



EFFICACY OF ELECTRONIC REVERSE AUCTION (ERA) IN THE PUBLIC PROCUREMENT SYSTEM IN INDIA

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Abstract

Electronic reverse auctions (eRA) have become popular in procurement circles. The Indian government's procurement sector started using eRAs for price negotiation in the new century. The CVC has not yet issued eRA event guidelines. Electronic risk assessments are a procurement "best practice" worldwide. They have become so to automate negotiation, not to put pressure on suppliers to lower prices. In order to win the business of providing things or services with well-defined design, quantity, quality, delivery, and terms and conditions, vendors lower their prices during the auction. The auction determines the supplier. Instead of growing, bids in a reverse auction decline. Standard auctions increase bid values. Online reverse auctions occur. Suppliers submit proposals that become cheaper over time using specialized software. The lowest-priced vendor wins the reverse auction. As bids are dropped, supplier rankings and prices may be revealed. However, their identity is kept private and all suppliers get the same information. This article summarizes the benefits and drawbacks of reverse auctions. It was found that reverse auctions should be utilized alongside other procurement methods and protected to ensure their effectiveness and integrity.

Keywords: Reverse auctions, public procurement, quality, cost savings

Introduction

Procurement is now a key and current issue in the India public sector. This is primarily a result of a directive from UK central government for the UK public sector to reduce costs and become more efficient. Procurement is the process of acquiring goods and services by purchasing, renting, or leasing. The procurement process includes preparing specifications and solicitations. The procurement process also includes evaluating bids and proposals, awarding contracts, and contract administration. A solicitation is a document that describes what you need and gives vendors instructions for responding. The State spends a significant amount of money through the procurement process. So, it is important for employees who purchase for state agencies and institutions to know and comply with the procurement laws, rules, policies and procedures.

The increasing volume of public procurement opportunities in India, coupled with the scale and magnitude of government projects, holds tremendous economic potential for both local and overseas companies. The recent uptick in procurement opportunity in India can be attributed to a variety of measures and initiatives. International

investors now have broader access to India's vast market than they ever had before. This is a significant change from the past. The Parliament just approved a plan to further liberalize investment and enhance foreign direct investment inflow into India. This will be accomplished by lowering investment limitations and opening up previously closed areas to international companies. The government's push towards modernizing existing infrastructure and equipment has also resulted in a number of procurement opportunities, as have new initiatives such as "Digital India" and "Make in India," which are geared towards improved physical and social infrastructure, connectivity, and local design and manufacturing capability. Both of these initiatives have resulted in a number of procurement opportunities.

Nevertheless, working with the government may be a mixed bag of benefits and problems, and the exposure of a corporation to the public sector can pose risks in terms of both legal and compliance obligations. To this aim, we have extracted a few important points from our expertise advising clients on public bidding procedures and vendor contracts with the government. This will allow us to achieve the aforementioned goal.

Public Procurement Regime – Overview

There is no one, all-encompassing piece of central law in India that governs public procurement in its entirety. In its place, the public procurement system is a framework that is made up of administrative regulations and guidelines that overlap with one another, sector-specific manuals, and state-specific laws.

The General Financial Rules ("GFR"), which were first put into effect in 1947 and most recently updated in 2017, provide the fundamental basis of the framework for the procurement process. The General Financial Regulations (GFR) are an all-encompassing set of administrative regulations and directives that include financial management and the processes involved in government procurement. All acquisitions made by the government are required to follow to the principles established in the GFR. These principles include precise restrictions on the procurement of goods and services as well as the administration of contracts.

In addition, the Manual for Procurement of Goods, 2017, which was published in 2017, provides instructions for the acquisition of goods, and the Delegation of Financial Powers Rules, which were published in 1978, distribute the financial authority of the government to a variety of ministries and subordinate agencies. All government agencies that have been given the financial authority to purchase products in the public interest shall be held accountable for ensuring the effectiveness, economy, and openness of their purchasing practises, as well as the fair and equal treatment of suppliers and the promotion of competition in public procurement. Manuals and regulations regulating procurement that are specific to various ministries and departments, such as military, telecom, and railroads, are supplementary to these administrative principles and should be followed as such.

Authorities such as (a) the Central Vigilance Commission, which is tasked with increasing transparency and objectivity in public procurement; (b) the Competition Commission of India, which checks anti-competitive elements; and (c) the Central Bureau of Investigation, which is engaged for investigation and prosecution of the criminal activities in the procurement process such as probity issues, check the framework (for compliance) and further layer it with rules.

Business to Government (B2G) is an abbreviation that stands for "Business to Government." B2G refers to networks or models that provide a mechanism for companies to submit bids for projects or items that the government may acquire or need for their organisation. This includes organisations in the public sector that are in charge of submitting bids. The use of real-time bidding on the internet for business to government transactions is becoming more common. B2G marketing is another name for marketing that targets the public sector. Bids submitted to the government come from companies that can provide the government with the goods or services that it requires. It's possible that the ideas will take the shape of reverse auctions, in which vendors compete with one another to win business. The idea of a "smart city" originated in the realm of business-to-government online trade. The B2G type encompasses all different kinds of contracts, including those for the sale of products, services, and information between companies of all sizes and all levels of government (both state and federal). When compared to comparable work in the private sector, government contracts are often more larger and more secure in nature.

2. Reverse auction

According to the Glossary, a standard auction consists of a buyer displaying an item, and other bidders competing for that item by placing bids until the auction is won by the person who placed the highest bid. The item will be awarded to the person who placed the highest bid. On the other hand, a reverse auction is an event in which the buyer makes a request for products and services that they need, and sellers bid the price for the goods and services that have been described. At the conclusion of the auction, the winning bidder will be the seller who submitted the bid with the lowest starting price.

According to the prokuria, a reverse auction is a kind of auction in which the typical roles of buyer and seller are switched around. This type of auction is also referred to as a buyer-determined auction or procurement auction. As a direct consequence of this, there is only one buyer (your organization), but there are many possible sellers (suppliers).

In a standard auction, prospective purchasers compete with one another to acquire the goods or services up for sale by submitting progressively larger bids. In contrast, in a reverse auction, sellers compete against one another by placing bids in an effort to win business from buyers; as a result, prices often decrease as sellers try to outbid one another. The use of reverse auctions as a method for acquiring products and services is becoming more common. They not only let the buyer save money by decreasing costs via increased competition amongst suppliers, but they also make it possible for the buyer to reverse engineer the procurement process of a corporation. The process of picking items for your company as well as managing your supplier onboarding system are examples of applications that might benefit from the usage of reverse auctions.

Consignment Auction Bidding refers to the procedure by which a buyer of products and services continues to request bids from sellers until the buyer is satisfied that it has achieved an acceptably low price. In its building application, the method often involves the use of a specialized internet website. The opening of bids for a project takes place at the predetermined time, after which all potential bidders upload their proposals to the project website. The prices are then shown on the site for all bidders to see on the website that is acting as the host. The identity of the bidders is often concealed from view. The bidders are then granted a certain amount of time during which they are permitted to provide a lower price proposal if they so wish. As a result, the auction is conducted in the "opposite" manner of a standard auction in the sense that it is anticipated that the bids would decrease rather than increase. The auction will be terminated when there are no further bids received after a certain amount of time has passed from the receipt and publishing of the last bid. The winner is then determined based on who submitted the lowest offer. (Shankar, 2005)

In a reverse auction, the objective is to get the lowest possible offer for the goods or service being auctioned. In contrast to conventional auctions, in which the price goes up as the bidding continues, reverse auctions see the price gradually decrease up to a certain point in the game. The bidders are required to make public their prices while using this format of bidding. However, because purchases made through Reverse Auction Bidding are typically price sensitive, in order to get around the issue of quality, we prequalify the bidders. The owner or general contractor may only look at one aspect of the construction, such as the bid or the price, without taking into account the bidders' work history, experience, or any other qualifications related to the construction. According to Guhya (2010), the system does have certain benefits; nevertheless, one of those benefits does not include a reduction in the cost of the purchases made in general.

According to Bieberstein (2002), reverse auctions may be categorized as either one-sided, descending, or open-bid auctions. The word "one-sided" refers to a partnership in which one buyer invites numerous sellers, often known as a one-to-many relationship. The phrase 'descending' refers to the lowering of bid prices as bidders continue to compete in underbidding the current lowest offer until the auction period ends or prices are unable to fall any further. According to Horlen, Eldin, and Ajinkya (2005), the word "open" refers to the fact that the bid prices are made public to all of the participants.

2.1. Concept

Reverse auctions are eAuctions where suppliers submit online bids to compete against each other. Unlike forward auctions, where bids increase as the auction progresses, in reverse auctions, bidding starts with the highest possible price and decreases gradually. The lowest bid wins.

2.2. Origin/History of reverse auction

Auctions originated as early as 500 B.C. when Babylonian communities held annual events to distribute women eligible for marriage to the highest bidder (Cassady, 1967). In the Roman Empire, soldiers often claimed the sites they conquered in military victories and sold them at public auctions. In the early 1 century, auctions were held in ancient Buddhist temples to raise funds to operate the facilities (Prince, 1999). Great Britain was the first country to popularize auctions for the commercial exchange of materials about 400 years ago. At that time, auctions regularly occurred in taverns and coffeehouses to sell artwork, furniture, and other commodity items (Cassady, 1967). In the mid 18th century, two prestigious auction houses were established in London: Sotheby's in 1744 and Christie's in 1766; they are still in operation today. During the colonial period, immigrants to the United States used auctions to sell animals, agricultural products, farm equipment, and, unsurprisingly, slaves (Reynolds, 1996). Today, auctions are prevailing in the U.S. corporate world for the liquidation of goods or for the sale of items otherwise unmarketable through conventional channels. Reverse auctions (RAs) are the opposite of traditional auctions. In a traditional or forward auction, interested buyers bid against each other to purchase an item until the one willing to pay the highest price remains. In a reverse or backward auction, however, a buyer solicits quotes for a product from multiple sellers, who bid against each other to get the business until the one willing to sell at the lowest price remains. Graphical illustrations of the two types of auctions are shown in Figure 1.

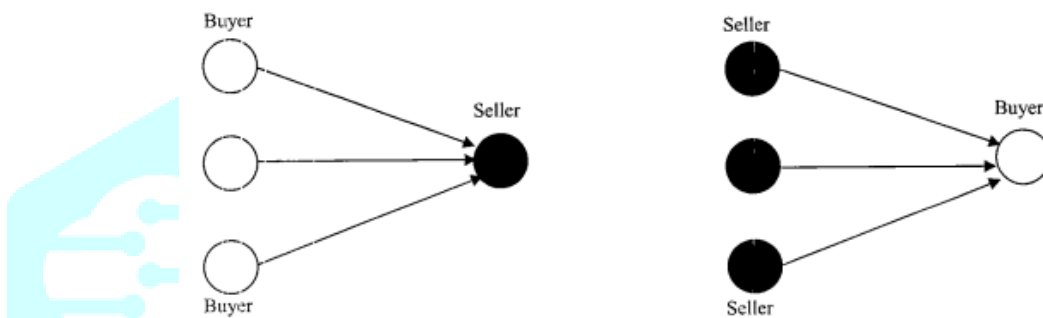


Figure 1: Two Types of Auctions [Kuo, Ching-Chung.,2004]

The Bank of England conducted the first RA of British government debt in January 1989 for £500 million nominal of stock (United Kingdom Parliament, 1989). In the U.S., the earliest RA program appeared to be established at General Motors in the early 1990s (Vasilash, 1993). In his seminal article on reverse auctioning, Karrass; (1995) explained why the new purchasing practice would work and what potential dangers might accompany it. The discussion generated much enthusiasm for RAs in the business community, which eventually facilitated the migration of reverse auctions to the Internet and gave rise to such auction houses as FreeMarkets and Priceline.com.

In 1994, Glen Meakem of General Electric (GE) recommended the use of ORAs but was told by the company's management that they did not represent the best strategy to pursue at that time. Subsequently, he left GE to found FreeMarkets, Inc., which is now one of the major players in the electronic auction arena (Hannon, 2001b). Priceline.com, the first company to apply ORAs in the open market, allows prospective passengers to post requests for airplane tickets on its website with airlines vying for the business by lowering fares. In 1998, Priceline.com earned a patent covering the so-called "bilateral buyer-driven commerce," which protects its Internet-based reverse auctioning format (Anonymous, 1998). Presently, a large number of businesses compete for a share of the market where ORAs exploit the strength of the Internet to deliver a revolutionary, customer-focused shopping environment. Numerous private organizations and government agencies have also entered the ORA arena and are conducting reverse auctions on the Web.

2.3 Types of reverse auctions

Reverse auctions are just one type of e-market mechanism, bringing together buyers and sellers online to arrive at a price for a given transaction. This section provides an overview of reverse auctions, beginning with a description of the differences between forward and reverse auctions. There is still much confusion today over what the difference is between auction types.

General Auction Categories: In the world, we live in today, there is still a significant deal of confusion regarding the distinctions that exist between the many types of auctions. In a nutshell, there are really just two different kinds of auctions, which are referred to as forward auctions and reverse auctions respectively. There are a number of factors that might cause things to shift, including the current phase the sale is in and the standards that will be applied to identify the "winner" of the auction. As a result, it is possible that the current state of affairs could shift. The following are examples of these many forms: Auctions at the Yankees [Yankee Auction is a sort of Dutch Auction in which successful bidders pay the amount they bid rather than the price chosen by the lowest qualifying bidder (as is the case in a Dutch Auction). In a Dutch Auction, the price is determined by the bidder who places the lowest qualifying offer. If the auction comes to a close in this manner, the top bidders will be awarded the product at the price they offered for it. For the purpose of selling the products listed below through our website <http://www.srm.vizagsteel.com>, we are soliciting bids from interested parties who wish to place them online. The transaction is being conducted on an "as is where is and no complaint basis" of any type, whether it be physical or chemical, and unintentional usage in relation to the material as indicated against each item.

