals;
- (5) Access to a larger pool of potential bidders; and
- (6) Automatic enforcement of bid submission cut-off times.

Some contractors have said that “online bidding comes as a relief,” noting that the technology, by making bidding possible from their own offices, saves them from having to pack up teams and office resources to travel to a bidding site. This could trim

bid prices because online bidding spares contractors from a potentially long drive, hotel bills and the price of hauling computer equipment (Berning & Flanagan, 2003)

SUMMARY

Construction of buildings, roads and other infrastructure is a complex and costly business. Reverse Auction Bidding like all new things attracts interest, because of the perception that it can lower costs on projects. The point is not yet proven.

CHAPTER III

METHODOLOGY

BACKGROUND

This chapter of the report overviews how the game will be conducted, how rain delays are implemented into the game, and with screen shots of what each participant will see upon logging in to complete the game.

Study participants have been asked to complete a bidding game using the Reverse Auction Bidding method and in which we will try to discover if personality plays a role in winning projects. Each personality is defined by the Keirsey Personality Test. To determine each individual's personality, we will have their supervisor answer the Keirsey test for them to insure accurate results.

This study has been completed multiple times using students as the test group but has never been conducted using industry professionals. After we have gathered the results of the personality test, the Reverse Auction Bidding game will be directed. After the game is completed, we will gather the results and start my analysis. Once we have completed the gathering of results and analysis, we will interrupt my findings and draw conclusions.

GAME PLAY

The game is played using a SQL Server database and ASP program (Kim, 2004)

Figure 2 represents the login screen for the participants. As stated earlier, each participant will have a separate user name and password.

Figure 2 Reverse Auction Bidding Login Screen

Figure 3 represents a sample data screen that each player will see once they have successfully logged in. Notice that the page is broken out into three different sections; active bids, jobs in progress, and completed jobs. This will be a key page for participants to track their jobs, how much money they have to bid with, and a record of how many jobs they have won and successfully complete.

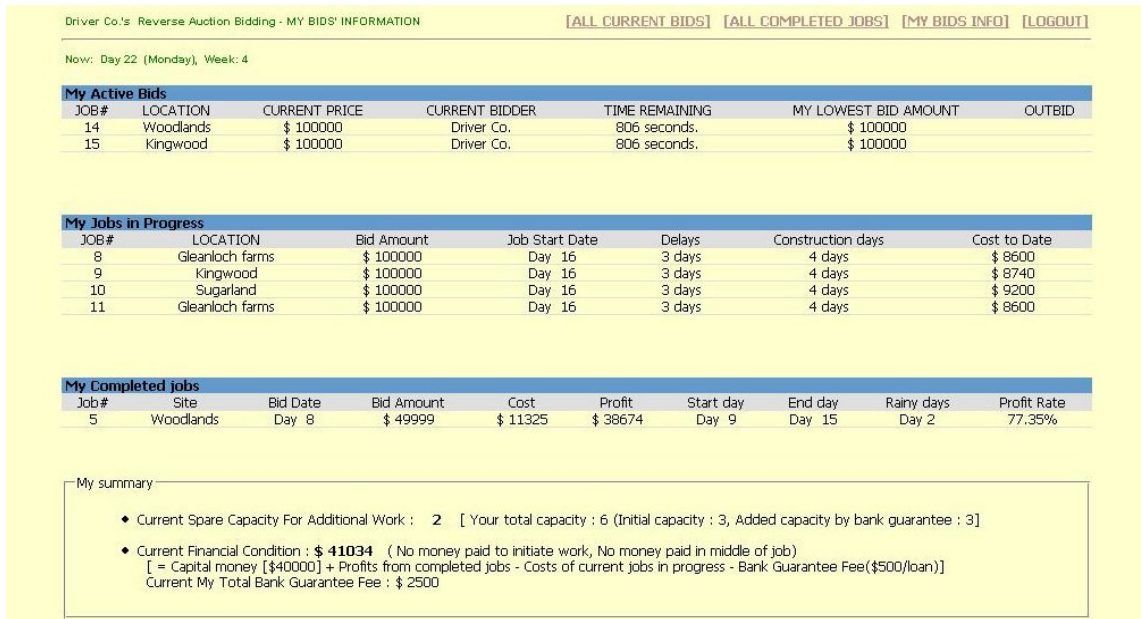


Figure 3 Reverse Auction Bidding – Sample Data Screen

RAIN DELAY

National Oceanic and Atmospheric Administration provides statistical information forecasting the probability of rain in the Houston area in mid-June through late July. This data was used for calculating the probability of rain during construction. According to National Oceanic and Atmospheric Administration, Houston has a probability to receive approximately 35% of rains during mid-June and late July. Consequently, it means that there is a 35% chance of delay in construction on any given day. Figure 4 shows the probability of rain in Houston Area in mid-June through late July. This data was used in a previous study (Chouhan, 2009)

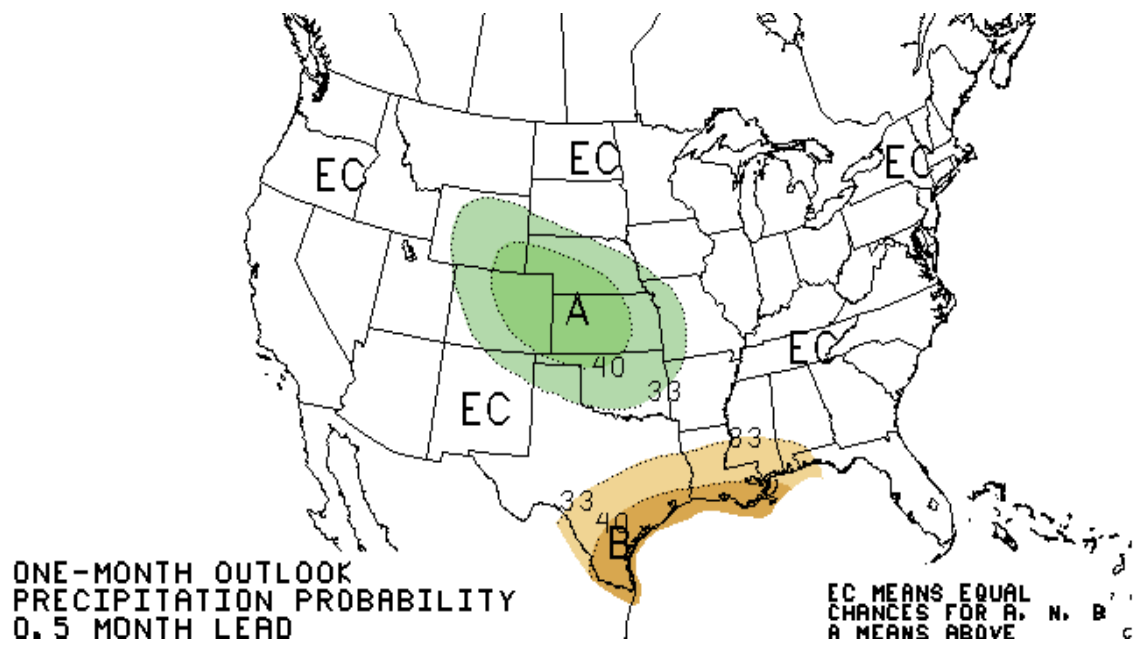


Figure 4 Rain Delay Data

CHAPTER IV

RESULTS

INTRODUCTION

This is the first Reverse Auction Bidding study at TAMU to use Construction Professionals instead of graduate students as participants in a Reverse Auction Bidding study. This chapter summarizes the results of the game played with the four participants outlining the personality determinates, and the profit levels for each player.

