

To assess the Impact of Electronic Reverse Auction and Their Challenges in Construction Companies

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Abstract:

This paper presents the discoveries from an exploratory top to bottom contextual analysis as to e-Reverse Auctions (eRAs) in the Indian public area. These discoveries feature that (eRAs) can further develop acquirement processes, acknowledge cost investment funds and decrease conveyance times. The examination likewise takes note of that (eRAs) can deliver dis-benefits, including helpless purchaser and provider connections and social ramifications. The paper inspires examples gained from the contextual investigation examination. These are given the intend to illuminate hypothesis and practice.

This paper merges and fundamentally examines current information concerning the reception and utilization of electronic converse sales in the light of explicit elements of the development business. The discoveries of the review demonstrate that reviews are tending to particularly five fundamental regions, i.e., reasonableness of electronic opposite sell off (eRA) for development tenders, related drivers and boundaries, moral contemplations, investment funds potential and offering conduct, and bid conveyance.

Keywords:- Competition, project management, electronic reverse auction, public procurement, construction auction

Introduction:-

e-Government (eGov) is presently endemic in overall public area associations. (eGov) has empowered the Indian public area to turn out to be more proficient and powerful. This has been because of upgrades to interior and outer cycles and exercises (Wilson and Game, 2007). One new and arising space of (eGov) is e-Reverse Auctions (eRAs). In basic terms, an (eRA) is an Internet-based, on the web and dynamic sale, wherein providers bid against one another to give items at the most reduced expense for the buyer. (Stupnikova and Sukhadolets, 2019), Development is a piece of the total interest, e.g., in the perspective on foundation necessities. Public spending effectiveness is considered as an essential advance towards forestalling the development of government consumptions. A significant piece of public uses is spent on development speculations, for example, streets, rail routes, medical clinics, instructive offices,

utilities, water the executives structures, and so forth The turn of events, upkeep, and upgrades of the above-mentioned public foundation are expensive, thusly any action that adds to the improved productivity of public development speculations is gladly received. This issue is turning out to be much more significant during the monetary emergency in light of the fact that the development business has a place with the main impacted areas of the public economy.

One of the endeavors of public offices to acknowledge development speculations with higher monetary execution is connected with successful value exchange during the acquirement cycle just as to the determination of proper task conveyance technique (PDM). Customarily, plan and development processes are isolated in the development obtainment. The worker for hire is chosen by the information submitted in tenders, in paper or electronic structure, in light of the delicate assessment

rules characterized in the acquirement reports. Nonetheless, if an electronic converse sale (eRA) is utilized, the contracting authority right off the bat checks whether the submitted offers relate to the honor measures. From that point onward, in opposition to customary obtainment, the power welcomes all members to submit new sale esteems in the electronic closeout. During this bartering, members approach data on their present rankings or potentially the best offered qualities as of now submitted. In such a manner, a serious climate in the bartering is advanced. Thinking about that the development area has a high multiplier impact, stoppage in development speculations causes a bothersome sequential decrease in other related enterprises (Kozumplíková et al. 2017). As per Eurostat (2019), the development business makes 4.92% of the gross added worth of all NACE (Nomenclature des Activités Economies dans la Commune Européenne, European industry standard order framework exercises in EU 27 nations, which is 698,912.3 million EUR.

The presence of a larger number of providers is fundamental to establish a cutthroat climate in the closeout. In one of the exceptionally referred to studies on (eRA), Emiliani and Stec (2002) uncovered that the main driver for (eRA) execution and use lies in the neighborhood association of the business framework alongside monetary, useful, and administrative aspects. Moreover, they contend that (eRA) can be considered an answer working with short-term monetary destinations. Consequently, (eRA) can serve supervisors as a speedy answer for different expense issues relating, e.g., to an organization's monetary execution issues coming out from the tension from financial backers.