Auctions held at Vickrey [Vickrey e-auctions are an example of a typical type of online auction held in the United Kingdom. The way they function is by enabling bidders to give instructions to the platform so that it may bid on their behalf. E-auctions of this specific kind have been widely pushed by online marketplaces such as eBay. In this section, customers who are interested in purchasing a product can specify the highest possible price that they are willing to pay for it. After the conclusion of the e-auction process, the winning buyer will not necessarily pay the amount that they suggested; rather, they will pay the price that was indicated by the competitor who was the closest, plus a little "step." For example, if one user states that the most they are prepared to pay for a widget is 100 Euros, and the person who is their closest rival states that they are willing to spend 50 Euros, the user who stated that they were willing to pay 100 Euros would be the user who wins the bid, but they will only pay 50 Euros plus a tiny step (often 1 Euro or less). E-auctions hosted by Vickrey provide contestants with an incentive to reveal the true price from the outset, rather than engaging in price-based strategy over the course of the auction. This kind of online auction may be a very effective tool when used in conjunction with suppliers; suppliers will identify the lowest possible price that they are ready to settle for an item. When the online auction comes to an end, the winning provider will be awarded a price that is superior to the one that was defined as the bare minimum. This will be the price at which the next closest rival is selling their product, minus a tiny step that the buyer chooses before the e-auction begins. For instance, if supplier A places a bid of 10 Euros per widget and supplier B places an offer of 15 Euros per widget, supplier A will win the bid, but at a price of, for example, 14 Euros (where the step is set by the buyer to be 1 Euro). In most cases, just one step is required to complete this kind of online auction. During the time that the electronic auction is active, sellers submit their best offers. The winner of the online auction and the final price are both decided by the system in accordance with the formula that was outlined earlier in this paragraph. Using Vickrey e-auctions means, of course, that the e-auction platform conceals from the buyer the price that was indicated by the supply, and that both buyers and suppliers trust the platform to accurately and confidentially compute the best pricing. This is because the buyer cannot see the price that was indicated by the supplier. There are further variants of Vickrey e-auctions that enable several rounds or the creation of a hybrid Vickrey/British Reverse e-auction. In this type of auction, sellers are able to view their position in the order of price and rank and change their best bids in accordance with the strategy they have chosen.

Japanese auctions The electronic auction in Japan works the same way as the one in the Netherlands, with the exception that sellers can only view a price and a countdown timer. On the other hand, rather of beginning with a very low price, the auction begins with a very high price, and then the price drops at regular intervals. As the price falls down, some of the providers will not be able to reach the listed price, and they will "opt-out" of participating in the auction. The transaction is awarded to the provider who is still in business at the end. You have the ability to establish several degrees of competitive exposure whenever you create a Japanese Reverse e-auction with Prokuria. For instance, they could choose to show potential suppliers that there are other offers at the same price, but not specify how many other offers there are (in which case the psychological pressure on suppliers would be higher), or they could specify that there are X other offers at the same price (in which case suppliers would have some wiggle room to employ various bidding strategies).

English Auction An open-outcry auction, sometimes known as an English reverse, is characterized by a high level of candor. This type of reverse auction works well when the price is an important factor. Every supplier can see the leading bid (as opposed to a ranked reverse auction, where only the winning bidder sees the bid). Each supplier has an equal chance of winning the auction, provided their price and quality are acceptable to the buyer.

Forward Auctions: In a forward auction, there is only one seller who is presenting the thing for sale, and the buyers compete with one another to purchase the item by bidding the price up higher and higher.



Figure 2. Forward Auctions [Wyld, David C.,2011].

Figure 2 illustrates the aspects that distinguish this type of auction from others. To a much greater extent, the general public is more familiar with the workings of forward auctions than they are with those of reverse auctions. This is largely attributable to the fact that forward auctions are more often employed at the consumer level.

In point of fact, forward auctions serve as the foundation for all other kinds of auctions, including the ones that are held on eBay and other online auction sites for the sale of art, wine, and other collectibles. They are also often used for auctioning a wide range of products, including vehicles, real estate, and machinery, amongst other things, with the purpose of the seller receiving the highest possible price for the object that is being offered at auction in the context of that particular auction. For this reason, a forward auction should be utilized for the sale of items and services of any sort, regardless of whether the transaction takes place offline, online, or through a mix of the two channels.

Internet-based or electronic reverse auctions, often known as "eRAs" (which is how we shall refer to them interchangeably throughout this book), are, by virtue of their own definition, a particular category of the electronic market. Electronic markets, also known as e-markets, can be thought of as online forums or marketplaces where buyers and sellers can connect with one another to share information and carry out transactions [1]. We shall refer to Internet-based or electronic reverse auctions as "eRAs" for the entirety of this study.

It is possible to characterize a reverse auction as "a real-time online competitive bidding event where the buyer sends out a request for quotation and suppliers bid on the business, decreasing their selling prices until optimally a true market price has been reached" [3]. This term applies in any scenario involving the acquisition of goods or services. An individual purchaser starts a procurement process known as a reverse auction by telling potential sellers of their desire to acquire a certain commodity or service. This can be done in order to obtain the best possible price for the item or service. The sellers engaged in cutthroat competition with one another during the course of the actual event of the reverse auction in order to secure the buyer's business. Because of this, the final price that was decided upon for the item was lowered to reflect this development. Because of this, the bid usually goes to the vendor that is able to offer the finest overall package to their customers. Not only may dynamic pricing be implemented via the use of reverse auctions, but the dynamics of the actual purchasing process can also be altered through their use. In an auction style known as a reverse auction, the roles of bidders and sellers, as they are traditionally understood, are swapped around. Instead of buyers responding to what sellers have to offer, retailers shift their practices to accommodate the requirements of the consumer [4]. Reverse auctions are employed in the process of acquiring products and services by private firms, government agencies, and non-profit organizations the majority of the time, despite the fact that there are a few exceptions to this rule (decisions on resource allocation, auctions for charity purposes, etc.). However, the most common usage of reverse auctions is in the process of selling goods and services for charitable causes.

Both sorts of auctions are growing at astounding rates in today's current day, and one of the primary reasons for this is the power of the internet to link individuals from all over the world. Consumers increasingly routinely participate in online auctions for a range of goods and services, ranging from electronic items to vacation package deals. This has sped the extension of forward auctions into new sectors, which can be seen as a positive development. Although it may appear that the mechanism behind the reverse auction is simple - having suppliers compete for the buyer's business and bringing prices down in the process - this is actually a very complex operation [5]. The task of managing and processing the information and knowledge that is exchanged between the buying organization and potential vendors at the auction is actually quite difficult. As a result of this, up until quite recently, the only organizations in the private sector that were able to benefit from the cost reductions associated with reverse auctions were the largest ones. This is due to the fact that the task is clearly out of reach for companies operating in the public sector and is beyond the capabilities of the vast majority of small firms. Therefore, we are seeing an ever-increasing number of organizations, both in the United States and abroad, using reverse auctions as a key part of their procurement strategies in order to ensure that they are obtaining the best-value for their acquisition budgets by obtaining "real-time" market prices on a variety of goods and services. This allows them to ensure that they are obtaining the best-value for their acquisition budgets in order to guarantee that they are obtaining the best-value for their acquisition budgets. This is due to the fact that these businesses want to ensure that they are getting the most value for the money that they are spending on acquisitions. Through the use of a process known as a reverse auction, a buyer has the option to collect bids from several prospective providers. When compared to any other method of acquiring goods or services, a reverse auction is unique in that it allows potential providers to take part in the bidding process at a very low cost and irrespective of their physical location [6].

2.4. Suitability for reverse auction

An attractive deal: It is necessary for the content of the contract (and, subsequently, the auction) to have a certain level of relevance for the market in terms of both its relative size and value in order to produce a contract that is really interesting for providers to enter into. In the event that this is not the case, suppliers would prefer to lose this contract in order to avoid hurting the margins of other contracts than to have this contract on a margin that is disproportionately low. This is because losing this contract would allow them to avoid the risk of damaging the margins of other contracts. (Jean-Philippe Massin is credited with developing reverse auctions)

Price flexibility: It is essential for bidders to have a solid understanding of the aspects of the contract that they may really negotiate in order to have a clear concept of the price increases that can be anticipated during an auction.

Enough participants: There must be a minimum of two bids placed. On the other hand, it is conceivable to state, in a general sense, that the possibility of an auction having dynamics is increased proportionately with the number of suppliers that participate in the auction.

Representative supplier panel: By taking part in a competitive auction that has been thoroughly arranged, one has the opportunity to get the best price that is currently accessible on the market. The pricing of the market can be satisfied only when there is involvement from suppliers whose customers are reflective of the market.

New suppliers: When a market is dominated by a group of suppliers who are familiar with one another, there is a greater likelihood of this happening because it increases the likelihood that a group of providers will split up all of the available contracts amongst themselves. There is a potential that this will happen. It is conceivable for these sellers to arrive to an agreement on a shared arrangement in advance, something that is particularly feasible while an auction is taking place. The participation of previously untested bidders in the bidding process is the method that has shown to be the most successful in mitigating the effects of this risk.

Qualified bidders: In order to guarantee that all of the proposals (bids) are completely comparable to one another, it is vital to qualify not only the items or services, but also the suppliers. This is done so that we can account for some of the risks that are connected with doing business with them. One way that may be used to achieve the goal of making many bids comparable to one another is to make use of supplier weightings.

Unambiguous product specifications: It ought to go without saying that the only time you will be able to correctly compare bids in an auction is if all of the sellers are competing for the exact same things or services in the same quantity contracts. This is the only circumstance in which you will be able to accurately compare offers. One way that may be used to achieve the goal of making many bids comparable to one another is to make use of supplier weightings.

Comparable offers: It is not enough to just make products and suppliers similar based on pre-qualification requirements; this must also be done. It is also vital to ensure that the entire offer is similar to one another. Consider the logistics, the costs of switching contracts, the guarantee, and any other circumstances that may apply. The use of supplier weightings is one method for making several bids comparable to one another.

Awarding method Commitment: If a bidder first exhibits his or her devotion to the outcome of the auction, only then will the sellers put forth their best effort during the event and throughout the duration of the auction. Before a consumer makes their last choice, the supplier should always exhaust all other avenues to improve their offer before turning to the auction as their ultimate resort. After the auction, there will be conversations, and those talks will call into question the dynamics of any future occurrences.

Limited initial bid level differences: The manner in which an auction is conducted as well as the success of the auction as a whole are both significantly influenced by this essential factor. When there is a close link between the various opening prices of the participating providers, there is a greater likelihood that prices will be driven down. This is because competition between the various suppliers drives down prices. Our previous observations have led us to the conclusion that there would be no dynamics in the market whenever there is a price gap of more than 20%; as a result, we are able to state this observation as a general rule.

2.5.1. Overview

In spite of the fact that a lot of focus has been placed on the "hard dollar" savings that may be obtained via the use of reverse auctions, there are also significant "soft dollar" savings that are related with their utilization. These savings are extremely important. In the past, this particular aspect was not given sufficient attention. These efficiencies are the consequence of the fact that reverse auctions, particularly those that are conducted through a third-party provider, have the potential to significantly cut down on the amount of time that is required for members of the procurement team to carry out the process of making purchases. This so-called "efficiency effect" was first documented in the research conducted by Vowler [7], who looked into the effect that using reverse auctions had on the actual costs incurred by local governments. According to the findings of Vowler, the utilization of reverse auctions resulted in a sizeable reduction in the amount of money spent. He found that while the lower prices paid on the items that were being acquired through competitive bidding could be attributed to accounting for 40% of the total savings, a full 60% of the total savings were attributed to the efficiencies gained by having procurement staffers take on more productive tasks in the time that was freed up by the use of electronic reverse auctions as opposed to traditional, paper-based, and labor-intensive purchasing methods. In other words, the use of electronic reverse auctions resulted in an increase in savings of 60%. Following an examination of the evidence, he arrived at this verdict. The use of competitive bidding, which has the potential to significantly cut acquisition cycle timeframes, can enable acquisition workers to devote their attention to significantly more productive tasks [8], which makes the efficiency features of reverse auctions in public sector procurement extremely significant.

Both the academic world and the business world are beginning to pay greater attention to the efficiency improvements that may be realized via the use of reverse auctioning. This trend is expected to continue in the foreseeable future. In their study, researchers Schrader, Schrader, and Eller documented the time and money savings associated with using reverse auctions. They found that using reverse auctions resulted in such "second order" reductions as well, cutting procurement cycle durations by up to forty percent [9]. This was accomplished by reducing the total amount of time spent on the process. According to the research that was conducted by these specialists, "buyers are seeing increased productivity from their employees in addition to receiving cost savings in the form of lower prices." The utilization of a standardized purchasing interface makes it feasible to get rid of procedures that aren't necessary. When paper approvals and processes are done away with, there is a considerable reduction in the costs connected with transaction processing. From a transactional point of view, the increased speed of reverse auctioning provides a variety of benefits, which may be obtained by businesses who take part in these types of auctions. These advantages include a reduction in the amount of time needed to complete a cycle of discussions and a lessened reliance on long-term commitments and contracts. The expediency of the reverse auctioning process is another advantage that accrues to businesses who take part in these types of sales.[10]

2.5.2. Time Savings

In point of fact, buyers increasingly view reverse auctions as "a time-saving tool" that enables them to concentrate on more value-added tasks in their job rather than processing bids, paperwork, and routine interactions [11]. This is because reverse auctions allow buyers to focus on more value-added duties in their employment. In the current market, reverse auctioning may be seen of as much more than just a way to lower prices; it may also be regarded as having many other potential benefits. In point of fact, time is one of the key differentiating aspects of reverse auctions in comparison to other methods of procurement and negotiation [12]. This is also one of the primary advantages of using reverse auctions. To put it another way, even if there is an increase in the amount of time that must be devoted to making sure that all parties are properly trained in how to participate in the auction and that they fully understand the specifications for the item(s) being contested, the utilization of reverse auctioning should mean that "overall procurement time(s) should beshorter."This is due to the hurried and time-sensitive nature of the conversations, which are held as a consequence of the simultaneous evaluations that are carried out by the sellers who are taking part in the reverse auction [13]. The simultaneous assessments are carried out as a result of the fact that the sellers are competing against one another to sell the item.To put it more simply, with each decision to bid or not bid and decrease their price to be in a lead position in the reverse auction, this means that talks that may have taken days or weeks to accomplish such price concessions are reduced to an immediate pricing decision in the atmosphere of the auction. This is because each decision to bid or not bid and decrease their price to be in a lead position in the reverse auction means that each participant has the opportunity to be in the lead position in the auction. The nature of the reverse auction offers a substantial benefit in this regard.