DETERMINING PERSONALITY OF THE PARTICIPANTS

The Keirsey Temperament Sorter Test characterizes personality into four main groups; Artisans, Guardians, Idealists, and Rationals. This testing system is used in the business world as a tool for assessing potential employees. Previous experiments started at TAMU showed that a Guardian personality type dominated the group that made a maximum profit in each game. Each of the groups is divided into four sub-groups as shown in Table 1. The participants were given an “ID” number to ensure they remain anonymous throughout the experiment. The “ID” numbers were also associated with a company name for bidding purposes when completing the Reverse Auction Bidding game. The first step of our experiment was determining the personality of our participants using the Keirsey Temperament Sorter (KTS) test. After completing the questions, a group and sub-group were determined for each participant.

Table 1

Keirsey Temperament Sorter Test Descriptors

Artisans	Guardians	Idealists	Rationals
Promoter	Supervisor	Teacher	Field Marshal
Crafter	Inspector	Counselor	Mastermind
Performer	Provider	Champion	Inventor
Composer	Protector	Healer	Architect

The results for the temperament sorter tests are shown in Table 2.

Table 2

Keirsey Temperament Sorter Results

ID	Company Name	Category	Sub-Category
9	Adze Co.	Guardians	Supervisor
10	Plane Co.	Idealists	Champion
11	Rasp Co.	Guardians	Inspector
12	Saw Co.	Guardians	Inspector

PARTICIPANT RESULTS

Figure 5 shows the total profit for each player. The maximum profit of \$286,111.00 was achieved by the player identified as Plane Co. who had an Idealists personality grouping. This personality type makes up no more than 15 to 20 percent of the total population. The other three Guardian players combined total was \$231,736.00 which is less than the total of the winning player. *Figure 5* shows that Plane Company was the clear leader followed by Rasp Company, Saw Company and Adze Company respectively. The competition level was high for Plane Co. and Rasp Co. but not so much for the bottom two.

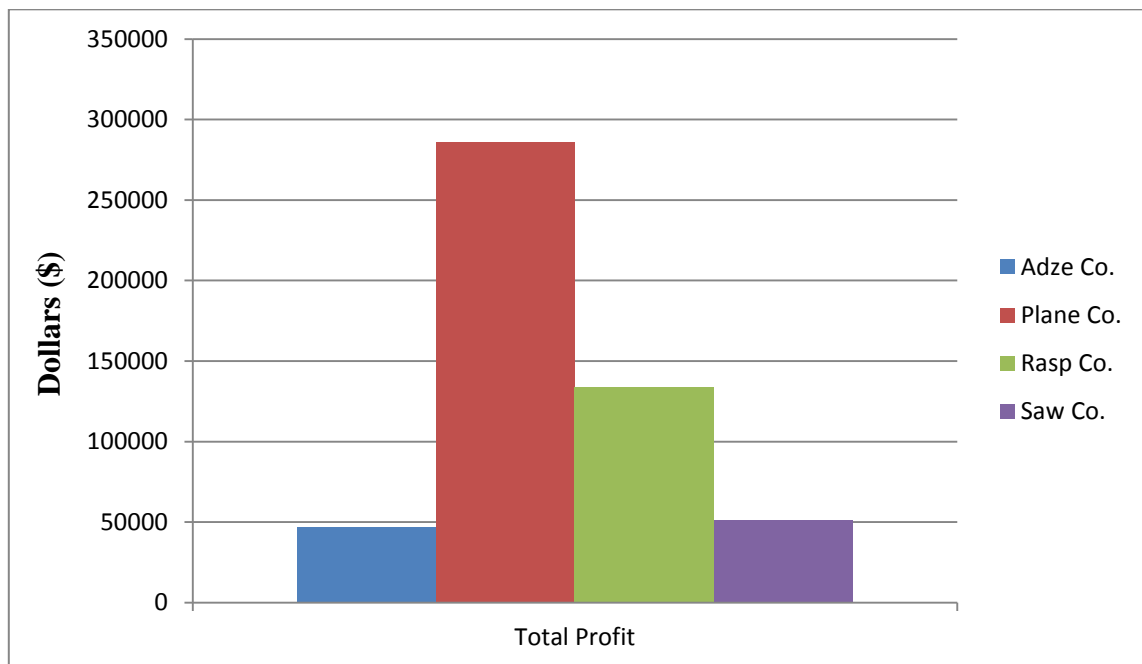


Figure 5 Total Profit for Each Company

BID AMOUNT PATTERNS

Figure 6 shows each of the bid prices for the game. Chouhan (2009) showed that a pattern existed in his experiment work that was explained using a four bidding stage categorization. Figure 6 shows a weak pattern unlike the positively pattern by Chouhan.