In this connection, electronic converse closeouts can be considered as a cutthroat and accommodating instrument to choose a proficient project worker. Without a doubt, (eRA) addresses an extraordinary instance of electronic exchange where a few providers contend in the delicate to supply items, administrations, and additionally works by diminishing their offers, particularly as far as offered costs (Mabert and Skeels, 2002; Wagner and Schwab, 2004). On account of appropriations, (eRA) is additionally exceptionally helpful. Mayr et al. (2014) revealed that this is particularly obvious in the

space of photovoltaics, where it would expand the all out power age as well as lead to a decrease openly spending.

As the utilization of (eRA) can be likewise seen as disputable (Charki et al., 2011), its possible reception and execution ought to be appropriately viewed as thinking about the elements of the particular business. Such outcomes into different issues in open acquirement in regards to development projects that should be visible as both positive and negative. In this specific circumstance, Horlen et al. (2005) uncovered the reasons for (eRA) discussion in development. In their review, it is contended that numerous project workers contradicting reverse sales accept that they ought to be permitted to submit offers dependent on their particular capacities and remarkable assets. Henceforth, rather than having recently the only a single chance to present their best costs (fixed offers), they are presented to savage and open value contest. One more part of the contention is the topic of what sorts of development works/projects are reasonable for (eRA) as far as the capacity to determine the subject of procurement adequately (Hanak, 2018). Accordingly, this paper means to solidify and fundamentally examine important issues concerning the utilization of (eRA) in the development business and propose future examination bearings.

Literature Review:-

The contextual analysis utilizes Grounded Theory (GT) created by Glaser and Strauss (1967). GT is an examination approach that expects to comprehend the peculiarity under study, which is grounded in the exact information.

The examination subject, (eRAs) in the public area, is a new and arising region. The examination is in this manner, explorative. The exploration comprises of an interpretive top to bottom contextual analysis of a UK neighborhood expert in the custom of Walsham (1995).

GT is an inductive methodology that is bound to look like authoritative reality, rather than hypothesis reasoned and created from ideas dependent on hard proof. The point is the

formation of information through contextual investigation research (Remenyi et al., 2002).

As a public area body, the contextual analysis association needs to consent to the European Union (EU) Procurement Rules (Arrowsmith, 2002). This necessary the association to promote the (eRA) and (eRA) contract in the European Journal and to follow the (EU) delicate interaction.

The contextual investigation (eRA) was by and large fruitful and delineates that specific logical conditions impact the accomplishment of any (eRA). This finding agrees with creators like Jap (2002), Beall et al. (2003) and Smeltzer and Karr (2003).

The fundamental Gershon report concerning UK public area effectiveness (Gershon, 2004) and the public acquisition methodology from the Office of the Deputy Prime Minister (ODPM, 2003) both require the UK public area to further develop acquirement to get efficiencies.

Schwab and Jap, (2007) note that the investment of four bidders in (eRA) as of now makes an adequate degree of rivalry. Expanded degree of contest estimated as far as the quantity of bidders makes tension on providers to bring down their edges.

Wamuziri (2009) guarantee that the impact of the quantity of bidders is more grounded under rank-based perceivability. As numerous purchasers face the reluctance of providers to partake in (eRA).

Objective:-

1. To assess the influence of e-Reverse auction method and gaining the goals in procurement.
2. To determine the association between e-Reverse auction technique and cost procurement system.
3. To evaluate the various factors which helps in decreasing price and increasing the desirability of the project.
4. To scrutinize the vendor's frame of mind about e-Reverse auction technique in
5. Terms of explicitly and acceptance.

Research Methodology:-

The information assortment process comprises of three stages. Initial step was information base determination, trailed by information recovery, and writing screening and supplement. As there is no past audit paper of the (eRA) subject in the development business, we chose to involve eminent data sets Scopus and Web of Science to give a worldwide outline of the exploration theme. The inquiry scope in those information bases was limited to the "Title/Abstract/Keywords" field.

To address how the current group of information has advanced towards explaining (eRA) reception and use in the development business, a methodical writing audit has been applied in this review. The examination work process (Figure 1) is created to recognize, look at, and assess all important writing on a specific exploration subject at a beginning phase. To do as such, a precise audit was utilized, as "a fundamental and basic technique for gathering themes, finding research holes, and building information systems" (Zelenika, 2013).