2.6. Difference between auction and reverse auction

Auction	Reverse auction
A reverse auction is a form of auction in which the roles of buyer and seller, as they are typically understood, are switched around.	In a reverse auction, the roles of buyer and seller, as these terms are generally understood, are swapped around.
As a result, there is only one buyer, but a large number of possible vendors. In a standard auction, commonly referred to as a "forward auction," bidders compete with one another in order to get products or services by bidding prices that are progressively higher.	This type of auction is referred to as a "reverse auction."As a direct consequence of this, there is only one buyer, but a significant pool of prospective sellers. In a traditional auction, which is more frequently referred to as a "forward auction," buyers fight with one another in order to get things or services by bidding prices that are gradually higher.
In contrast, while conducting a reverse auction, the vendors compete against one another in order to win the buyer's business. As a result, prices often go down since the sellers try to outbid one another.	When performing a reverse auction, on the other hand, the sellers compete against one another in order to obtain the buyer's business. Because of this, prices frequently decrease as a consequence of the vendors attempting to outbid one another.
A unique bid auction is comparable to a reverse auction due to the fact that the fundamental premise of both types of auctions is the same. On the other hand, a unique bid auction adheres more closely to the conventional auction structure in that each offer is kept secret and a single winner is determined at the conclusion of the auction.	A unique bid auction is analogous to a reverse auction owing to the fact that the essential premise of both kinds of auctions is the same. This is because the winning bidder is determined by the person who placed the highest bid. On the other hand, a unique bid auction sticks more closely to the structure of a traditional auction in the sense that each offer is kept secret and a single winner is decided once the auction has come to a close.
In the context of business auctions, this phrase refers to a specific kind of auction process (also known as a procurement	This phrase refers to a certain sort of auction process that is used in the context of business auctions. This process is also known as a

auction, an e-auction, a sourcing event, e-sourcing, or an eRA, an eRFP, an e-RFO, an e-procurement, or a B2B Auction).	procurement auction, an e-auction, a sourcing event, e-sourcing, or an eRA, an eRFP, an e-RFO, an e-procurement, or a B2B Auction.
It has been regular practice in many nations for many decades for both the private sector and the government to adopt open procurement methods, which are a sort of reverse auction.	Both the private sector and the government of many countries have been using open procurement processes, which may be seen of as a form of reverse auction, as part of their standard practices for many decades. This has been the case in many nations.

Review of the literature

The emergence of new technologies, particularly those that are based on information and communication, has had an effect on all facets of industry in industrialized nations (Soltes, V., Balloni, A. J., Gavurova, B., & Soltes M. 2014). This is particularly true for information and communication technologies. This is especially the case with regards to the technologies that are dependent on information and communication. An organization's internal operations have been improved as a direct result of the implementation of a wide variety of innovative solutions (Delina, R. 2012; Stefko, R., & Nowak, S. 2014; Stefanescu, A., & Stefanescu, L. 2008; Bacik, R., Gavurova, B., & Fedorko, I. 2015); Gavurova, B., Soltes, V., & Novacek, M. The implementation of information and communication technologies (ICT) in operational procedures has gained widespread acceptance, not only in the commercial sector but also in the public sector, largely as a result of the efficiency gains that result from its use. Therefore, it is natural to discover electronic solutions to numerous challenges in nearly every business, including the procurement that takes place inside supply chains (Lancioni, R., Smith, M., & Jensen, S. 2003). This is because electronic solutions are natural to discover. This is because of the change that has taken place as a direct result of the transformation that took place. ICT-based solutions play an important role in the achievement of the goals of procurement teams, enabling on-time supplies with an efficient quality-to-price ratio. This is true regardless of the type of product (goods or services) that is being purchased and the method of negotiation that is selected, such as sealed bid tender, electronic auction, or even pre-commercial procurement (PCP) and innovative partnership for highly innovative products. This holds true irrespective of the nature of the acquisition being made, be it for products or services.

There have been several variants of e-sourcing put into practice since its inception. The electronic reverse auction (eRA) is one of the types of auctions that is believed to be among the most successful forms of negotiation within the field of electronic procurement. In addition, the eRA is one of the types of auctions that is the most well-known and commonly utilized of these types of auctions. Since it was first implemented, both the rate of its widespread acceptance and the level of interest in it have been constantly on the rise ever since. This trend is expected to continue (Beall, S., et al. 2003; Jap, S. 2002; Schoenherr, T., & Mabert, V. A. 2007). According to Amelinckx, I., Muylle, S., and Lievens, A. (2008), the electronic request for offer, also known as eRA, is a method of electronic sourcing that provides a competitive and dynamic environment in which a number of suppliers compete against each other in real time to win a firm. This method of electronic sourcing is also known as the electronic request for proposal, or eRP. In this setting, the contract is granted to the service provider that achieved the highest total score by the time the procedure was complete. Due to the fact that the entire process is carried out in an online setting, this method supports the ideas of transparency and speed when compared to more conventional methods of making purchases (Sipos, G., and Turcek, M. 2015). In addition, this method is more secure than more traditional methods.

Since the introduction of the electronic savings account (eRA), there has been a lot of talk about the many ways to increase one's savings, as well as the elements that play a role in this progression. They are dependent on the circumstances of the market the vast majority of the time. As a consequence of this, the outcome of the auction will be helpful if and only if the conditions are such that they are favorable. On the basis of the previous investigations and the body of published research, we may make the assumption that there are also additional consequences. Numerous industry professionals are of the opinion that the amount of interest displayed by vendors can only be approximatively gauged by looking at the number of bids that are placed during the auction. To phrase it another way, it is to one's benefit to have a higher number of suppliers (Onur, I., Ozcan, R., & Tas, B. K. O. 2012; Pavel J., & Sicakova-Beblava, E. 2013; Pridavok, M., & Delina, R. 2013). This variable is not as significant when compared to tenders, in which each participant is only given the chance to submit a single

proposal and is not informed about the number of other providers that are vying for the same business. On the other hand, the price is dynamically driven down during the auction as a result of the rivalry among the different providers, each of whom has the objective of outbidding competitors. Within the framework of the procurement process, the relevance of this factor is greatly increased as a result of this. Some authors (Singer, M., Konstantinidis, G., Roubik, E., & Beffermann, E. 2009) claim that having one supplier results in poor outcomes; having two suppliers results in only mixed outcomes; and having a larger number of bids leads in the best savings. These findings were published in Singer, M., Konstantinidis, G., Roubik, E., & Beffermann, E. 2009. Nonetheless, there are contrasting points of view to take into consideration. (Beall. S., et al. 2003) give findings on auctions with just two providers, emphasizing that in such situations there is a large risk of loss of anonymity and a possibility that individual suppliers may recognize themselves. In addition, the authors note that in such instances there is a risk that individual suppliers may recognize themselves. Evidence is provided by others about auctions that involve more than two vendors. According to the findings of the vast majority of previous studies (Beall. S., et al. 2003; Schoenherr, T., & Mabert, V. A. 2007), in order for an auction to be successful, it has to involve at least three to five different suppliers. The auction theory concurs with this assumption (Jap, S. 2002; Yilmaz, M. 2014). Others (Wagner, S. M., and Schwab, P. A. (2004) provide a general statement that the auction ought not to be held if there is a restricted number of sellers. They say that this is because it is unfair to the remaining merchants.

Objective of the study

1. To study the Efficacy of reverse auction in the public procurement system in India.
2. To study Enhancing reverse auction use theory.

Research Methodology

This article provides a summary and analysis of what is currently known regarding the adoption and exploitation of electronic reverse auctions within the context of specific parts of the public procurement process. A structured literature review was utilized in order to achieve the task of selecting the papers that are housed inside the Scopus and Web of Science databases respectively. According to the findings of the study, researchers are devoting the majority of their attention to the following five primary areas: the appropriateness of electronic reverse auctions (eRA) for public procurement tenders; associated drivers and impediments; ethical issues; possible savings; bidding behavior; and bid distribution. As a consequence of this, the authors are arguing for three distinct directions that future research should take in order to concentrate its efforts on the reciprocal interaction of computerized reverse auctions and the long-term effects on the outcomes of public procurement projects.

3. E-procurement

Electronic Procurement, or e-Procurement as it is more often known, is a component of the revolution in information and communications technology that is having a significant impact on the day-to-day activities of both individuals and companies. E-Procurement is a word that is used to represent many different forms of e-commerce that are used to either add value to or decrease the expenditures connected with an organization's procurement operations. E-Procurement may be used to either add value to or lower the expenses associated with an organization's procurement activities. The term "e-procurement" refers to the electronic management of all buying activities, and it often starts with low-value, high-volume, non-strategic commodities and services that are needed to support the operations of the organization. Businesses of all hues and governments of many different stripes in the great majority of prosperous nations are rapidly adopting its use. This trend is expected to continue. Although every country has the same challenges with e-Government and e-Procurement, each country is at a different level in its growth due to the fact that its location, population, culture, and resources are all radically different from one another. When compared, the European Union is actively involved in the deployment of e-Procurement across all levels and sectors of government.



Figure 3: e-procurement system [Dr.J. Thirumaran.,2015] “E-Procurement – Challenges and opportunities in India”. IJARIE, Vol-1 Issue-4,pp 419-423.

3.1. Concept

Electronic procurement, also known as e-procurement or supplier exchange, is the process of requisitioning, placing orders for, and making purchases of items and services through the use of the internet. This procedure can also go by the name "e-procurement." This is a protocol that is followed while doing business with other companies.

E-procurement, in contrast to e-commerce, makes use of a closed system that is controlled by the supplier and is only accessible to those who have already registered for usage of the system. Using electronic bids, purchase orders, and invoices, customers and the vendors they choose may more easily engage with one another thanks to the efficiencies afforded by electronic procurement.

The initial steps toward the adoption of electronic procurement were done in the 1980s, with the introduction of Electronic Data Interchange (EDI), which paved the way for further development of the concept. After another decade of technological development, Electronic Data Interchange (EDI) made it feasible for companies to construct online catalogs for their suppliers. In the modern world of business, the term "e-procurement" refers to a wide range of activities, including the evaluation and selection of suppliers, the administration of contracts, electronic orders, and payments, and more.

Electronic procurement, often known as e-procurement, is the process of linking buyers and sellers digitally through the utilization of a web interface or some other kind of networked system. Electronic purchase of materials for an organization is often controlled by policies that were set either by the chief procurement officer of the company or by the procurement department of the firm.

Employing an electronic procurement system, also known as an e-procurement system, has as its primary goal the acquisition of products or services at the most advantageous price and within the most advantageous time frame conceivable. If businesses want to be successful in achieving this goal, establishing productive partnerships with the members of their supply chain is very necessary. As a direct result of this, the personnel responsible for procurement are able to successfully negotiate contracts with various suppliers. They also have the opportunity to establish criteria, such as rules or restrictions, for budgets and expenditures when using the e-procurement platform.

3.2. Electronic auction

In recent years, the specialized method of purchasing known as an electronic reverse auction (eRAs) has attracted a growing amount of interest in both the academic research and the practitioner literature. This interest is due to the fact that eRAs provide several advantages over traditional auctions. The expansion and use of eRAs are taking place in an era marked by increasing global competition and decreasing governmental control. This has resulted in an environment that does not benefit individual businesses or dyads (Farmer, 1997; Tan, 2001). Because of the climate, an atmosphere has developed that is conducive to the use of electronic Reverse auctions (eRAs). That is to say, dyadic connections are embedded inside of a larger network of trade ties (Anderson et al., 1994; Rindfleisch and Moorman, 2001), which typically rely on norms rather than contracts to link them together

(Dwyer et al., 1987; Heide and John, 1992). Rindfleisch and Moorman (2001) found that dyadic connections are embedded inside of a larger network of trade interactions. An economy based on exchange is a network of links between people who trade goods and services with one another. As an alternative to open markets and integration, these inter-organizational networks are becoming increasingly prevalent, particularly on a worldwide scale (Granovetter, 1985; Thorelli, 1986). According to Trent and Monczka (2003), the present techniques of procurement are moving away from operational purchasing (also known as "local optimization") and toward the integration and coordination of sourcing strategies on a global scale and throughout the supply chain. This transition is taking place away from operational purchasing (which is also known as "local optimization"). According to Trent and Monczka (2003), one of the primary reasons for moving away from local procurement and towards international sourcing is the reduction in overall per-unit costs. The shift towards global sourcing brings up new market opportunities, which might result in increased pricing rivalry in local markets. This is especially true when companies opt to employ eRAs, which create an environment in which several rivals fight for the business of a single customer.

When considered from the point of view of the buyer, the utilization of reverse auctions is backed by a compelling rationale. According to Tully (2000), cost reductions on a per-unit basis can range anywhere from 5 to 40 percent, with typical gross savings ranging from 15 to 20 percent (Cohn, 2000). When taking into account the fact that manufacturers spend an average of 55 percent of their revenues on purchased products and services (Monczka et al., 2002), this represents a large cost reduction. According to Emiliani (2000), major organizations operating on a worldwide scale are becoming more conscious of the fact that a one dollar drop in the costs of bought products and services is equivalent to a five dollar rise in top line revenues. These groups are coming around to the realization that this is a fact, which is encouraging.

It is not envisaged that the use of electronic records archives would ever cease; in fact, usage is expanding all the time. In July 2008, the United States government's Office of Federal Procurement Policy distributed a memorandum to the chief acquisition officer of each department, recommending that those departments make use of electronic Reverse auctions (eRAs) in situations where it was appropriate to do so. This emphasis, in conjunction with recent success stories such as the United States Department of Homeland Security saving 8.7 million dollars (9.2 percent of spend) over 525 bidding events (Ely, 2008) and the United States Air Force saving 395 thousand dollars (21 percent of spend) on one procurement conducted in the Middle East (McCree, 2008), suggests an increased utilization of the tool in the federal sector. Those who are against the implementation of eRAs say that the data that reveal reduced prices per unit do not take into consideration all of the costs that are incurred along the supply chain (Chen et al., 2005). As a consequence of this, people have the misconception that the amount of money that may be saved is far more than it actually is (Emiliani and Stec, 2002a, 2002b, 2004, 2005b). In addition, critics have proposed the idea that reverse auctions represent a fundamentally coercive use of buyer market power that, in the long term, is detrimental to the success of a firm (Giampietro and Emiliani, 2007). Because of the continuing need for electronic Reverse auctions (eRAs) Outsourcing (Schoenherr and Mabert, 2007; Schoenherr, 2008), experts in the field of sourcing need to have a thorough grasp of how to make the most of the technology, paying particular attention to how to avoid falling into any of the traps that the tool may give. Additionally, the antecedents to the perception of appropriateness and usage of business-to-business electronic marketplaces have only been investigated in a limited number of research (Beall et al., 2003; Joo and Kim, 2004; Kaufmann and Carter, 2004; Wagner and Schwab, 2004), with varying degrees of success (Beall et al., 2003; Joo and Kim, 2004; Kaufmann and Carter, 2004). Wagner and Schwab (2004). Specifically, organizational and buyer cognitive factors have been mainly ignored up until this stage in the research process. Because of this, a thorough answer to the question "Why do sourcing managers choose to use eRAs?" has not yet been supplied. The reason for this is because of the previous point.