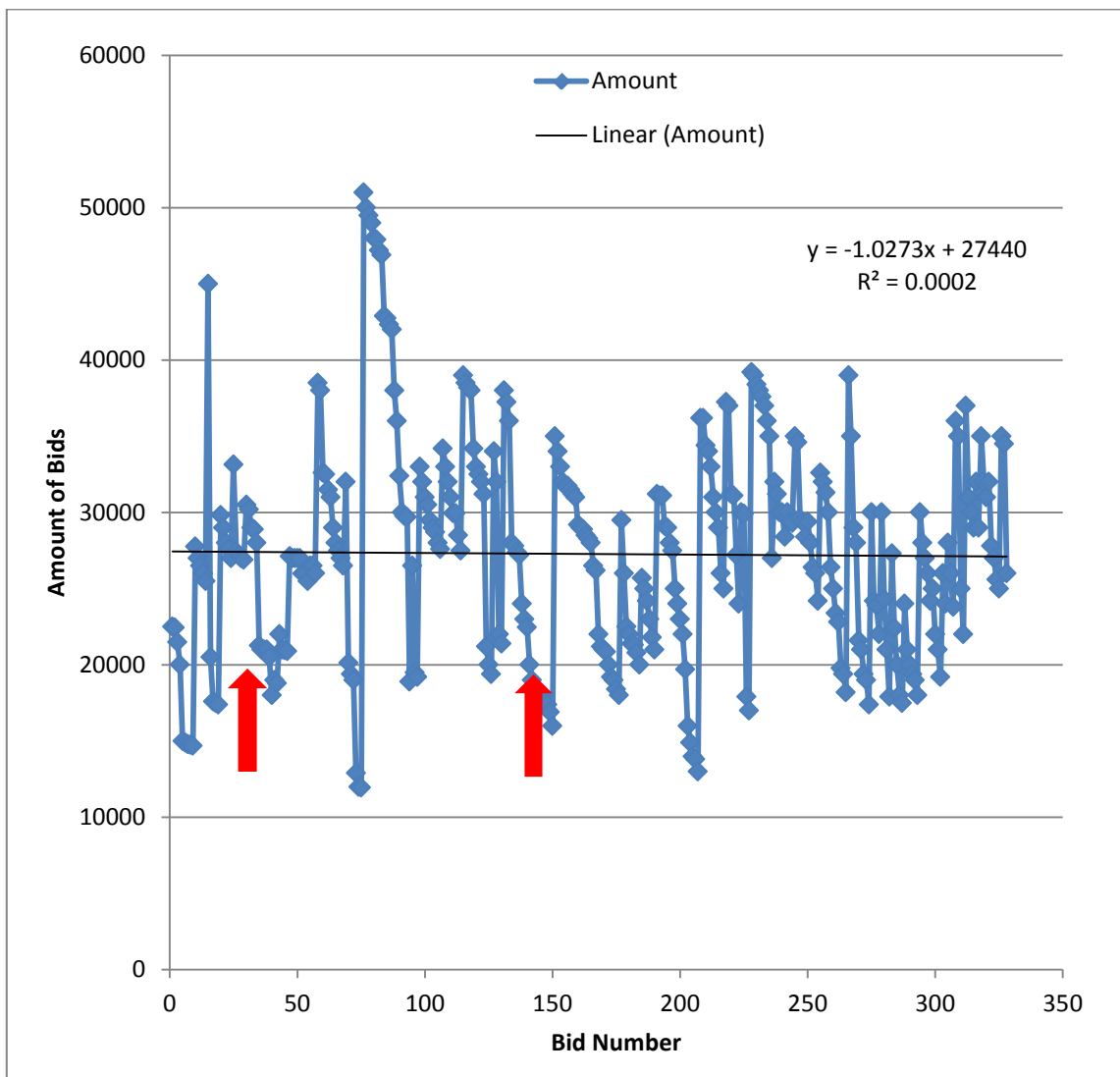


Figure 6 All Bids vs. Amount of Each Bid

Figure 7 shows the plot for the first 75 bids in the game. In the traditional Chouhan model, this is an intensive competitive period, but one observes at least one player who bid higher than expected for this initial period. It would be necessary to repeat this form of the experiment to determine if it is standard for professional bidders or an anomaly in this bidding game.

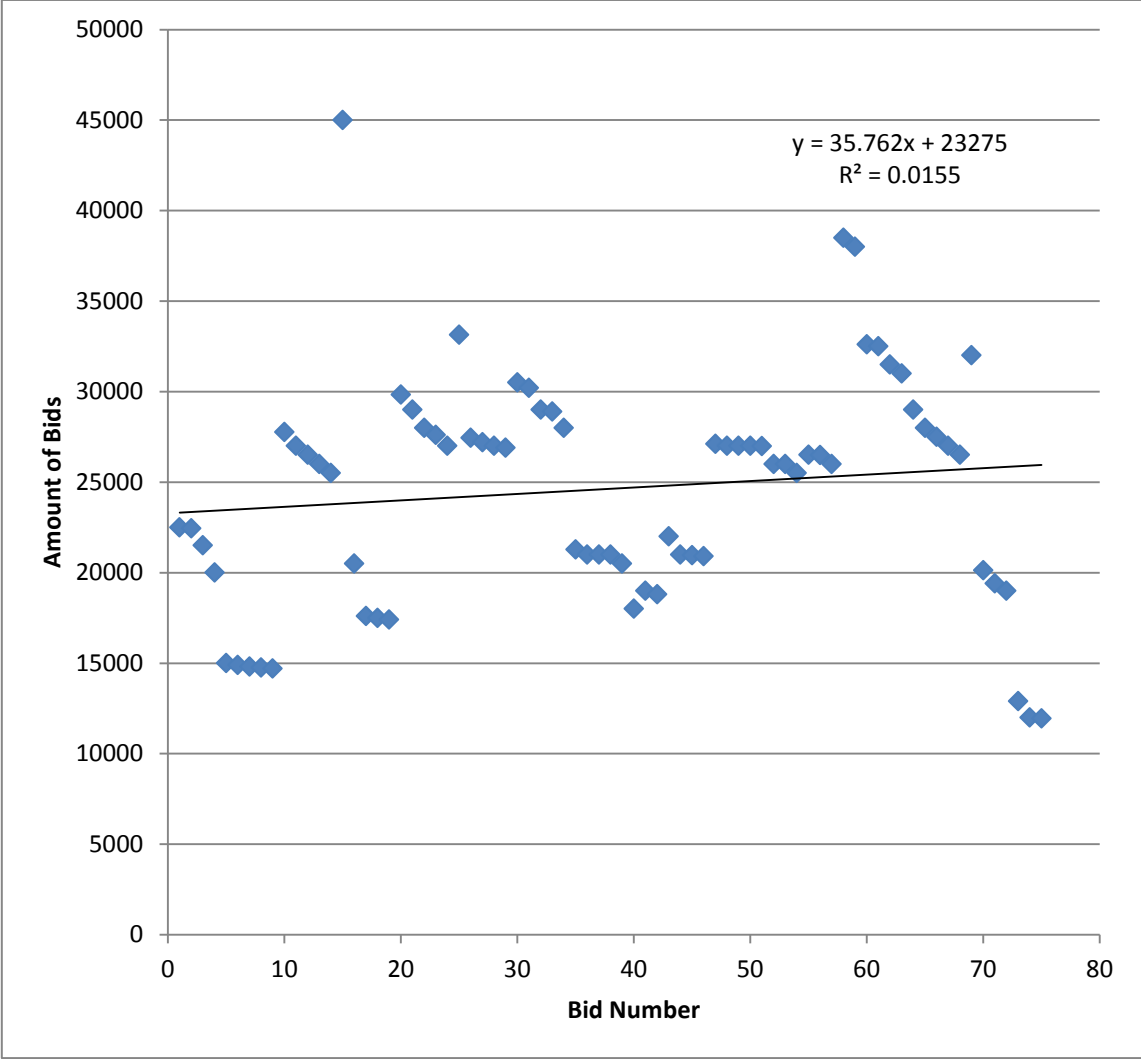


Figure 7 Bids #1-75

Figure 8 shows bids 76-207. This bid period shows a period of higher overall initial bids, but a slow degradation of overall returns.