The gathered papers, and the survey later, considers papers distributed in peer-reviewed diaries, ideally articles and audit papers. To guarantee the top notch and oddity of information being investigated, just diary papers distributed from 2005 to 2019 were incorporated. The review was directed utilizing chosen catchphrases: electronic sale, buying closeout, invert sale, development, and development sell off. They came about into two arrangements of papers:

The writing screening and supplement were performed on the two sets. During the screening, the two sets were checked to channel copies. Then, at that point, a regressive inquiry (cross-referencing) was performed along the references to try not to miss significant references. This brought about adding a few more seasoned references (from 2003 to 2005) where the (eRA) was presented as another offering apparatus in the development business.

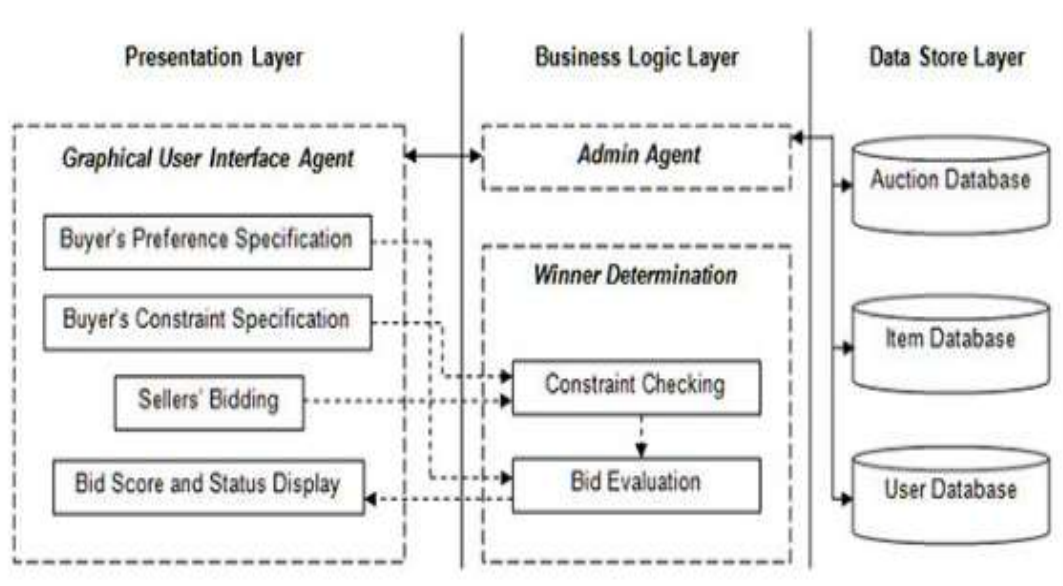


Figure 1. The research workflow.

With respect to no. 1, the directed study brought about an absolute number of 1428 (Scopus) and 1583 (Web of Science) papers. As this paper centers exclusively on the development business, a nitty gritty investigation has been led concerning construction-oriented papers. For set no. 3, 318 papers were found in Scopus and 316 in the Web of Science data set. Moreover, this set has been diminished by eliminating deceptions (152 papers) and papers that lie out of the extent of this review (182 papers). Such countless papers eliminated by being superfluous to this review is caused particularly by the way that they utilize the watchword "development" in an alternate significance. The subsequent number of examinations remembered for a point by point examination dropped altogether to 132. As the previously mentioned information demonstrate, a huge group of information on eRA exists; in any case, the extent that papers situated towards the development business are concerned, the scope of accessible writing is fundamentally more modest. The subsequent arrangement of diary papers is enhanced with a couple of references to the authority measurements and models from training. Moreover, during the writing survey,

extra sources have been gotten while examining the rundown of references.

Such a course of information assortment is trailed by a writing investigation process. It comprises of two- advance examination, (1) the measurable conveyance of gathered distributions across the time of distribution and (2) their circulation across the exploration regions. Additionally, no in-depth bibliometric examination, for example, reference of articles or creation and co-authorship investigation was performed. The quantity of distributions considered in this paper and their relating year of distribution is summed up in Figure 2, while Figure 3 gives data about research regions in which papers were ordered.