3.3. Buyer's strategy during procurement through e-reverse auctions

Procurement auctions have given rise to innovative kinds of competitive bidding and bidding methods. For instance, in many different contexts involving procurement, buyers are required to take into consideration significant non-price criteria, such as product quality, the responsiveness and skills of suppliers, etc. As a result, a significant number of industrial purchasers rely on "buyer-determined" full-price visibility auctions. In these auctions, the characteristics of the suppliers themselves are known, but the qualities and names of their competitors remain unknown. Only price bids, which do not necessarily indicate who will win the auction, are made public to all participants; however, this information is dynamic and is subject to change over the duration of

the auction. In addition, the buyer has unrestricted discretion to choose the winner according to any criterion they see fit (Jap 2002; Engelbrecht-Wiggans et al., 2006). This structure not only enables buyers to take into consideration a variety of factors other than price when making a selection choice, but it also paves the way for new techniques for bidding on the part of suppliers. Suppliers lose the motivation to bid down below their costs, which is the predominant bidding technique in English auctions (McAfee and McMillan, 1987). If the bidder with the lowest price is not assured to win, this changes the incentive for suppliers. In these auctions, what kinds of techniques for bidding may the providers use? What kind of competitive bidding results from this situation, and how is that type impacted? And how does the nature of competition change as a result of the changes that occur inside this digital context (for example, variances in the quantity of information regarding the nature of the price bids)? The responses to these questions speak to the purpose of this Special Issue and contain crucial implications for the way in which the buyer designs procurement auctions. As economist Hal Varian pointed out, the design of an effective auction might represent a vital strategic option for the company. Designing the correct sort of auction will have as large of an influence on the brand, customer loyalty, and profit margins of the enterprise as will the designing of the appropriate kind of items.

Therefore, each bid depends on the bidder's privately known quality and inferences of the competition's quality from the bids witnessed during the auction. This creates a dynamic adjustment process that needs regular updating of opinions regarding the qualities of other bidders in the auction.

This section will present common strategies that buyers on online auction sites use and the overall effectiveness of these strategies. We will consider first auctions with buyout prices and whether the best strategy for bidders then is to use the buyout price or proceed with regular bidding.

2.1.1. Auctions with Buyout Prices for Bidders

An auction with a buyout price is where the bidder sets a fixed value for the object, and there is the option to buy the object for that value without needing to bid for it. Yang defines the three main categories of buyout auctions as follows: auctions with fixed, temporary, and permanent buyout prices [14]. An auction with a fixed buyout price is one where the sellers set a buyout price before the auction begins, and the bidders must buy the object at a price set by the seller. This is also known as regular online purchasing, and there is very little research done on this topic as it is very straightforward. First, when the bidder's valuation is less than the buyout price, a bidder's best strategy is to simply not participate in the auction because the bidder's profit would be negative. Second, when the bidder's valuation is greater than the buyout price, the best strategy is to bid the buyout price early. This decreases the possibility of other bidders buying the object before you can. Meanwhile, auctions with temporary buyout prices are ones where the first bidder chooses whether to buy the object immediately at the buyout price or to submit a regular bid above the reserve price and begin a regular auction. If the second option is chosen, the buyout price disappears.

Since bidders here are not the first mover, most studies on this topic focus on auction revenue to discuss whether sellers would implement buyout prices. A few of the papers considering the effect of buyout prices on consumers found that the probability of using the buyout price option highly depended on the individuals themselves. For example, risk-averse bidders and bidders who are in a hurry may be more likely to choose to use the buyout price [15-17]. Otherwise, the paper by Yang assuming risk-neutral bidders concluded that if the valuation of the first bidder is greater than the buyout price and greater than a calculated certain value, then the bidder should choose to use the buyout price. Otherwise, they employ the regular bidding strategy. Auctions with permanent buyout prices have buyout prices that remain throughout the course of the auction. The bidder strategies are very similar to those in auctions with temporary buyout prices, except that throughout the auction, all of the bidders can choose to continue bidding or buy the object at the buyout price. Yang writes that in a permanent auction, if the valuation is above a calculated different certain value that depends on the bidder's values, the bidder should use the buyout strategy. Otherwise, they would bid normally. Meanwhile, Gallien and Gupta believe that a permanent buyout could increase bidders' profits since it incentivises late bidding [16]

2.1.2. Theory of Online Bidding Strategies: Late Bidding

The growth of online auctions has led to a considerable number of papers discussing the behaviour of market participants in this new form of auction and how they are affected by auction ending rules. When considering online auctions, observers will quickly notice one particular strategy utilized by many bidders unique to online auctions. This strategy is 'sniping', or, as defined by eBay themselves, "waiting until the last few seconds of an

auction to make a winning bid”. Also known as “late-bidding”, multiple scholars have observed this practice and is undisputed in its existence though a few studies show conflicting levels of behaviour. Due to the prevalence of sniping, many papers have sought to understand why so many bidders, particularly on eBay, enlist this strategy and have attempted to investigate how this strategy fares against more traditional strategies such as bidding your valuation. Some earlier studies named irrational behaviour as an explanation for sniping behaviour. However, further research has led many to conclude that there are rational reasons behind sniping behaviour. Roth and Ockenfels compared the prevalence of sniping on Amazon, which employs a non-fixed end time compared to eBay’s fixed end time, against eBay, proving that snipers do have a logical reason for sniping on eBay. They introduced a new theory that suggested sniping resulted from players implicitly colluding to avoid bidding wars and that it was a best-response against naïve bidders. By modelling a private value auction, they showed sniping can lead to an equilibrium, and, as long as the probability of your bid being successfully submitted is greater than a certain value, that equilibrium payoff is greater than the payoff of the equilibrium where both players bid their valuation early on [17]. Later studies by Ambrus, Burns, and Ishii agree with Roth and Ockenfels that bidders can implicitly collude by bidding gradually or by waiting to bid until the last minute [18]. Multiple papers have explained how sniping benefits in auctions of objects with commonvalue properties by allowing more informed bidders to avoid giving less informed bidders information about the product’s true value. This can theoretically help keep the price of the object down [19,20, 21]. This view is, as far as I can tell, completely uncontested. Some later papers like Gonzales and Hasker’s, which found empirical data that they took to indicate that bidders are not using the “snipe-or-war” strategy suggested by Roth and Ockenfels, even suggested that small changes in the model of the auction to include small common-values could explain the model better [20]. So, while views towards common-value objects are universal, perhaps more research needs to be done on the instance of sniping in private-value auctions.

2.1.3. Empirical evidence of late bidding vs alternative strategies

Now that researchers agree that there are rational reasons to snipe, multiple papers have attempted to answer whether sniping is a strategy that bidders should consider actively using in the real world. We will look at this in two ways. Firstly, does sniping increase the probability of winning an auction? Secondly, does sniping increase your surplus compared to alternate strategies? Generally, studies all find that sniping increases the probability of winning the auction. Ely and Hossain found that in two identical auctions, sniping increased the probability of winning an auction by around 9% compared to the benchmark strategy of squatting (submitting a high initial bid of your valuation at the start of the auction) [21]. Gönül and Leszczyc also found that there is a greater probability of a bidder who is a sniper winning the auction [22]. However, whether sniping results in a lower final price and thus a high surplus for the bidder is more disputed. The study conducted by Ely and Hossain on eBay auctions of DVDs found that though sniping did generally yield a greater payoff compared to squatting, this increase was very small, only around 18 cents which were 1.36% of their induced valuation. Meanwhile, the study by Gönül and Leszczyc found like implications. They discovered an inverse trend between final price and the estimated probability of sniping, which they took to suggest that for auctions with a lower ending price, there is more likely to have been snipers participating. The exact likelihood and difference in ending prices were not considered. Nevertheless, they concluded that “bidders who want to win an auction and pay the lowest possible price for the item may want to use a sniping strategy.” (Gönül and Leszczyc, 2009) [23]. A field experiment by Gray and Reiley also found that, on average, sniping yielded 2.54% lower prices than squatting, with an average price reduction of $\$0.50 \pm \1.00 [24]. Finally, a study by Halton found that the time that a bid is placed has very little impact on the selling price. In other words, sniping has very little impact on the surplus earned [25]. Therefore, we can generally say that most research shows that sniping increases the probability of winning an auction. However, the surplus gained from sniping is very small on average. Furthermore, this surplus gained is only attributed to the existence of naïve bidders, where sniping is only an optimal strategy against them and not against other sophisticated bidders [19,20, 21,22]

3.3.1 The Negotiation Parameters and Lotting Strategies

The organisation that serves as the primary focus is referred to as FinanceCo. Several electronic risk assessments were carried out by FinanceCo. When electronic RAs are used for procurement, the parties involved have fewer alternatives available to them when it comes to negotiating the criteria for the transaction. The purchase price was the only negotiation criterion that was open for alteration in electronic requests for proposals (e-RAs), which were

submitted to suppliers. Throughout history, a wide range of non-monetary elements, including settlement, logistics, and inventory management, have occasionally been up for discussion and negotiation. Earlier on in the process of putting the contract for the e-RAs out to bid, FinanceCo carried out a substantial amount of research on both the product and the several potential providers. It is essential for it to collect data on the product's specifications and prices, as well as the demand and supply of the market and the qualities of the potential providers. This is done in order to ensure that the e-RA tender document addresses all aspects of the product that have even a remote chance of being relevant. Generally speaking, the performance, the quality, and the expectations of the product are benchmarked to standards that are supported by the industry or norms that have been mutually agreed upon. In order to guarantee that a fair and just atmosphere exists for "comparing apples with apples" while assessing and comparing the proposals, these norms of negotiation become non-negotiable as soon as they are defined. This is done in order to ensure that a fair and just environment exists. This is done to make certain that there is an atmosphere that is fair and just.

During the e-RA event that was held for courier and forwarding services, it was seen that one particular supplier attempted to differentiate their offerings from those of the other vendors in the market. Although the vendor was ready to meet or surpass an existing lowest offer by supplying services of a higher quality, they were not excited about decreasing the entire purchase price. This was because the vendor was concerned about losing business. It is possible that this bid is of a larger value than the other bids that are competing for the same thing; nonetheless, FinanceCo has strictly followed to the terms and conditions for the e-RAs and notified all bidders that all proposals that satisfy the requisite requirements are being examined equally. This bid gives the appearance of being more valuable than the other bids that were submitted for consideration. By doing so, FinanceCo sent to potential suppliers the message that they might potentially improve the value of their offer by promising to over-specify a product; but, they would not be successful in winning the auction unless they placed the lowest price bid.

3.3.1.1 Transparency in e-reverse Auctions

As a direct consequence of the transparency of the information that is included inside e-RAs, additional challenges that are associated with the lack of non-price negotiation criteria have been brought to light. The use of e-RAs allowed for the bundling and unbundling of different types of purchases. It is now feasible to acquire the components of a purchase that were previously only available in pre-configured bundles. This is made possible by advancements in sourcing as well as the ability to determine the pricing of individual components on an individual basis. The things themselves were commoditized, which resulted in the production of products with little or no extra features. In order to compete with one another on price, producers and merchants got rid of value-added items that did not incur any further costs for the customers. For example, in the auction for hotel accommodations for the staff, the inclusion of breakfast was omitted so that basic room accommodations could be compared more readily. This was done in order to save time during the auction. This was done to make the procedure go more smoothly. Unbundling the purchase offered FinanceCo the option to examine the price structure of its suppliers and also provided them with the flexibility to opt in (or opt out) of components of a product that were not necessary to the product's operation. In spite of this, a re-bundling of value-added services has also been observed in the market. In the electronic request for proposals (e-RA) for computing peripherals, FinanceCo established a new service, which stated that suppliers must dispose of outdated computer peripherals. This requirement was for computing peripherals. In the case of e-RAs, the buyer is the one who is in charge of preparing the tender document, and they are the ones who are required to have a very clear understanding of the delivery, settlement, product specifications, and any other distinctive characteristics. It should not come as a surprise that the competitive nature of e-RAs leads merchants to omit "frills" from the things they offer or to charge customers extra money for these "frills" individually.

For the purpose of acquiring a "basket" of items, FinanceCo has resorted to the employment of different methods due to the absence of non-price negotiation elements. Instead of buying a huge quantity of similar items all at once, FinanceCo was able to buy products of varying quality and performance alone. The division of big purchasing lots into a number of smaller ones meant that the smaller lots may be obtained either from the same supplier as the larger lots or from a number of other vendors. This created an opportunity that was not taken advantage of prior to the introduction of e-RAs since the expenses of conducting a search for various components individually sometimes exceed the price of acquiring a product that is already bundled together.

Due to the absence of non-price negotiating components, FinanceCo has been forced to resort to the use of various strategies in order to accomplish their goal of obtaining a "basket" of commodities. FinanceCo was able to purchase things of various quality and performance on their own, as opposed to purchasing a large amount of commodities that were all the same at the same time. The large purchasing lots were divided into a number of smaller ones so that the smaller lots could be bought either from the same supplier as the bigger lots or from a number of other suppliers. This allowed for greater flexibility in the procurement of the smaller lots. This presented an opportunity that was not taken advantage of previous to the advent of e-RAs because the costs of performing a search for various components individually can sometimes surpass the price of obtaining a product that is already bundled together. This is because it is sometimes more expensive to acquire a product that has all of its components already bundled together.

When it came to the overall number of purchases that were made, e-RAs enabled FinanceCo to make purchases in larger amounts on occasion by combining its purchases with those of the other divisions of its parent business. This increased the total number of purchases that were made. For example, when it came to the e-RA for hotel stays, FinanceCo had combined their purchases with those of the other business divisions of its parent company. By pooling their resources and combining their purchases, they were able to attain critical mass for less major purchases, which allowed them to take advantage of economies of scale and save money. When a supplier sells their wares to FinanceCo through electronic request for quotes (e-RAs), they have the opportunity to provide several subcomponents of a larger product and, if at all feasible, a fully-packaged solution. This is the viewpoint of a provider, who analyzes the problem from the vantage point of their own position in the supply chain.