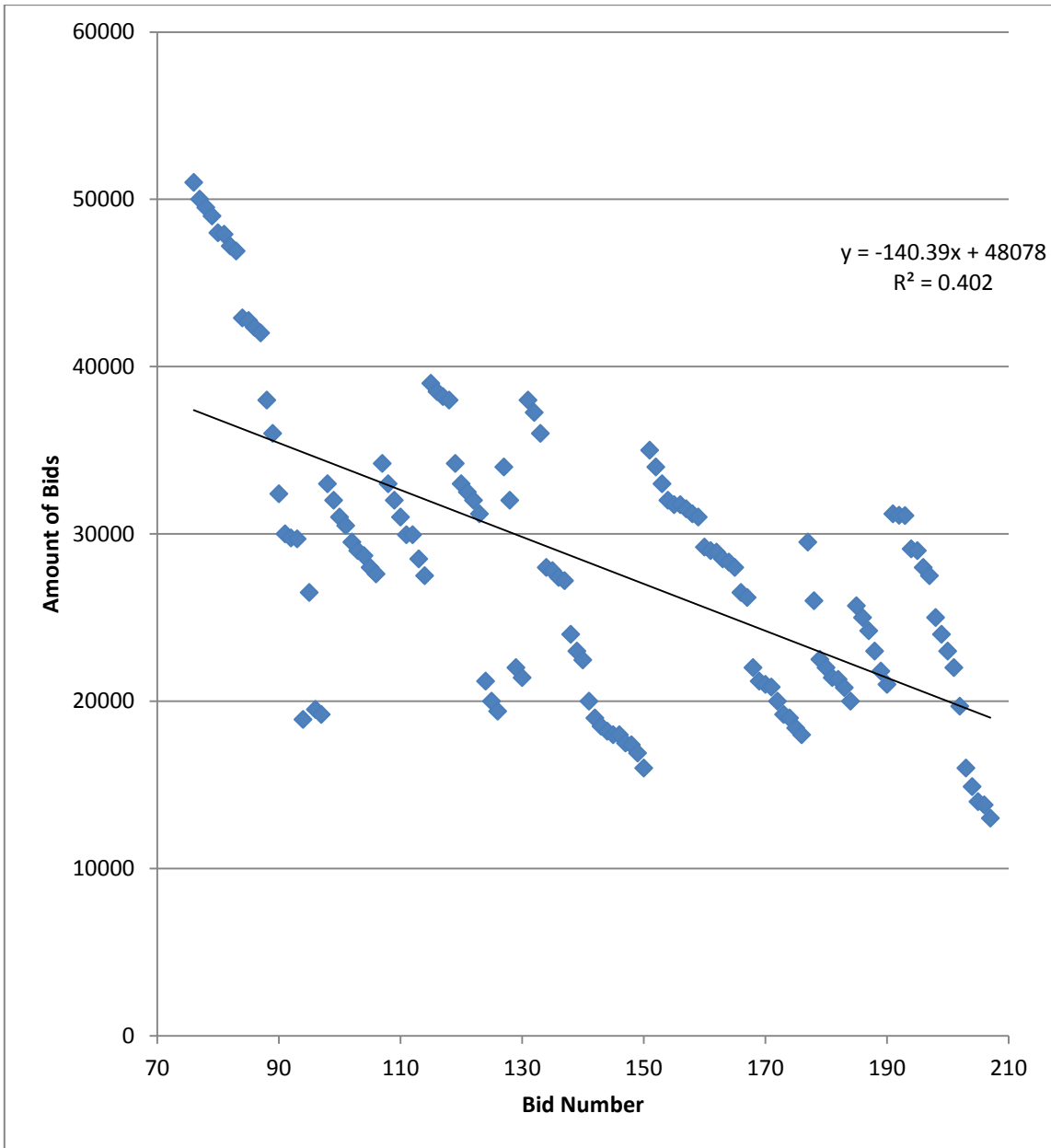


Figure 8 Bids #76-207

The last area examined were bids #208-328, as shown in Figure 8, a negative slope is shown in Figure 9 which has been typical in past experiments. When compared to Figure 8, the number of bids submitted decreased which raises several questions.

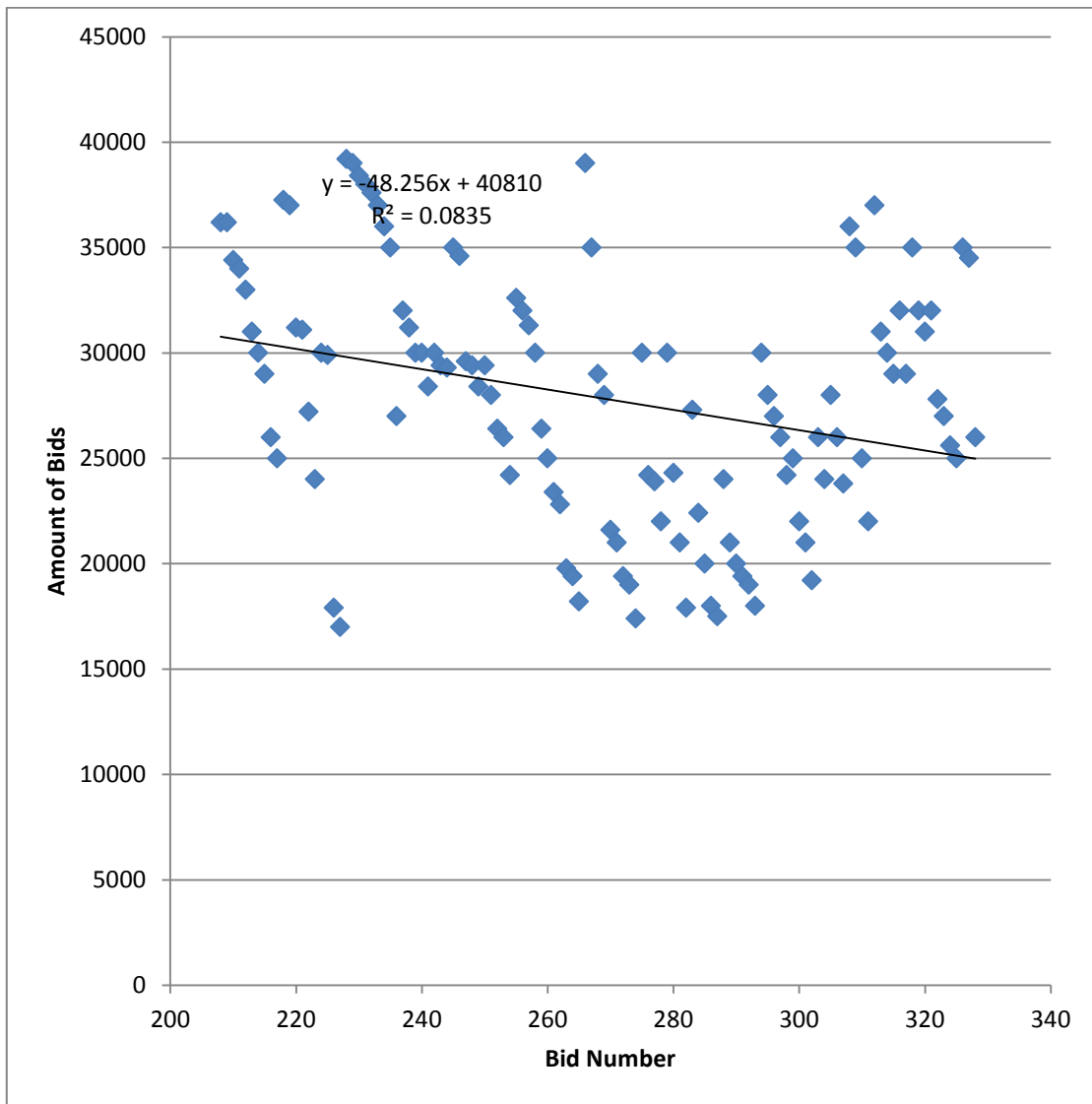


Figure 9 Bids #208-328

BID PATTERN

The game started at 6:00 PM and concluded at 8:35 PM. *Figure 10* shows the number of bids for each of the games. The third game was the most intensive, whilst the average game had a mean number of bids of 35 excluding game 3, which was 83.