With respect to time dispersion of construction-oriented sell off diary papers, Figure 2 demonstrates the expanding interest in this theme by the examination local area during 2010–2016, while the quantity of distributed papers diminished in 2016. For 2017, it ought to be noticed that different papers might show up in the information bases during October 2018 and later.

Figure 2. India's E-reverse auction (2017-2018) for allocating renewable energy capacity.

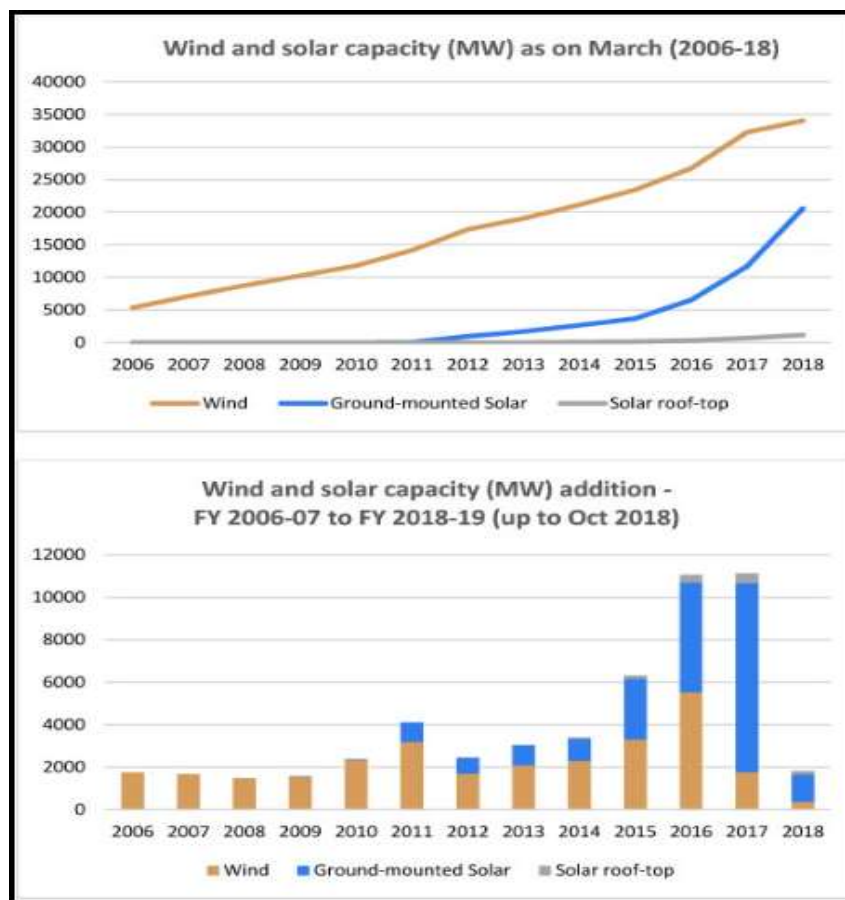


Figure 3 plainly shows that most of distributed papers are arranged towards business, the board and bookkeeping (31%), designing (29%), and

financial aspects, econometrics and money (19%) research regions. These exploration regions are fit with Scopus research regions.