The observations that were made on the change in behavior in FinanceCo's purchase suggest that there is the possibility for the firm to optimize its procurement practices, as shown by the observations. In addition to an increase in the level of competition among suppliers, which might result in reduced buy costs, FinanceCo obtained a better knowledge of its purchases, which enabled the company to optimize its purchasing decisions so that it could take advantage of the capabilities offered by specific suppliers. This was a positive development for both parties. Businesses should make their purchases via electronic request for quotations (e-RA) systems whenever it is feasible to do so. The vendors that supply the best bargains should be the ones from whom the company makes its purchases. However, in terms of the appraisal of the "value for money" of purchases, this provides FinanceCo with still another challenge to overcome. If there are no criteria other than price that can be negotiated, then it is likely that providers will sell their wares depending on the possibilities that present themselves. For instance, a product that requires after-sales help may be offered for sale at an inexpensive first purchase price; but, the price of continued after-sales support would be priced more to compensate for the inexpensive initial purchase price. Although it is true that such behaviors are looked down upon, a buyer must be aware that "you get what you pay for," and that electronic resource allocations are primarily a more effective instrument for pricing, and potentially for the distribution of resources as well. Prospective buyers of a product need to take into account the product's Total Cost of Ownership in addition to the product's initial purchase price. This is because the initial purchase price of a product may be merely the tip of the iceberg. Because of this issue, it is difficult to find indirect suppliers, which leads to significant monetary constraints connected with the repair, maintenance, and disposal of equipment, as well as the upgrading of the aforementioned equipment. The Total Cost of Ownership (TCO) may not be as much of a problem when it comes to direct suppliers that are more like commodities; nonetheless, the purchase price should still take into consideration the quality, delivery, and settlement flexibility of the product. In addition, the significance of the customer and suppliers cooperating on product research and design may be overlooked in e-RA transactions, despite the fact that this is a truly beneficial business practice. The capability to be flexible in delivery, inventory management, and settlement were some of the primary elements that contributed to the adoption of supply chain management by businesses. Businesses who obtain their supplies through electronic regulatory agencies (e-RAs) have an obligation to investigate the implications that come with the cessation of such partnership. In addition, the pricing of the intangible characteristics of the product, the one-of-a-kind talents of the suppliers, and any process enhancements (such as Just-In-Time manufacturing), cannot be described in terms of prices, nor can it be assumed that these things are the same. When it comes to the process of assigning pricing to the intangible characteristics of things as well as the qualities of the providers, then, e-RAs present a significant challenge for both customers and business owners in the marketplace.

3.3.2 The Timing of Electronic Reverse Auctions

Several characteristics of the product in question were taken into consideration by FinanceCo before the company made a choice on whether or not to make a purchase of supplies through electronic request for quotes (e-RAs). It was also essential to take into consideration the number of firms that supplied the items, as well as the chance that those companies may submit bids that compete with one another for the contracts. If a certain item is only sold by one or two suppliers, FinanceCo could decide against using electronic request for quotations (e-RAs) as a method to source it. When there is a restricted number of suppliers, those suppliers often have a good knowledge with one another's business methods and cost structure, and they will only be ready to submit bids that are equivalent to those of their competitors. This is because there is less competition among the suppliers. Under these circumstances, the e-RAs business model will not be able to provide the consumer with significant benefits in the form of a reduction in the total purchase price of the product. In a similar vein, e-RAs will not cause a large amount of competition if a product is given by multiple suppliers, but none of them have the spare capacity to fulfill the quantity that is required by FinanceCo.

One of the techniques that FinanceCo has used in order to boost the interest of suppliers in putting competitive bids and, as a direct result, increase the amount of competition that exists in the market is to aggregate the purchases of all of its branches and, on occasion, its sister enterprises. This is one of the tactics that FinanceCo has implemented in order to increase the amount of competition that exists in the market. During this time, FinanceCo carried out research on the market for a certain product and determined the periods of time in which there was an available surplus of capacity. As a consequence of an investigation of the shopping patterns of other organizations, FinanceCo scheduled its e-RA events such that they occurred before those of other organizations before other organizations made their purchases. This guaranteed that prospective vendors had not made significant commitments to other customers prior to FinanceCo's events. By strategically planning the timing of its purchases in comparison to other companies, FinanceCo was able to attain the largest possible participation rate and, quite possibly, the biggest possible outcome from their e-RA events. This was accomplished by gaining an advantage over the competition. If the system were correctly set up, furthermore, suppliers that wish to guarantee that they would have future business when their existing contracts expire would be able to take part in e-RAs without worrying that they will be caught in a capacity gap if they do so. This would allow them to participate in e-RAs. By employing this two-pronged strategy, which required expanding a purchase order and picking a period during which more supplier capacity was available, FinanceCo was able to maximize the amount of competition that existed among the various suppliers.

However, FinanceCo was aware that electronic Reverse auctions (e-RAs) should not place suppliers at a disadvantage to the point where there is a decline in healthy competition. This was a concern for the company. This is of utmost significance during periods of sluggish economic activity. If there is to be a consistent supply, there must be a supplier that stands to gain financially during the course of the contract. As a result, FinanceCo must walk a tightrope in order to enhance the competitiveness of its suppliers and, at the same time, prevent the suppliers from going out of business. In addition to this, FinanceCo is always searching for new vendors that are capable of meeting its standards in terms of both their expertise and their capacity.

3.3.3 Education and Awareness

E-RAs introduce the idea of shifting one's perspective from a particular spot to a more expansive region. Instead of physically attending RA events, it enables vendors to submit their bids for the tenders through the Internet, which eliminates the need for them to physically attend RA events. Although such practices have been common in seller-hosted advance auctions, it is not very frequently the case that sellers need to compete in live auctions with their competitors in order to acquire the right to offer their wares. This is due to the fact that the auctions are frequently run by the vendor themselves. To prevent suppliers from conspiring with one another and to ensure that suppliers do not view electronic request for quotes (e-RA) as merely a method to collect price quotations, the host of electronic request for quotes (e-RA) must comply with terms and conditions that have been mutually agreed upon and give some level of transparency. This is necessary in order to ensure that suppliers do not view e-RAs as merely a method to collect price quotations. According to the findings of six different e-RA FinanceCo events, with the pricing strategies that suppliers use are, without exception, reactive. This was discovered to be the case. They did not demonstrate any willingness to establish the pricing benchmark for the sector. Instead, the main objective of the suppliers was to make their prices competitive with those of the dominant player in the market. On the other hand, because of the way in which electronic RAs were designed, it is a given that the bidder

with the lowest price will be awarded the majority of the advantages. In order to further increase the incentives that are provided to suppliers for participating in e-RAs, it is the obligation of the e-RA sponsors (either the buyer or the buyer's agent) to educate potential suppliers. The goal of this is to increase the degree of information that the participating bidders have regarding the obligations and rights that they have, as well as the required processes that the buyer and the seller should follow in order to complete the transaction successfully.

The day before the actual auction, FinanceCo prepared a trial run for the auction in order to assure that the suppliers would not have any technical issues or have inadequate infrastructure for participation in the e-RAs (Lee, Chia & Corbitt, Brian 2004). This was done in order to protect FinanceCo from liability in the event that any problems arose during the actual auction. However, in order to separate the trial run from the actual auction, FinanceCo underlined to the bidders that they should not place proposals based on the pricing techniques that they would really employ if they were successful in winning the auction. The purpose of the trial auction was to provide buyers with a "simulated" experience and to clarify any potential uncertainties that may have occurred regarding the e-RA method. This was accomplished by holding the trial auction. In addition, FinanceCo assured its suppliers that it would not participate in electronic reverse auctions (e-RAs) for the sole purpose of price discovery; rather, it would do so because it fully intended to transfer providers in the near future.

Through the training and guidance that they are given, potential bidders have their awareness raised regarding the legally binding character of e-RAs. They come to realize that even though if e-RAs make it simpler to assess pricing, it is not possible to withdraw bids once they have already been presented for consideration. Because of this, potential bidders will need to have a thorough grasp of their own cost structure prior to the e-RA in order to ensure that the bids they make are both realizable and reachable. This is because the e-RA will be held electronically. As a result of the training and education efforts that are carried out, potential bidders experience significantly less anxiety and negative emotional states when participating in electronic responsive auctions (e-RAs). It is strongly advised that bidders submit their offers in a rational manner and not let their judgments be swayed by impetuous impulses or be scared by the bids that are being placed by other bidders. The efforts that are placed into training and educating ensure that participants have a consistent familiarity of the mechanism that is used to conduct the auction.

During the course of a variety of e-RA activities, a number of observations, including the ones that have been discussed thus far, were made. The e-RA event that takes place may cause the prominence of more than one of these worries to alter. Nevertheless, the person or organization that is hosting or sponsoring the electronic reverse auctions (e-RAs) is the one who is responsible for examining all of the possible results and coming up with solutions that are both workable and equitable.

3.4. Evaluation of bids in e-reverse auctions

Bid evaluation form is for use in the evaluation of bids, in accordance with the provisions of World Bank's "Procurement Regulations for IPF Borrowers, July 2016" referred to hereafter as "Procurement Regulations". This document is intended for assisting in the evaluation of bids procured through National Open Competitive Procurement following single stage two-envelope bidding process, with e-procurement. If bids are invited for individual lots (contracts) or for any combination of lots (packages), which may be awarded as a package to one bidder, or as sub-packages of one or more lots to several bidders, the bid evaluation is to be done separately, for each lot, subject to any cross-discounting.

Principles in Bid Evaluation

There are certain principles and practices of ADB in a bid evaluation that must be clearly understood and observed in the bid evaluation process.

- **Prompt Public Bid Opening:** The time for opening bids must coincide with the deadline for bid submission, or it must take place as soon as possible after that time. It is absolutely necessary to protect the integrity of the bid submission, which, in turn, helps to promote transparency right from the beginning of the process of bid review.
- **Confidentiality of Procedures:** After the bids have been publicly opened, no information regarding the examination, clarification, and evaluation of bids, as well as recommendations concerning awards, shall be communicated to any person who is not officially concerned with these procedures until after the successful bidder has been notified that they have won the contract.

- **Priority of Documents:** The Guidelines and Regulations state that the bidding document, and not the Guidelines and Regulations or the financing agreement, is the document that governs the rights and obligations of the Executing Agency and the bidders offering to supply goods and perform the works for a particular procurement activity under a project. This provision states that the bidding document governs the rights and obligations of the Executing Agency and the bidders offering to supply goods and perform the works. Following the distribution of the solicitation for bids for a particular contract, the provisions of that solicitation for bids will govern the subsequent steps of the procurement process. If there is any conflict between the solicitation for bids (the "bidding document") and this Guide, the solicitation for bids (the "bidding document") must take precedence.
- **Clarification and Modification of Bids:** After the bids have been opened, it will not be possible for any bidder to change their bid in any way.⁷ The Executing Agency will only request or accept clarifications for bids if such explanations do not alter the nature or price of the offer in any way. Both the request for explanations and the answer by the bidder are required to be made in writing or by means of appropriate electronic communication (such as scanned documents delivered through e-mail or a facsimile machine). Any response to an enquiry from the Executing Agency that results in a change in the bid price or in the substance of the bid will be deemed a modification and will not be taken into consideration in the evaluation of the bids. The Executing Agency is required to keep a record of any and all clarifications they request and receive, and they must attach these documents to the report that evaluates the bids.
- **Rejection of Bids:** All valid bids received shall be evaluated in accordance with the criteria, methods, and procedures provided in the bidding document, and only those bids which do not substantially meet the specifications, bidder qualifications and other requirements of the bidding document may be rejected.
- **Currency of Bid Evaluation:** Bid prices expressed in different currencies shall be converted into a single currency for evaluation and comparison purposes, using the selling exchange rates prescribed for similar transactions on the date and from an official source (such as the central bank) specified in the bidding document.
- **Qualifications and Track Record of the Bidder:** Only the qualifications and track record of the Bidder itself are considered in the evaluation, and not those of the Bidder's subsidiaries, parent entities, affiliates, or subcontractors, unless specifically permitted in the bidding document. For certain key elements or activities of required experience the bidding document may allow the required experience to be met by specialist subcontractors/ manufacturers.
- **Extension of Bid Validity Period:** The Executing Agency shall make every effort to complete bid evaluation and contract award before the expiration of bid validity. The validity of bids may only be extended in exceptional circumstances. If during the evaluation process an extension of bid validity is considered necessary, all those who submitted bids that have not otherwise been withdrawn shall be asked to extend the validity of their bids. Bidders who are willing to extend the validity of their bids shall not be permitted to modify the substance or price of their bids. They must, however, be required to extend the validity of their bid securities or bid securing declaration. The bid securities of bidders who do not extend the validity of their bids shall be returned to them promptly.
- **Rejection of All Bids:** The rejection of all bids is justified when the bids submitted are not substantially responsive or where none of the bids received meet the specifications, bidder qualifications, and other requirements, or where there is evidence of lack of competition. The rejection of all bids and calls for new bids solely for the reason of high prices are not accepted by ADB. Where all bid prices have substantially exceeded the cost estimate, the Borrower may, instead of calling for new bids, and after consultation with ADB, negotiate with the lowest evaluated bidder for a reduction of the bid price. If no satisfactory contract can be concluded, rebidding should be initiated with appropriate modification of the scope of the contract.

3.4.1 Definition of Bid Evaluation

Evaluating bids is a structured process that involves reviewing and comparing bids in order to choose the best offer in order for an organization to purchase the products, works, and services that are necessary for the company to meet its goals. This is done in an effort to obtain all that is necessary to attain those aims, which are outlined in the previous sentence. The offer that was determined to be the most advantageous after being exposed to the evaluation procedure is referred to as the "lowest responsive evaluated bid." The phrase "lowest responsive

evaluated bid" Alternately, it might be referred to as the most economically advantageous tender, or MEAT for short. This is because it offers the most potential financial gain.