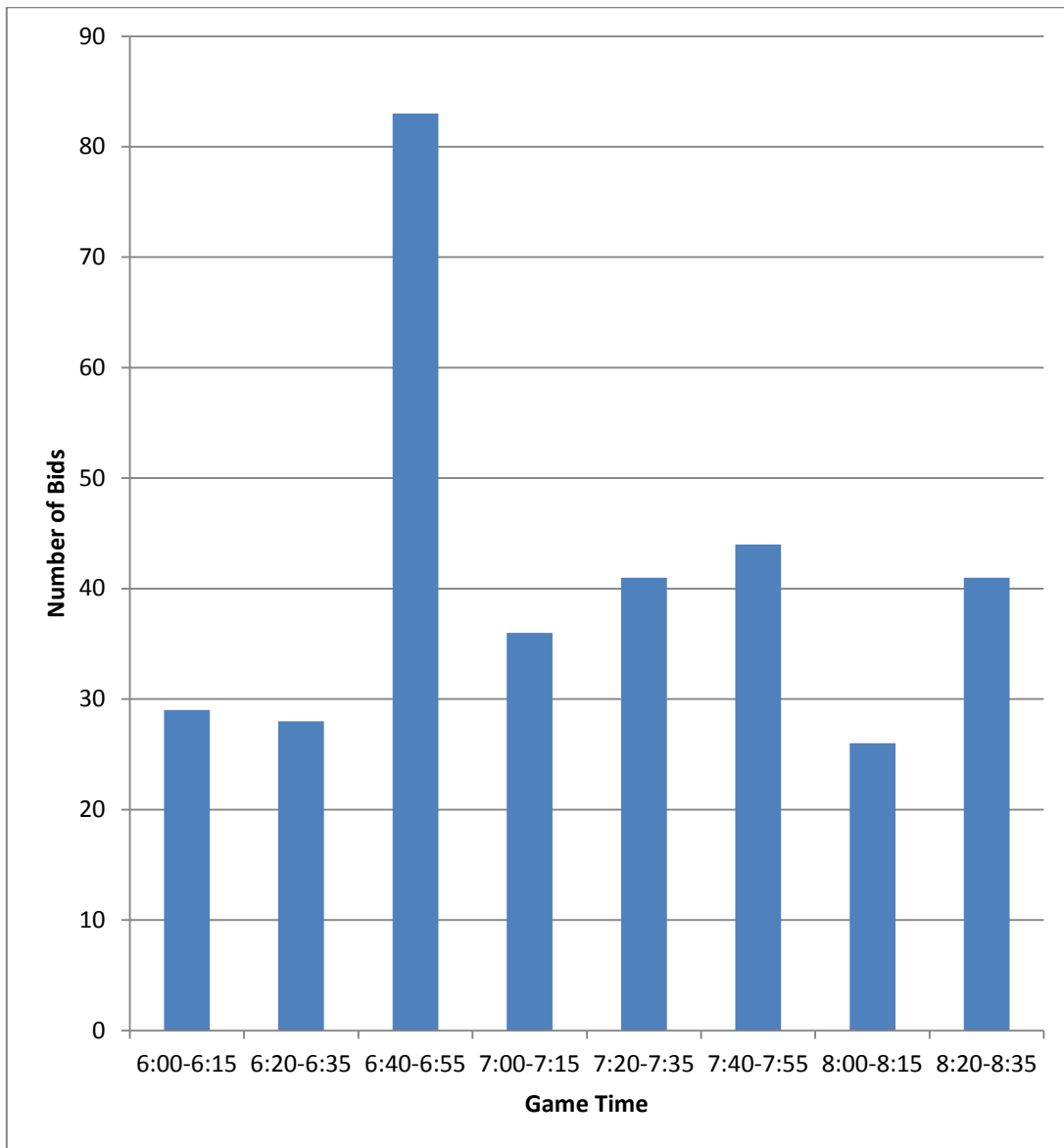


Figure 10 Game Number vs. Number of Bids

PROFIT ANALYSIS

A technique was developed by Gupta (2010) to provide a method of comparing profits. The profit levels are normalized with a range of 0 to 1. 0 represents the lowest profit and 1 the highest. The normalized profit for each job number is shown on *Figure 11*.

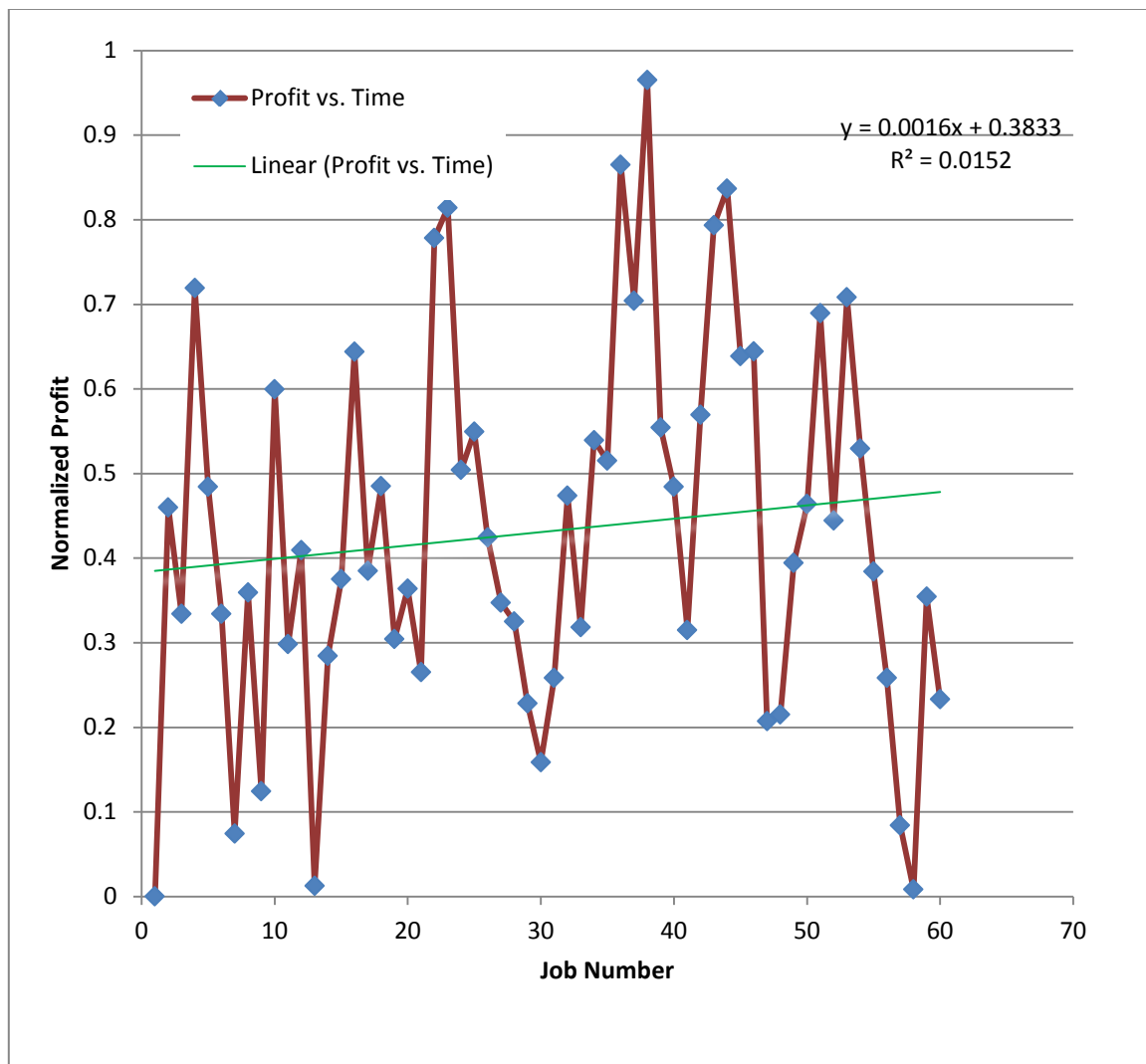


Figure 11 Profit vs. Time

Standard practice is to provide a bar chart summary of the profit levels as shown in Figure 12. Figure 12 shows our graph of how many points fall into each tenth when we compared profit vs. time. Figure 12 is clearly not normal distributed as was shown by others.