A committee known as the Bid review Panel is in charge of evaluating each of the submissions that are submitted for employment. There are many other names that may be given to this committee, depending on the organization. The terms quotation review panel, bid review board, and tender review committee are just a few examples of the various terminologies that may be used interchangeably with this notion. The vast majority of the legal and regulatory frameworks that regulate procurement require it to be an ad hoc committee with at least three members who are knowledgeable in procurement, who have a technical grasp of the particular item that is being acquired, and who are also a representation of the organization that will be utilizing the item. For instance, in accordance with Section 30 of the Public Procurement and Concessions Act of the Republic of Liberia (PPCA-2010), the primary job of the Bid Evaluation Panel is to review the bids and offer recommendations regarding who should be granted the contract. This provision is included in the law. Before starting the process of analyzing the bids, the criteria for doing so must first be created. These criteria are then included in the documents that are up for bidding. During the bid evaluation process, only the established criteria are employed, and the panel's recommendation is to award the contract to the lowest responding proposal that has been reviewed.

3.4.1.2 Lowest Responsive Evaluated Bid versus Lowest Priced Bid

The distinction between the lowest responsive reviewed bid and the lowest priced bid is typically murky in the minds of those who are just starting out in the world of public procurement. As the phrase suggests, a lowest responsive evaluated bid is a bid that has been examined and determined to be responsive to formal qualification requirements. It has also been evaluated in detail, and it has been found to be compliant with pre-defined evaluation criteria, and it has been found to have the lowest price after price evaluation and comparison. On the other hand, the bid with the lowest price read-out at the public bid opening event is considered to be the lowest priced bid even though it has not been reviewed. As a result, the proposal that is suggested for the awarding of the contract might not necessarily be the one that has the lowest read-out price.

3.4.2 Evaluation Criteria

Evaluation criteria are the standards that are used to judge the competitiveness of bids. According to UNDP (2016), assessment criteria may be broken down into three categories: (i) obligatory criteria, (ii) weighted criteria, and (iii) weighted criteria that include required parts. Simple ways of evaluating bids employ mandatory criteria, which are graded as either pass or fail, responsive or non-responsive, or comply or non-comply. They are often utilised in the assessment process for the acquisition of commodities, but they may also be utilised for the acquisition of services and activities related to infrastructure. According to UNDP (2016), the required criteria are the initial criteria that are used to analyse bids in order to exclude bids that do not correspond to these standards.

Criteria that are weighted are those that may be evaluated according to the degree of reactivity they elicit. The method of procurement and the category of procurement both have a role in determining the scale that is used to quantify the degree of responsiveness. Typically, this is relevant when discussing the assessment of services. Weighted criteria with mandatory elements are criteria that have mandatory minimum requirements defined and are measured above that minimum requirement (UNDP, 2016). For instance, a requirement may be set for a consultant to be fluent in at least two international languages, and a rated score may be assigned for persons with additional international language capabilities, if the additional language adds value to the requirement. Weighted criteria with mandatory elements are criteria that have mandatory minimum requirements defined and are measured above that minimum requirement.

3.4.3 Stages of the Bid Evaluation Process

the bid evaluation process into four basic stages including (1) preliminary examination for responsiveness to formal qualification requirements, (2) evaluation for compliance with technical requirements, (3) price/financial evaluation and (4) post qualification/due diligence.

1. Preliminary Examinations to Determine a Candidate's Capability to Respond to Formal Qualification Requirements: During the preliminary examination, bids are inspected to ensure that they come from qualifying firms or nations, that the bid is presented with all of the requirements, that bid securities (where applicable) are legitimate, and that tax requirements and other legal and commercial criteria are satisfied. This is done to determine a candidate's capability to respond to formal qualification requirements. 2. There

is careful thought given to each and every one of these aspects. At this point, none of the bids that have been determined to be non-responsive will be given any further consideration and will be rejected outright.

2. **Evaluation to Determine Whether or Not Technical Requirements Have Been Met:** At this stage, the panel will evaluate whether or not the quality (specifications) fulfill the requirements that have been established. In addition to this, they take into consideration aspects such as the degree of experience had by the bidder, the timetable for delivery, compliance with the money that was sought, the timetable for the works, after-sale services, warranty, and any other terms that were included in the bidding papers. On the other hand, these are not fixed in stone but rather are established beforehand based on the particular circumstance. The price and the financial evaluation will not take into consideration any bids that do not comply with the technical criteria because those bids will be disqualified. Before going on to the price evaluation, all of the bids that are not responsive will be recorded, and the reasons that these bids will not be accepted for further assessment will be properly documented. This will be done before moving on to the evaluation of the prices.
3. **Price/Financial Evaluation:** At this step, the panel assesses the supplied price for computing mistakes and, depending on the sort of procurement (goods, services, or work), takes into consideration components such as provisional amounts and discounts, etc. Depending on the kind of procurement (goods, services, or labor), the panel also takes into consideration elements such as provisional amounts and discounts, etc. The panel will analyze the given price for computational mistakes in different ways depending on the kind of procurement being conducted (goods, services, or work). In the case that bids are priced in more than one currency, all of the currencies are converted to a single currency for the purpose of evaluation based on an exchange rate acquired from a specific source, as stated in the papers relevant to the bidding process. This single currency is then used to make a decision on which offer to accept. After the prices have been recalculated and evaluated, a comparison between them is carried out, and the bids are arranged in order, beginning with the lowest responding evaluated bid. In addition, research on price reasonableness is conducted in order to establish whether or not the price that is being provided by the proposed bidder is appropriate in light of the situation that the market is now in. On the other hand, the Program Procurement Guidelines (MCC PPG) of the Millennium Challenge Corporation require that this must be done expressly (see MCCPPG P1.A.1.18). Even if it is implied that an examination of price reasonableness should be done, the great majority of businesses do not consider this type of analysis to be a required criterion for the assessment process. MCC is responsible for the development of procurement and grant rules and processes, which are primarily anchored by the Programme Procurement Guidelines (PPG) and the Programme Grant Guidelines (PGG). Additionally, MCC is responsible for the oversight of MCC-funded procurements and grants that are handled by partner nations.
4. **Postqualification and more research to follow:** After being evaluated, this action will be taken with regard to the bid that obtained the lowest possible score. For certain businesses that have already gone through the process of prequalifying bids, the verification process begins with the bidder who submitted the lowest response evaluation. This verification is being performed with the intention of determining whether or not the bidder still fulfills the requirements for prequalification. Postqualifying is done in places where prequalifying was not done, and it is based on the criteria that are described in the papers that are used to request bids. Take, for instance, the fact that the North American Development Bank necessitates that this particular activity be done. This easy check is carried out in circumstances in which there is no prequalification, and it is based on the qualifying criteria that are stated in the bidding documents. Other institutions, such as the Asian Development Bank and the Millennium Challenge Corporation (see MCC PPG P1.A.2.70, P1.A.2.71), do not consider candidates for the post qualifying procedure if they have previously been prequalified.

3.5. Decision-making on pricing

Pricing decisions may have significant consequences for the organization. It is one of the first considerations for customers and it determines the amount of profit margin on the products. Pricing is one of the significant elements of the marketing mix. Pricing is an important decision making aspect after the build or manufactured. Price determines the future of the product, acceptability of the product by the customers and return and profitability from the product. The importance of pricing can be studied under the following points:

A. Most Flexible Marketing Mix Variable: Price is the most adjustable aspect of the marketing mix. Prices can be changed rapidly, as compared to other elements like product, place or promotion. Changes in product design or distribution system take a long time to be implemented. Bringing about changes in advertisements or promotional activities is also a time consuming task. But price is very flexible and can be changed according to the needs of the situation. Therefore it is a very important component of marketing mix.

B. Setting the Right Price: The wrong price decision can bring about the downfall of a company. It is extremely significant to fix prices at the right level after sufficient market research and evaluation of factors like competitors' strategies, market conditions, cost of production, etc. Low prices may attract customers in the initial stages, but it would be very hard for the company to raise prices on a future date. Similarly, a very high price will ensure more profit margins, but lesser sales. So in order to maintain balance between profitability and volume of sales, it is important to fix the right price.

C. Trigger of First Impression: Often price is the first factor a customer notices about a product. While the customer may base his final buying decision on the overall benefits offered by the product, he is likely to compare the price with the perceived value of the product to evaluate it. After learning about the price, the customers try to learn more about the product qualities. If a product is priced too high, then the customer may lose interest in knowing more. But if he thinks that a product is affordable, then he would try to get more information about it.

Therefore price is a critical factor that influences a buyer's decision. **D. Important Part of Sales Promotion:** Being the most flexible component of marketing mix, price is the most important part of the sales promotion. In order to encourage more sales, the marketing manager may reduce the price. In case of goods whose demand is price sensitive, even a small reduction in price will lead to higher sales volume. However prices should not be fluctuated too frequently to stimulate sales.

3.6. Challenges in procurement through reverse auctions

When contemplating implementing a more competitive process for their suppliers, procurement professionals have a number of primary concerns, which are outlined in the following list.

#1 Reverse auction will hurt suppliers

When reverse auctions are being held, vendors compete against one another to obtain the buyer's business by providing lower prices than their rivals. The increased level of competition should lead to lower prices for customers.

Before you pull the plug and decide to give up on hosting a reverse auction, you need to pause and ask yourself the following question: what's the use of building a strategic supplier link if you're not going to utilize it? If you're going to give up on holding a reverse auction, you need to ask yourself this question before you pull the plug. You need to take a moment to pause and ask yourself these questions before settling on a choice once and for all. The idea of many bidders competing for the same item is not fresh new. This problem has existed, albeit in varying degrees of severity, for some time in virtually every procurement firm that there is. It is possible that this will enrage some suppliers; however, this is likely to be the case only if those suppliers are not competitive or if those suppliers are incumbent enterprises that have not had their contract placed up for open and active competition for several years, or even longer.

"Any supplier who can't figure out how and when to be competitive and maintain an overall acceptable profit margin is probably not a supplier you want to do business with over the long term," says Gregg Brandyberry, president of RDPE Inc. "Any supplier who can't figure out how and when to be competitive and maintain an overall acceptable profit margin is probably not a supplier you want to do business with." "You probably don't want to do business with a supplier if they can't figure out how and when to be competitive while still maintaining an overall acceptable profit margin." "It is essential that customers bear in mind that vendors deliver the same products and services to diverse firms at variable pricing. This is something that they should keep in mind while making purchases. Costs are lower for those firms that do a good job of obtaining supplies and equipment.

Take into consideration, as well, the fact that there has been an increase in the number of online reverse auctions due to the popularity of the practice. The use of reverse auctions is more likely to play a significant role in the business practices of larger businesses. The assumption that the use of reverse auctions reflects a lack of care for the preservation of good ties between buyers and sellers may become less frequent as their use becomes more widespread. [Case in point:] eBay has announced that it will no longer host live auctions.

#2 Due to scale and size, reverse auctions benefit the largest competitors

Most of the time, smaller firms have an edge over their bigger counterparts due to the fact that they have lower overhead costs and a cost structure that is more efficient. Smaller firms often have a competitive edge, despite the

fact that larger organizations could have the benefit of scale and size. They are also more motivated to achieve success in the process of obtaining new consumers.

If a provider was rational and they judged that taking part in a reverse auction would not be profitable to their company, then they would not waste their time doing so. This would be considered a waste of time. In addition, reverse auctions have the ability to bring other benefits, such as immediate feedback on the degree to which a bid is competitive in the marketplace.

You will need to invite suppliers that are reasonably equivalent to one another in terms of their pricing power and their potential to cut prices in order to have effective reverse auctions. This will allow you to successfully run reverse auctions. Consideration of the composition of the market is also of the utmost importance; for instance, you would not want to conduct a reverse auction if the market is composed of a limited number of closely affiliated service providers.

#3 Reverse auctions will create tension with the suppliers and will weaken the company's supply chain

In most cases, reverse auctions cast buyers in the role of villains who prey on the competitive spirit of sellers by encouraging them to engage in a contest in order to increase their chances of winning a bid at a sourcing event.

Although this could have been the case a few years ago, now days both customers and sellers are much more accustomed to utilizing technology in their daily lives.

Buying organizations will often relieve any fears a supplier might have about participating in a reverse auction by:

- fostering communication;
- educating suppliers on the methods and tools used before a sourcing event takes place;
- using 3rd party hosts to administer the event.

Following the completion of the auction, the companies will make the findings public and ask for feedback in order to continue developing and refining the procedure. It is not required in any way, shape, or form that reverse auctions apply in any manner, shape, or form to any and all types of purchases. The provision of support and chances for expansion to strategic suppliers may most effectively be accomplished through the formation of strong relationships. On the other hand, the overwhelming majority of the merchants will not belong to that category. Although it's possible that some suppliers may consider the transparency of reverse auctions as a drawback, there's also a chance that others will view it as an asset due to the fact that it helps them acquire more business. On the long run, you want to work together with the people in the group who are the most competitive in terms of their overall performance, particularly those who are adaptable and productive.

#4 Reverse auctions are perceived as a way of exerting power over suppliers

The phrase "the technology that has triggered more ethical concerns in the e-commerce arena than in any other segment of activity" relates to reverse auctions. This is according to a statement that was made. Some individuals believe that reverse auctions have a "coercive" element to them since the buyers have the ability to pressure the sellers into taking part and dropping their prices. This argument is based on the reality that the power actually lies with the purchasers.

There is a possibility that some sellers will have the impression that they are being coerced into taking part in a process that pits them against one another in a battle to lower their prices. According to this point of view, reverse auctions are more likely to result in buyers and sellers engaging in exploitative conduct against one another than they are to enable purchasing groups to work together. This is because buyers and sellers have greater incentive to take advantage of one another when they are competing against one another. However, due to the fact that buyers and sellers typically have different criteria, goals, and expectations, this form of conflict is inescapable.

However, the involvement in reverse auctions actually leads in positive outcomes rather than bad outcomes for a considerable number of providers. This is the case despite the common misconception that participating in reverse auctions has negative consequences. This is due to the fact that having a high degree of specificity and clarity regarding the items and services that are being auctioned off is required in order to establish an agreement on them. Because of this requirement, buyers and suppliers are forced to increase their capacity to communicate with one another and engage more closely while the process is being carried out.

In the context of reverse auctioning, providers are provided with immediate feedback on their capacity to deliver the relevant item or service within a real-time market environment. The providers can enhance their performance with the aid of this feedback.

Therefore, if a supplier loses the reverse auction, he has the opportunity to improve his company operations in order to cut prices, produce items of a higher quality, or otherwise satisfy the demands of the buyer in a manner that is more efficient with regard to the use of both time and labor.