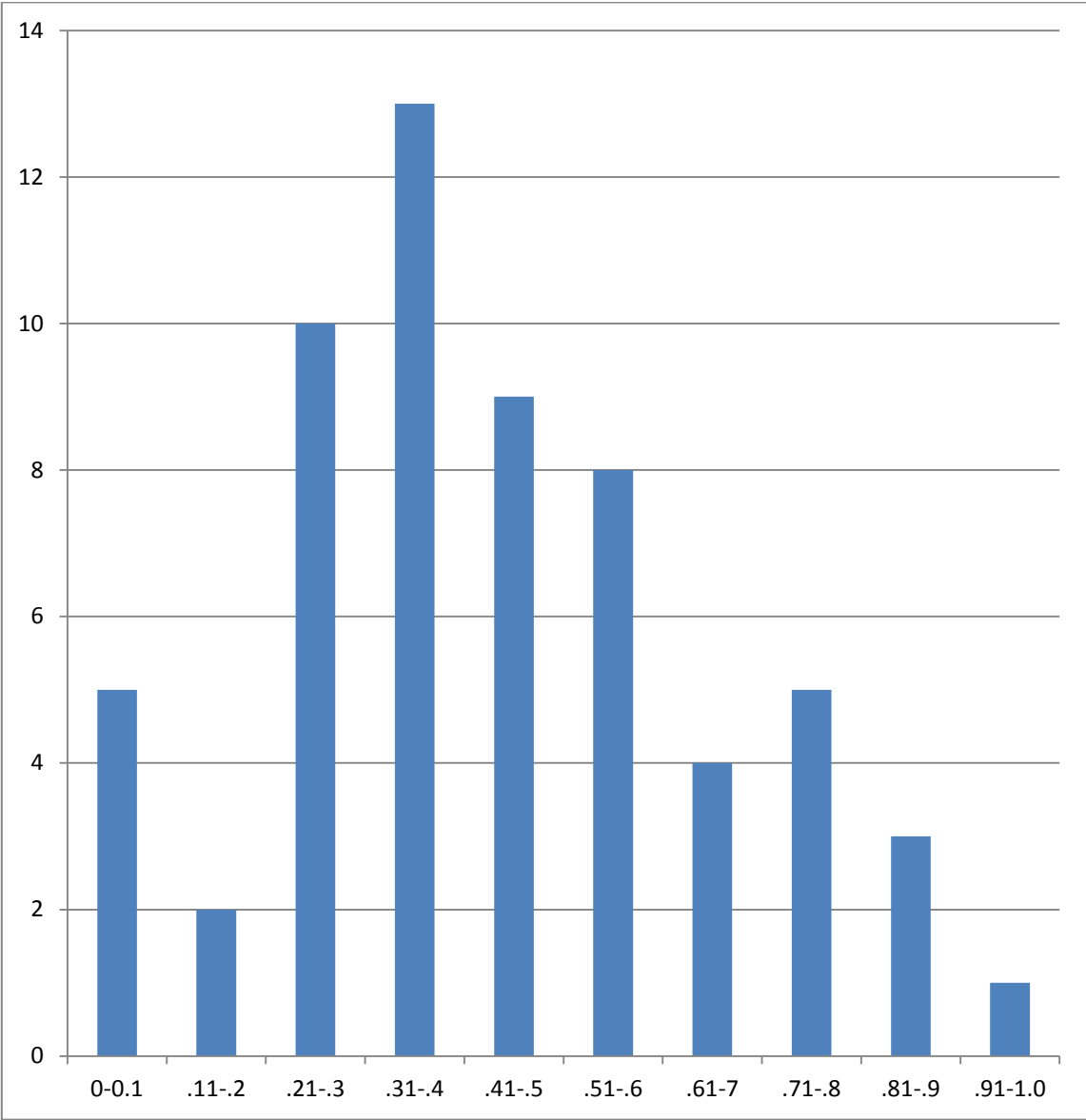


Figure 12 Normalized Profits

Table 3 shows the data points that we collected with those of past experiments. This will be used to show the similarities from past experiments and this experiment.

Table 3

Normalized Profits for Several Case Studies at TAMU

Range	Gupta	Saigaonkar	van Vleet	Piper
< 0	0.08	0.14	0	0
0 - 0.1	1	0.79	0.09	0.38
0.11 - 0.2	0.02	0.5	1	0.15
0.21 - 0.3	0	1	0.37	0.77
0.31 - 0.4	0	0.64	0.11	1
0.41 - 0.5	0	0.43	0.14	0.69
0.51 - 0.6	0.02	0.14	0.06	0.62
0.61 - 0.7	0.23	0.29	0.2	0.31
0.71 - 0.8	0.25	0.14	0.06	0.38
0.81 - 0.9	0.19	0.07	0.03	0.23
0.91 - 1	0.15	0.36	0.03	0.08

Using the data from Table 3, we derived the bar graph shown in Figure 13. There is clearly a consistent pattern shown and the data from this experiment match that of past experiments. The same polynomial shape exists with each experiment including our experiment on industry professionals.

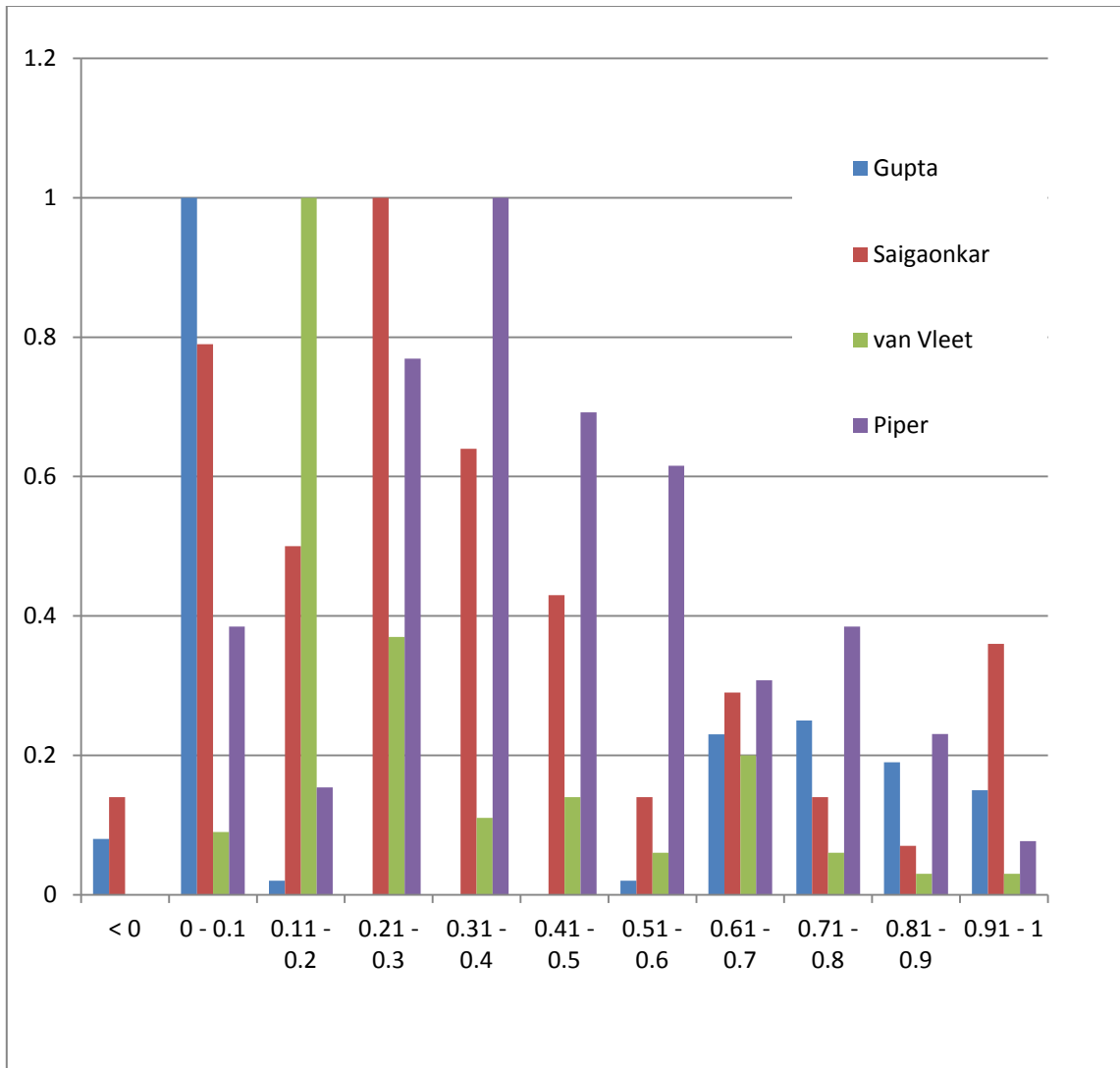


Figure 13 Normalized Profits Chart

BANK LOANS AND PROFIT

Table 4 shows the total profit and total amount of bank loans for each company. Plane Co. clearly had the highest bank loans but also had the highest profit total. If we look at Rasp Co., they took out the fewest bank loans but were second in total profit.

Table 4

Bank Loans and Profit

ID	Total Profit	Bank Loan
9 (Adze Co.)	46637	2500
10 (Plane Co.)	286111	31000
11 (Rasp Co.)	133899	2000
12 (Saw Co.)	51200	5000

Table 5 shows the data points from the Gupta (2010) case study.

Table 5

Gupta Bank Loan and Profit

Gupta Personality Types	Bank Loan	Profit
Provider	\$21,000.00	\$382,281.00
Supervisor	\$14,000.00	\$368,126.00
Protector	\$5,000.00	\$310,565.00
Inspector	\$14,500.00	\$297,062.99

Table 6 shows the bank loan and profit totals from this experiment.

Table 6

Piper Bank Loan and Profit

Piper Personality Type	Bank Loan	Profit
Supervisor	\$ 2,500.00	\$ 46,637.00
Champion	\$ 31,000.00	\$ 286,111.00
Inspector	\$ 2,000.00	\$ 133,899.00
Inspector	\$ 5,000.00	\$ 51,200.00

When the data sets from both experiments were plotted together, the results showed a similar pattern as shown on (see Figure 14). Both lines are positive and this experiment showed a higher R^2 value. This indicates that the higher bank loans you take out, the higher your profits will be.

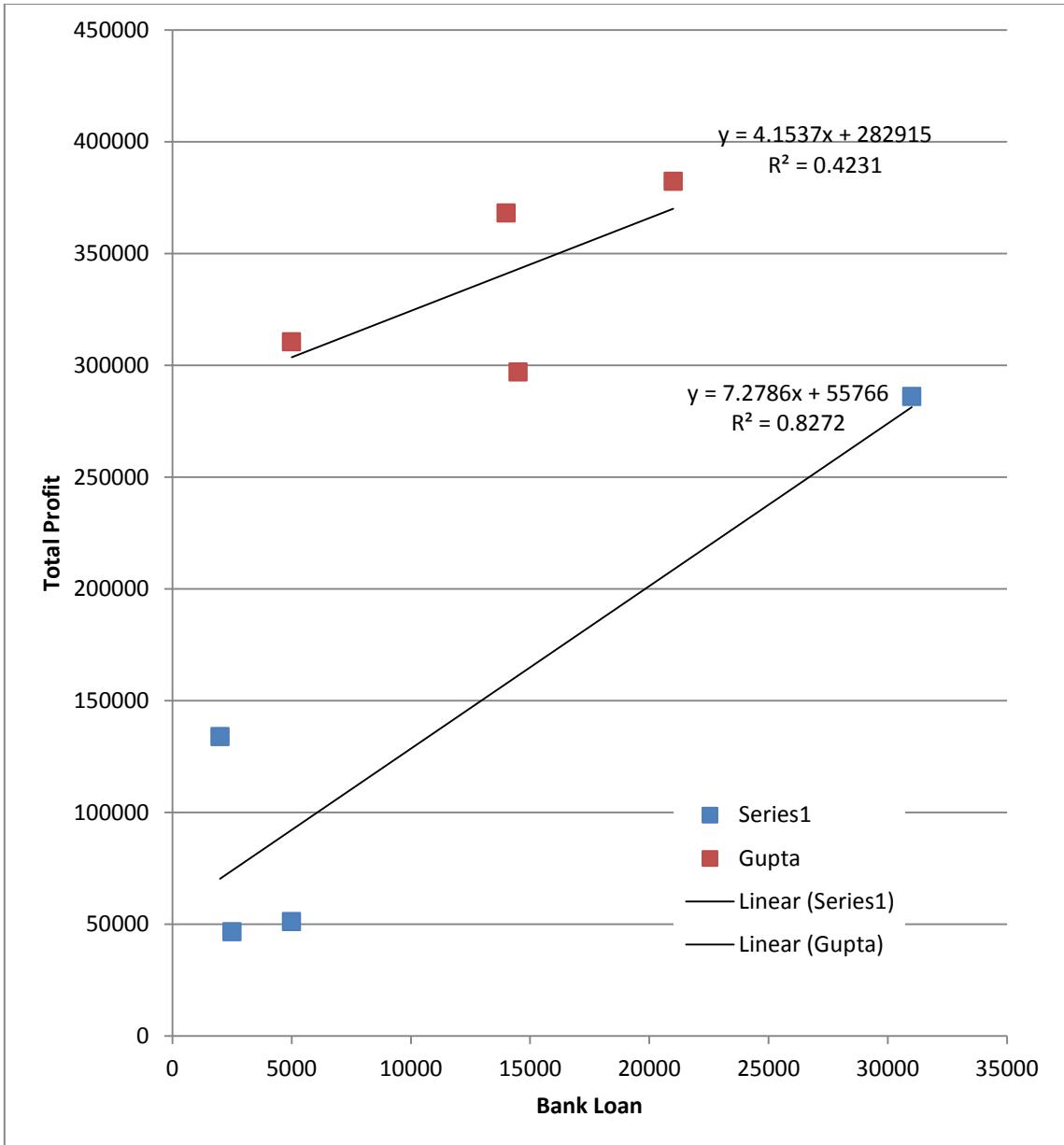


Figure 14 Gupta Bank Loan and Profit vs. Piper Bank Loan and Profit

SUMMARY

The professional participants showed similar patterns of play to early case studies.

CHAPTER V

CONCLUSIONS

A formal study of the Reverse Auction Bidding System commenced in 2004 at Texas A&M. van Vleet, who led the first study, was interested in collusion. Since this research, numerous studies have been done, with each one showing similar results, but slowly adding to the body of knowledge on performance on the Reverse Auction Bidding game.

One key development from this study was the personality that was awarded with the most profit differed from the results observed in previous studies. In past studies, the “Guardians” personality type was typically the most successful in terms of profit. For this study, the “Idealists” personality type was undisputedly the most successful followed by three “Guardians” personality types. Of course it may simply be that fifteen percent of the population there have been only limited testing with idealist personality types.

Profits during this experiment matched the pattern from those of past experiments. The pattern is that at the beginning profits are low and begin to increase with time. As you approach the middle of the game, profits maximize and decrease as the game goes on.

Bank loan take up rate was a key indicator of performance as has been observed previously. However the returns for this game were lower than typical games. This could

lead to some speculation that industry professionals that bid on work as a career are more conservative than those of college aged students.

The hypothesis was false, personality appears to again have an impact on performance. Further work is required on this aspect of the game play.