In addition, because they take place over such a little period of time, reverse auctions substantially reduce the amount of time required to decrease the length of time necessary to acquire a customer's business. This is because the length of time required to earn a customer's business is directly proportional to the amount of time it takes to complete the auction. They also reduce the amount of time you waste on business prospects who do not choose your company for the particular procurement that you are pursuing since they are a less likely candidate for that procurement.

It is possible to open up the competitive process by utilizing a technique known as a reverse auction. This offers an environment that is fair, transparent, and efficient for all interested providers to compete on an equal playing field for a contract. Consequently, the competitive process may be made more open. In point of fact, they are considered to be "best practice" in a significant number of different companies.

4. E-procurement scenario in India

The current amount of public procurement spending in India is 340 billion British pounds, which is roughly comparable to somewhere in the range of 15 to 20 percent of the country's annual GDP. This industry is impeded by a regulatory environment that is difficult to understand, procedures that are manual and inconsistent, and lengthy lead times in both national and state procurement agencies. Because of this, there are a number of inefficiencies that are a direct result of the money that is spent on public procurement in India. These inefficiencies come about as a direct effect of the money that is spent. When these challenges are conquered, a significant amount of value will become available, and it will be much simpler to distribute resources across a wide range of development schemes and initiatives. Beth E (2017) When it comes to e-government procurement, you need to provide more than simply technical specs. The e-GP requires strong leadership on both the political and institutional fronts in order to be successful. In order to implement e-GP in a way that is compliant with all applicable laws and regulations, there are a number of legislative and legal questions that must be answered. These judgments cover a wide range of topics, including those pertaining to the functioning, the law, and technology. (Walker H, Brammer S 2019) The people who make decisions in the government usually make specialized assessments without taking into account the implications for the policies that will be implemented. In the absence of a centralized lead procurement agency, the advantages of putting in place an e-GP system would be greatly diminished. In order for the e-GP to lead and administer the system, as well as provide mechanisms such as agreement among government organizations, it is necessary for the e-GP to have a separate central procurement office in addition to an independent procurement policy and monitoring body. (Knight L, Harland C, Telgen J, Thai KV, Callender G, McKen K 2012) For the purpose of reengineering the process of general processes for e-business, it is possible that the establishment of interdepartmental working groups or committees will be required. In order to bring management practices and transactions into the electronic environment up to date and to prevent operational challenges that did not exist when the manual process was in place, it is important to redefine the rules and regulations that govern procurement. This is necessary in order to bring about the necessary changes. The need that documents from government entities be delivered in both electronic and hard copy versions is a good illustration of this principle in action. differences across different government buildings, as well as early signs of wear and tear. (GREIFFENHAGEN and SHERMAN, respective years 2018) The legislation governing e-GP shouldn't include any information concerning the system itself in any way. To find a solution to the problems that are now being experienced, the body that is in charge should compose a set of guidelines and regulations that will govern the specifics of how the e-GP system operates and then make them accessible to users. (2015) According to A. Brandon-Jones and R. Silvestro. The idea of an e-Government program ought to be viewed of as a single network that connects the different departments, agencies, and levels of government that are present in the country. It will result in an increase in the usage of technology as well as a reduction in the duplication of security management, catalog management, supplier registration, and the difficulties associated with inter-operable systems. (Teo, T. S. H., S. Lin, and K. Lai 2014.) The use of the internet to shop for goods and services has the potential to simplify the management of administrative procedures, which is one of the many benefits of adopting this practice(Panayiotou N. A., S. P. Gayialis, and I. P. Tatsopoulos 2013). This has had the immediate effect of reducing the number of steps involved in the purchase process, which in turn has made it easier to achieve better service from the various suppliers. In India, a number of success

stories using e-procurement have been published, and these tales have provided evidence that this method is both effective and valuable. These examples of achievements have been documented inside the commercial as well as the public sectors. These illustrative instances of success may be discovered in both the public and private sectors of the economy. Not only did the e-Choupal platform, which was developed by ITC Ltd., make it easier for soybean farmers to obtain commodities, but it also helped these farmers improve their trading decisions by increasing the degree of transparency that was present in the process of procurement. Increasing the level of openness and transparency inside the system was the key to success in achieving this goal. (McKnight and Chervany, 2013; Knight, D. H., and Chervany, N. L.) The procurement site that the Andhra Pradesh government uses to support activities like e-procurement, e-tendering, e-selling, and e-auctions has also led to an increase in the simplicity with which procurement operations may be finished. This ease of completion has contributed to an increase in the number of procurement operations that have been successfully completed. This has resulted in an overall increase in the effectiveness of the methods the state uses to acquire goods and services. The following is an illustration of one of the many different ways in which the level of simplicity with which these procedures may be carried out has increased to a greater level. (2015) According to McQuiston and D.H. McQuiston In a method that is somewhat equivalent to this, the Karnataka State Police Housing Corporation is able to effectively buy services by utilizing electronic tendering in conjunction with a system of online bidding. This allows them to successfully acquire services at a cost that is within their budget. This is done in order to ensure the highest quality of findings.

One of the goals for the year 2016 that the Government of India has set for the Mission Mode Project (MMP), which is also known as the Mission Mode Project, is the implementation of the GePNIC solution. This solution was developed by the National Informatics Centre (NIC), which is the implementing authority for the e-procurement project. Another one of the goals for the year 2016 is the completion of the Mission Mode Project (MMP). The NIC is the entity that is responsible for the entire execution of the project and is liable for its completion. (Kraljic, P.,2014) MMPs are self-contained initiatives that concentrate their efforts on a particular domain of electronic governance, such as commercial taxes, property records, or banking, to name a few examples of these domains. MMPs may also concentrate their efforts on a variety of other aspects of electronic governance. Some examples of the various kinds of MMPs include the following: You could also hear managed metadata projects (MMPs), which stand for managed metadata projects, referred to simply as MMPs. MMPs can also be referred to by this word. (2015) According to Cannon and Perreault Jr. The authors are Cannon and Perreault Jr. This website not only aggregates all of the bids that have been requested from around the country by the myriad of state governments and union territories, but it also gives information on the contracts that have already been awarded. The purpose of this consolidation is to bring about procurement reforms across the whole government by elevating the degree of efficiency and integrity of the process of procuring goods and services for the government. This will be accomplished by the combination of two separate processes into one. (Parker, D.B., Zsidisin, G.A., and Ragatz, G.L., 2018) In particular, the objective of this consolidation is to carry out procurement reform across the entirety of the Department of Defense. Electronic request for quotations (e-RFQ), electronic tendering, electronic auctions, and electronic invoicing are some examples of the web-based standardized processes utilized by the most significant CPSEs. (Bunn, M.D.,2014) In order for an electronic government system to function in a way that is both effective and efficient, it is necessary to make use of a wide range of distinct electronic procurement processes. It is absolutely necessary to bring to people's notice the role that businesses operating in the private sector play in significantly contributing to the public acceptability of electronic government and digital governance.

Case studies

We took the following three steps to get acquainted with the current procurement process and in the government departments to collect auction-related data: (1) Browsing the website of the government of India departments (www.India.gov.in, accessed on 1st March 2008); (2) Studying the relevant publications by the government of India, attending seminars and workshops organized by government departments, and reviewing the published research papers on procurement of works and services; and (3) Studying the details regarding the award of work contracts in the Rural Development Department (RDD) of Orissa, a state in the Republic of India (the department spends the highest in road construction projects in the Orissa) and gathering information on the details of the work contract-awarding process and contractor evaluation attributes, by interviewing the officials of the RDD.

We consider the problem of contractor selection for two cases each involving three roadwork projects that were carried out by the RDD of Orissa.

Table 2 Contractor quoted for the works contracts.

Case	Quotation for project I by contractor j	Bid price in million Rs.	Total amount of work done in million Rs.	Avg. time taken for completion of project in months	Warranty provided in years	Physical resources available in numbers	Liquid asset in million Rs.	Past performance score
Case 1	n11	2.826	1.633	12	3	54	2.847	8.05
	n21	2.700						
	n31	2.593						
	n12	2.691	2.001	9	3.5	52	2.435	6.58
	n22	2.705						
	n32	2.589						
	n13	2.782	2.691	6	4	58	2.182	8.13
	n23	2.602						
	n33	2.485						
	n24	2.697	2.081	10	4	41	1.305	7.56
	n34	2.391						
	Case 2	n11	3.323	2.522	8	3.5	47	1.197
n21		2.112						
n31		3.153						
n12		3.192	2.385	9	3.2	42	1.252	7.19
n22		2.231						
n32		3.173						
n13		3.426	2.239	6	4	40	1.453	8.21
n23		2.341						
n33		3.248						

Case 1

The tender notice for three projects was put up on October 9, 2006, by the RDD. In this case the projects were finally awarded to contractors 2, 3, and 4, respectively.

Thus the case under consideration focuses on awarding of three roadwork projects ($I = 3$) to four contractors ($J = 4$) where projects are not divisible among the contractors and where a contractor who is likely to win more than one contract may lose one of them if his available resources, liquid assets, and the quantum of work (in rupees) done by him in the past fall short of the requirements of these projects. Three contractors (contractor 1, contractor 2, and contractor 3) have quoted for project 1, while all the four contractors have placed their bids for projects 2 and 3.

Table 2 (Case 1) gives the quotations submitted by the contractors. Column 2 of Table 2 gives n_{ij} the quotation (containing a set of values of the selection attributes) made for the i th project by the j th contractor. Each row of Table 2 (Case 1) gives the details of the corresponding contractor's quotation for different attributes.

The present practice of contractor selection does not require a contractor to quote the time to complete a project; instead it directs all the participating contractors to complete the project within a stipulated time. Therefore data on the quoted times to complete a project were not available. Also, because the present practice of contractor selection does not consider warranty period promised by the contractor, data on warranty were also not available. To apply our contractor selection model (given in Section 4), we have used surrogate measures of these two attributes, instead. We have used the average time taken by a contractor to do the i th type of projects in the past, in place

of the time quoted by the j th contractor to complete the i th project. Similarly, we have used the average warranty period provided by the contractor in the past for the i th type of projects, in place of the warranty period promised by the j th contractor for the i th project.

Table 3 Requirement set by the government.

Case	Reserve price in million Rs.	Required quantum of work in million Rs.	Required time for completion of project in months	Required physical resources in numbers	Required warranty period	Required liquid asset in million Rs.	Required past performance score
Case 1	2.943	0.971	8	28	4	0.883	8.00
	2.710	0.894	8	24	4	0.813	7.50
	2.625	0.866	6	21	4	0.788	7.50
Case 2	3.531	1.165	8	28	4	1.059	8.00
	2.410	0.795	6	24	4	0.723	7.50
	3.313	1.093	8	28	4	0.994	8.00

Table 3 (Case 1) gives the values of different attributes, published by the RDD in the tender notice.

This problem has been formulated as a binary goal programming model (mentioned in Section 4), the formulation is given in the Appendix. We have used the LINDO 6.1 software package to solve the problem (LINDO 6.1, a product of LINDO systems Inc. (Schrage, 1999), is a software package dedicated to design and solve linear and integer optimization models). The optimal solution is obtained as $Z^* = 2.000$, and the optimal values of the decision variables are obtained as follows: (X11,X12,X13,X21,X22,

X23,X24,X31,X32,X33,X34) are (0,0,1,0,0,0,1,0,0,1,0). The results imply that the first and third projects should be awarded to contractors 3 and the second project should be awarded to contractor 4. The over-achievement and under-achievement values of each goal are the following: $d1 \frac{1}{4} 0:314; d12 \frac{1}{4} 2; d\beta22 \frac{1}{4} 2; d\beta14 \frac{1}{4} 0:130; d\beta24 \frac{1}{4} 0:060; d\beta34 \frac{1}{4} 0:63$, and $d\beta1 \frac{1}{4} d\beta12 \frac{1}{4} d\beta22 \frac{1}{4} d22 \frac{1}{4} d\beta32 \frac{1}{4} d13 \frac{1}{4} d23 \frac{1}{4} d33 \frac{1}{4} d14 \frac{1}{4} d24 \frac{1}{4} d34 \frac{1}{4} d\beta13 \frac{1}{4} d\beta23 \frac{1}{4} d\beta33 \frac{1}{4} 0$: The optimal solution meets all the ten goals set by the government department.

Table 4 (Case 1) gives the following: (1) the RDD's actual decision with regard to awarding the projects to the contractors for the present case (column 3). The results obtained for the present case when the binary goal programming model was formulated and solved for each project separately by ignoring the suggested selection attributes of quoted time to complete a project, quoted warranty period, and past performance (i.e. by ignoring constraints (2)–(4) in the model given in Section 4) so as to reflect the present practice of contractor selection, and (2) the results obtained for the case when the model was solved by considering all the selection attributes suggested in the paper (column 4).

The last row of the Table 4 (Case 1) shows the value of the objective function as obtained for the two cases. We observe that when the three new selection attributes are considered in addition to those already used by RDD, the optimal results (given in column 3) are entirely different from those for the present selection process. Contractor 2 lost the project 1 in the proposed model because of poor past performance score (6.58) and low warranty period quoted (3.5) compared to those of contractor 3 (with value of 8.13). In fact, contractor 2 failed to get any project because of the same reasons. Further, contractor 3, who quoted the least completion time and the highest warranty period, also won the award of project 3. Contractor 4, who had reasonably high amount of work done in the past and quoted reasonably low bid price and the highest value of the warranty period, won the award of the project 2.

Case 2

The tender notice for three projects was put up on April 29, 2007, by the RDD. In this case the projects were finally awarded to contractors 2, 1, and 1, respectively.

Thus the case under consideration focuses on awarding of three roadwork projects ($I = 3$) to three contractors ($J = 3$). Three contractors (contractor 1, contractor 2, and contractor 3) have quoted for all the three projects.

Table 4 Comparison of outputs between present practice and proposed method.

Case	Project	Contractor who was awarded the project	
		RDD's present practice	Proposed model
Case 1	1	2	3
	2	3	4
	3	4	3
	Value of the objective	0.592	2.000
Case 2	1	2	2
	2	1	3
	3	1	1
	Value of the objective	0.797	3.430

Table 2 (Case 2) gives the quotations that were submitted by the contractors. Column 2 of Table 2 gives n_{ij} the quotation (containing a set of values of the selection attributes) made for the i th project by the j th contractor. Each row of Table 2 (Case 2) gives the details of the corresponding contractor's quotation for different attributes.