With advances in technology making everyday life easier, the same occurs for the Reverse Auction Bidding game and its researchers. For instance in this study, data was gathered from four different participants in four different locations. This marked the first time that the Reverse Auction Bidding game was conducted away from the Texas A&M campus and with non-students. Technologies have made the process of collecting data and conducting the experiment easier, which in the future will allow students and instructors to gather data twenty-four hours a day and seven days a week, which will provide an enormous amount of information to more precisely match personalities and successful bidders.

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APPENDIX A

THE KEIRSEY TEMPERAMENT SORTER

For each question, decide on answer a or b and put a check mark in the proper column of the answer sheet. Scoring directions are provided. There is no right or wrong answers since about half the population agrees with whatever answer you choose.

1. When the phone rings do you
 - a. hurry to get to it first
 - b. hope someone will answer
2. Are you more
 - a. observant than introspective
 - b. introspective than observant
3. Is it worse to
 - a. have your head in the clouds
 - b. be in a rut
4. With people are you usually more
 - a. firm than gentle
 - b. gentle than firm
5. Are you more comfortable in making
 - a. critical judgments
 - b. value judgments
6. Is clutter in the workplace something you
 - a. take time to straighten up

- b. tolerate pretty well
7. Is it your way to
- a. make up your mind quickly
 - b. pick an choose at some length
8. Waiting in line, do you often
- a. chat with others
 - b. stick to business
9. Are you more
- a. sensible than ideational
 - b. ideational than sensible
10. Are you more interested in
- a. what is actual
 - b. what is possible
11. In making up your mind are you more likely
- a. to go by data
 - b. to go by desires
12. In sizing up others do you tend to be
- a. objective and impersonal
 - b. friendly and personal
13. Do you prefer contracts to be
- a. signed, sealed, and delivered
 - b. settled on a handshake

14. Are you more satisfied having
 - a. a finished product
 - b. work in progress
15. At a party, do you
 - a. interact with many, even strangers
 - b. interact with a few friends
16. Do you tend to be more
 - a. factual than speculative
 - b. speculative than factual
17. Do you like writers who
 - a. say what they mean
 - b. use metaphors and symbolism
18. Which appeals to you more:
 - a. consistency of thought
 - b. harmonious relationships
19. If you must disappoint someone are you
 - a. usually frank and straightforward
 - b. warm and considerate
20. On the job do you want your activities
 - a. scheduled
 - b. unscheduled
21. Do you more often prefer

- a. final, unalterable statements
 - b. tentative, preliminary statements
22. Does interacting with strangers
- a. energize you
 - b. tax your reserves
23. Facts
- a. speak for themselves
 - b. illustrate principles
24. Do you find visionaries and theorists
- a. somewhat annoying
 - b. rather fascinating
25. In a heated discussion, do you
- a. stick to your guns
 - b. look for common ground
26. Is it better to be
- a. Just
 - b. merciful
27. At work, is it more natural for you to
- a. point out mistakes
 - b. try to please others
28. Are you more comfortable
- a. after a decision

- b. before a decision
29. Do you tend to
- a. say right out what's on your mind
 - b. keep your ears open
30. Common sense is
- a. usually reliable
 - b. frequently questionable
31. Children often do not
- a. make themselves useful enough
 - b. exercise their fantasy enough
32. When in charge of others do you tend to be
- a. firm and unbending
 - b. forgiving and lenient
33. Are you more often
- a. a cool-headed person
 - b. a warm-hearted person
34. Are you prone to
- a. nailing things down
 - b. exploring the possibilities
35. In most situations are you more
- a. deliberate than spontaneous
 - b. spontaneous than deliberate

36. Do you think of yourself as
- a. an outgoing person
 - b. a private person
37. Are you more frequently
- a. a practical sort of person
 - b. a fanciful sort of person
38. Do you speak more in
- a. particulars than generalities
 - b. generalities than particular
39. Which is more of a compliment:
- a. "There's a logical person"
 - b. "There's a sentimental person"
40. Which rules you more
- a. your thoughts
 - b. your feelings
41. When finishing a job, do you like to
- a. tie up all the loose ends
 - b. move on to something else
42. Do you prefer to work
- a. to deadlines
 - b. just whenever
43. Are you the kind of person who

- a. is rather talkative
 - b. doesn't miss much
44. Are you inclined to take what is said
- a. more literally
 - b. more figuratively
45. Do you more often see
- a. what's right in front of you
 - b. what can only be imagined
46. Is it worse to be
- a. softy
 - b. hard-nosed
47. In trying circumstances are you sometimes
- a. too unsympathetic
 - b. too sympathetic
48. Do you tend to choose
- a. rather carefully
 - b. somewhat impulsively
49. Are you inclined to be more
- a. hurried than leisurely
 - b. leisurely than hurried
50. At work do you tend to
- a. be sociable with your colleagues

- b. keep more to yourself
51. Are you more likely to trust
- a. your experiences
 - b. your conceptions
52. Are you more inclined to feel
- a. down to earth
 - b. somewhat removed
53. Do you think of yourself as a
- a. tough-minded person
 - b. tender-hearted person
54. Do you value in yourself more that you are
- a. reasonable
 - b. devoted
55. Do you usually want things
- a. settled and decided
 - b. just penciled in
56. Would you say you are more
- a. serious and determined
 - b. easy going
57. Do you consider yourself
- a. a good conversationalist
 - b. a good listener

58. Do you prize in yourself
- a. a strong hold on reality
 - b. a vivid imagination
59. Are you drawn more to
- a. fundamentals
 - b. overtones
60. Which seems the greater fault
- a. to be too compassionate
 - b. to be too dispassionate
61. Are you swayed more by
- a. convincing evidence
 - b. a touching appeal
62. Do you feel better about
- a. coming to closure
 - b. keeping your options open
63. Is it preferable mostly to
- a. make sure things are arranged
 - b. just let things happen naturally
64. Are you inclined to be
- a. easy to approach
 - b. somewhat reserved
65. In stories do you prefer

- a. action and adventure
- b. fantasy and heroism

66. Is it easier for you to

- a. put others to good use
- b. identify with others

67. Which do you wish more for yourself:

- a. strength of will
- b. strength of emotion

68. Do you see yourself as basically

- a. thick-skinned
- b. thin-skinned

69. Do you tend to notice

- a. disorderliness
- b. opportunities for change

70. Are you more

- a. routinized than whimsical
- b. whimsical than routinized

APPENDIX B

KIERSEY TEMPERAMENT SORTER SCORING

Enter a check for each answer in the column for a or b.

	a	b		a	b		a	b		a	b		a	b		a	B			
1			2			3			4			5			6			7		
8			9			10			11			12			13			14		
15			16			17			18			19			20			21		
22			23			24			25			26			27			28		
29			30			31			32			33			34			35		
36			37			38			39			40			41			42		
43			44			45			46			47			48			49		
+50			51			52			53			54			55			56		
57			58			59			60			61			62			63		
64			65			66			67			68			69			70		
1			23			43			45			65			67			87		

1			2
E	I		

3			4
S	N		

5			6
T	F		

7			
J	P		

Directions for Scoring

1. **Add down** so that the total number of a answers is written in the box at the bottom of each column. Do the same for the b answers you have checked. Each of the 14 boxes should have a number in it.
2. **Transfer the number** in box #1 of the answer grid to box #1 below the answer grid. Do this for box # 2 as well. Note, however, that you have two numbers for boxes 3 through 8. Bring down the first number for each box beneath the second, as indicated by the arrows. Now add all the pairs of numbers and enter the total in the boxes below the answer grid, so each box has only one number.
3. **Now you have** four pairs of numbers. Circle the letter below the larger numbers of each pair. If the two numbers of any pair are equal, then circle neither, but put a large X below them and circle it.