Table 3 (Case 2) gives the values of different attributes, published by the RDD in the tender notice.

Solving this problem (mentioned in Section 4) using the LINDO 6.1 software package. The optimal solution is obtained as $Z^* = 3.430$, and the optimal values of the decision variables are obtained as follows: $(X_{11}, X_{12}, X_{13}, X_{21}, X_{22}, X_{23}, X_{31}, X_{32}, X_{33})$ are $(0, 1, 0, 0, 0, 1, 1, 0, 0)$. The results imply that the first, second, and third projects should be awarded to contractors 2, 3, and 1, respectively. The over-achievement and under-achievement values of each goal are the following: $dp_{12} \frac{1}{4} 1; d_{13} \frac{1}{4} 0.8; d_{33} \frac{1}{4} 0.5; d_{14} \frac{1}{4} 0.81; d_{34} \frac{1}{4} 0.32; d_1 \frac{1}{4} 0.568, dp_{24} \frac{1}{4} 0.071$ and $dp_1 \frac{1}{4} d_{12} \frac{1}{4} dp_{14} \frac{1}{4} dp_{22} \frac{1}{4} d_{22} \frac{1}{4} dp_{23} \frac{1}{4} dp_{32} \frac{1}{4} d_{23} \frac{1}{4} d_{24} \frac{1}{4} d_{13} \frac{1}{4} dp_{23} \frac{1}{4} d_{32} \frac{1}{4} dp_{33} \frac{1}{4} dp_{34} \frac{1}{4} 0$. The optimal solution meets all the ten goals set by the government department.

Table 4 (Case 2) gives the following: (1) Column 3 gives the RDD's actual decision by solving binary goal programming model for each project separately and ignoring the suggested three selection attributes and (2) Column 4 gives the results obtained for the case when the model was solved by considering all the selection attributes suggested in the paper.

The last row of the Table 4 (Case 2) gives the values of the objective function when selection attributes are not considered (RDD's present practice) and when they are considered. We observe that in the proposed model results in different project allocation decision and in a higher value of objective function compared to the present practice. Contractor-1 lost the project-2 in the proposed model because of non-availability of adequate physical resources and liquid asset required to take up two projects simultaneously. This is also the reason for other two contractors for getting one project each.

5. Usage of the e-reverse auction in the public procurement system in India

The most major benefit that may accrue to purchasers as a direct result of the broad usage of eRA is the potential for a decrease in costs. This reduction in costs may be achieved by engaging in fruitful real-time online price negotiation. eRA has been widely adopted. The amount of money saved on prices is calculated by deducting the price that was historically observed or forecasted from the offer that was submitted at the lowest possible price. However, it is essential to bear in mind that these cost reductions should be treated as gross savings, as Emiliani and Stec (2002) and Aloini et al. (2012a, 2012b) have found. This is one of the most crucial things to keep in mind. According to them, true savings, which are also known as net savings, should be taken into consideration since they take into account switching costs, auction charges, and other losses such as the risk that the buyer would not accept the offer with the lowest price. According to Pawar et al. (2017), the percentage of possible cost reduction that may be realized through the use of eRA-supported bids can vary anywhere from 3% to 40%. This range allows for a greater degree of flexibility in terms of how much of a reduction in costs can be achieved. This significant variation in relative cost savings can be attributed to a number of different factors, such as the nature of the purchase (for instance, the amount of money saved when making straight rebuys with frequent usage of an eRA is significantly less than when making eRA-supported fresh buys), or the supply and demand dynamics of particular markets. It is essential to underline, in light of the possibility of cost savings, that one of the most significant roles played by eRA factors is by the number of bids. This is because one of the most important roles played by eRA factors is by the number of bids. According to Wagner and Schwab (2004), there is already an acceptable degree of competition in eRA because there are four bidders participating in the auction. According to Jap (2007), increased levels of competition put further pressure on suppliers to cut the profit margins of their products. This pressure may be seen in the number of bids that are submitted. According to the findings of Delina et al. (2019), increasing the number of bids results in higher savings in the overall cost. There are further elements that impact the likelihood of cost reductions, such as the structure of the auction (for example, rank-based visibility as opposed to price-based visibility). In addition, there are additional factors that influence the possibility of cost reductions. Yenyurt et al. (2011) found that when visibility was evaluated based on rank rather than total number of offers, the influence of the total number of bids was significantly bigger. When there is a restricted supplier base that can be accessed, the multi-attribute auction approach that was introduced by Ray et al. (2011) might be a useful instrument to have on hand. This is due to the fact that many customers are met with the unwillingness of suppliers to participate in electronic risk assessment (Wamuziri, 2009).

Even if the amount of money saved is affected by a wide variety of factors, the findings of Prdavok and Delina (2013) indicate that the amount of money saved is not connected to the monetary worth of the contract. This is the

case despite the fact that the amount of money saved is impacted by a wide variety of circumstances. When evaluated from this perspective, it is reasonable to suppose that it is feasible to gain large cost reductions even for relatively modest purchases. This is because it is easy to purchase items in bulk. However, Smeltzer and Carr (2003) indicate that the monetary amount of the transaction needs to be sufficiently big in order to persuade potential suppliers to take part in eRA. This may be done by increasing the amount of money involved in the transaction. Because of this, the bad attractiveness of smaller contracts from a financial point of view needs to be reinforced by the attractiveness of another quality, such as the distinctive and seductive subject of purchase or the high reputation of the purchaser. In other words, the attractiveness of a smaller contract needs to be compensated for by the attractiveness of an additional attribute.

The usage of e-reverse auction in the public procurement system in India has been gaining momentum in recent years. An e-reverse auction is an online bidding process where suppliers compete to offer the lowest price for a particular contract or project. It is a tool used to promote transparency, competitiveness, and cost-effectiveness in public procurement.

The Government of India has recognized the potential benefits of e-reverse auctions and has taken several initiatives to promote their usage. Here are some key points regarding the usage of e-reverse auctions in the public procurement system in India:

1. **Government e-Marketplace (GeM):** The Government of India has established the GeM platform, an online marketplace for government procurement. GeM facilitates the use of e-reverse auctions as one of the methods to procure goods and services. It provides a user-friendly interface for both buyers and sellers to participate in the auction process.
2. **Central Public Procurement Portal (CPPP):** The CPPP, operated by the Public Procurement Division of the Ministry of Finance, Government of India, also supports e-reverse auctions. It serves as a central portal for publishing procurement notices, receiving bids, and conducting online auctions.
3. **Cost-effectiveness:** E-reverse auctions are particularly useful for procuring standardized goods or services where price is the primary consideration. By promoting competition among suppliers, e-reverse auctions can lead to lower prices and cost savings for the government.
4. **Transparency and fairness:** The online nature of e-reverse auctions ensures transparency in the procurement process. All participating suppliers can see the bidding activity and the lowest bid. This transparency helps in eliminating favoritism and corruption.
5. **Training and capacity building:** The government has been conducting training programs and workshops to familiarize procurement officials with the e-reverse auction process. These initiatives aim to enhance their understanding of the system and its effective utilization.
6. **Eligibility criteria and qualification:** To participate in e-reverse auctions, suppliers need to meet certain eligibility criteria and qualification standards set by the procuring authority. This ensures that only competent and qualified suppliers can participate, enhancing the quality of bids received.
7. **Sector-specific implementation:** E-reverse auctions have been successfully implemented in various sectors, including infrastructure, healthcare, construction, and goods procurement. The government has identified specific sectors where e-reverse auctions can be particularly effective in achieving cost savings and value for money.
8. **Increased competition:** E-reverse auctions encourage a higher level of competition among suppliers. By creating a transparent and level playing field, multiple suppliers can participate and bid for the contract, leading to increased competition. This competition can drive down prices and result in better value for the procuring entity.
9. **Time and cost savings:** E-reverse auctions streamline the procurement process by automating various tasks, such as bid submission, evaluation, and contract award. This reduces the administrative burden and paperwork involved in traditional procurement methods. Additionally, e-reverse auctions generally have shorter timeframes, allowing for faster procurement cycles.
10. **Enhanced market access:** E-reverse auctions provide an opportunity for small and medium-sized enterprises (SMEs) to participate in public procurement. The online platform enables SMEs to access a larger market, compete with larger firms, and showcase their capabilities. This promotes inclusivity and supports the growth of SMEs.

11. Real-time monitoring and reporting: E-reverse auctions provide real-time monitoring and reporting features, allowing procuring entities to track the bidding process, view bid prices, and monitor supplier activity. This transparency and monitoring help in ensuring compliance with procurement regulations and identifying any potential irregularities.
12. Supplier feedback and evaluation: E-reverse auctions enable suppliers to receive immediate feedback on their bids and pricing competitiveness. This feedback can help suppliers improve their future bids and pricing strategies. It also encourages suppliers to enhance their efficiency and quality to remain competitive.
13. Standardization and uniformity: E-reverse auctions promote standardization in the procurement process. The bidding parameters, terms, and conditions are predefined, ensuring uniformity and consistency in the evaluation of bids. This reduces the potential for subjective decision-making and enhances fairness in the process.
14. Continuous improvement and learning: The usage of e-reverse auctions allows procuring entities to analyze historical bidding data and identify trends, patterns, and best practices. This analysis can inform future procurement strategies, improve procurement policies, and enhance overall efficiency in the public procurement system.
15. Challenges and considerations: While e-reverse auctions offer numerous benefits, there are challenges to address. These include the need for robust internet connectivity, ensuring data security and confidentiality, training stakeholders on the use of the platform, and managing the transition from traditional procurement methods to e-reverse auctions.

It is worth noting that while e-reverse auctions have their advantages, they may not be suitable for all types of procurements. Factors such as complexity, quality considerations, and supplier capacity need to be evaluated before deciding to use e-reverse auctions in a particular procurement process. The Indian government continues to focus on leveraging technology and digital platforms to enhance the efficiency and effectiveness of public procurement processes. The usage of e-reverse auctions is part of this larger effort to drive transparency, competitiveness, and cost savings in public procurement in India.

The usage of e-reverse auctions in the public procurement system in India has gained significant traction in recent years, driven by the government's focus on promoting transparency, competitiveness, and cost-effectiveness. The Government e-Marketplace (GeM) and the Central Public Procurement Portal (CPPP) are two key platforms facilitating the adoption of e-reverse auctions. These online platforms provide user-friendly interfaces for buyers and sellers to participate in the auction process, enabling suppliers to compete and offer the lowest prices for contracts or projects. The benefits of e-reverse auctions are manifold. They promote cost savings by fostering competition among suppliers, leading to lower prices and enhanced value for money. The online nature of e-reverse auctions ensures transparency and fairness, eliminating favoritism and corruption. The government has conducted training programs to enhance the understanding of procurement officials regarding the e-reverse auction process. While e-reverse auctions may not be suitable for all procurements, they have been successfully implemented in various sectors, including infrastructure, healthcare, construction, and goods procurement. The government has identified specific sectors where e-reverse auctions can deliver significant cost savings and value for public funds. Overall, the usage of e-reverse auctions in the public procurement system in India is aimed at driving efficiency, transparency, and better utilization of resources.

E-reverse auctions offer several advantages in the Indian public procurement system. They promote increased competition among suppliers, which can lead to better pricing and quality of goods and services. The streamlined and automated nature of e-reverse auctions saves time and reduces administrative burden, resulting in faster procurement cycles. This efficiency translates into cost savings for both the government and suppliers. Moreover, e-reverse auctions provide a platform for small and medium-sized enterprises (SMEs) to participate in public procurement and expand their market reach. By fostering inclusivity, e-reverse auctions contribute to the growth and development of SMEs, which are vital for the Indian economy.

The adoption of e-reverse auctions also enables real-time monitoring and reporting, allowing procuring entities to closely track the bidding process, monitor bid prices, and ensure compliance with procurement regulations. The transparency and monitoring capabilities of e-reverse auctions contribute to accountability and mitigate the risks of corruption and favoritism. Additionally, e-reverse auctions encourage suppliers to improve their bidding strategies, pricing competitiveness, and overall efficiency to remain competitive in the market. E-reverse auctions

promote standardization and uniformity in the procurement process, reducing the potential for subjective decision-making and ensuring fairness in evaluating bids. The analysis of historical bidding data from e-reverse auctions helps in identifying trends, patterns, and best practices, which inform future procurement strategies and enhance the overall efficiency of the public procurement system. While the usage of e-reverse auctions in India's public procurement system brings significant benefits, there are challenges to address. These include the need for reliable internet connectivity, ensuring data security and confidentiality, training stakeholders on the use of the platform, and managing the transition from traditional procurement methods to e-reverse auctions. Overcoming these challenges requires a comprehensive approach that encompasses infrastructure development, capacity building, and continuous improvement in the e-procurement ecosystem. The Indian government remains committed to leveraging technology and digital platforms to drive efficiency, transparency, and cost-effectiveness in public procurement. The usage of e-reverse auctions is an integral part of this larger strategy, aiming to optimize resource allocation, maximize value for money, and ensure a level playing field for all suppliers in the public procurement process.

6. Suggestions and Conclusion

This has been done on the basis of the critical discussion of an extensive literature research, and it has been done in order to underline certain special features of the adoption and usage of eRA in the public procurement. Previous studies focused primarily on the appropriateness of eRA for public procurement-related tenders, the analysis of the drivers and barriers that influence eRA adoption, the unwillingness of suppliers to participate, the estimation of savings potential, ethical considerations, as well as the statistical analysis of bidding behavior and bid distribution. In addition, these studies looked at the distribution of bids. This evaluation offers the possibility of adopting a novel point of view, in particular with regard to the consequences that will have a long-term effect on the outcomes of projects involving public procurement. Therefore, the authors suggest that future research should be pursued in three challenging directions. These directions are as follows: (1) estimation of eRA effects in individual project phases and from the perspective of life-cycle costs; (2) considerations of achieving best value in relation with the use of eRA; and finally (3) exploration of the suitability and benefits of eRA for different project delivery methods. It is anticipated that new results that may be accomplished within the three indicated approaches will contribute to the expansion of theoretical knowledge in the subject that was examined, as well as to the implementation of eRA by procurement and purchasing practitioners who make decisions that are more informed. When seen from this perspective, the information that will be obtained in the future has the potential to significantly promote more efficient expenditures on the part of public entities in respect to procurement activities.

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