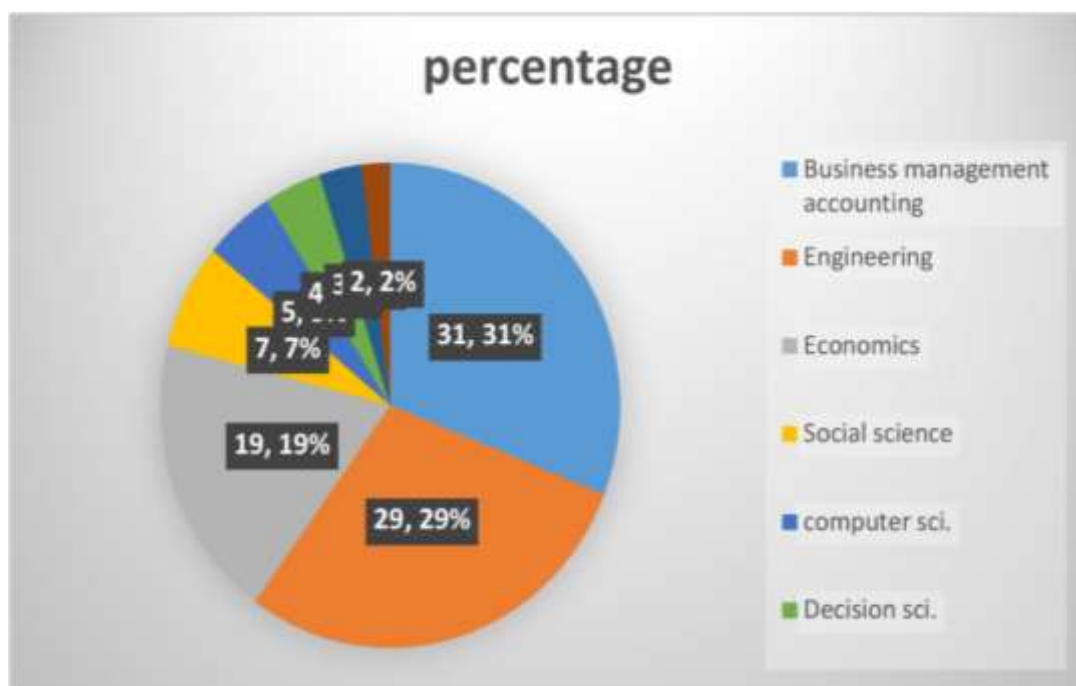


Figure 3. Research areas of published construction auction papers.

The last advance of the led research work process is "Topical conversation" that comprises of deciding the principle research regions and tending to them fundamentally bringing about future difficulties and headings. All through the cycles of information assortment and writing investigation, it was seen that the present body-of-knowledge of (eRA) in the development business comes up short on an overall outline and the papers are stacked up in a few fundamental regions with low or no suitable associations between. Those regions should be visible as the ones with taking care of issues that emerged from explicit elements of the development area, yet additionally openings and dangers for purchasers and providers. In particular, those principle regions are the appropriateness of (eRA) for development tenders, related drivers and hindrances, moral contemplations, reserve funds potential and offering conduct, and bid dissemination. As there is a sure hole between them, a basic outline is required to open new difficulties advertisement foster new bearings later on. This is done in the accompanying areas.

General Issues and Facts of eRA in Procurement

Electronic converse sell-offs are frequently considered as a speedy and simple instrument to decrease expenses of bought items (Emiliani and Stec, 2002) and still can be considered as an inventive acquirement course, as its utilization is minor in open acquisition when contrasted with the complete number of tenders. In this connection, Cabral et al. (2016) have detailed just an insignificant rate (0.6%) of eRA use in Portugal in the 2014–2015 period. A correspondingly low pace of utilization has been recognized fair and square of the European Union (European Commission 2011), and e.g., Rašić et al. (2019) tracked down only two public tenders that pre-owned (eRA) in 2018 in Croatia. Then again, there are spearheading establishments that apply (eRA) in all appropriate public tenders effectively, like the town of Znojmo in the Czech Republic (Znojmo City, 2012).

Reserve funds as the Main Benefit and Effect on Competition

The primary advantage for purchasers coming about because of (eRA) reception is monetary reserve funds that can be accomplished through viable real-time online value arrangement. Value reserve funds are processed as a contrast between noteworthy/anticipated cost and the most minimal bid submitted. Be that as it may, these investment funds ought to be considered gross investment funds, as learned by Emiliani and Stec (2002) and Aloini et al. (2012a, 2012b). As per them, genuine (or net) investment funds must be thought about as they consider exchanging costs, closeout costs, and different misfortunes, for example, the way that the purchaser may not choose the least offered. The overall measure of reserve funds that can be accomplished in (eRA) upheld tenders differs from 4% to 43% as revealed by Pawar et al. (2017). Such a huge scope of relative reserve funds reflects e.g., the kind of purchasing circumstance (for straight rebuys with rehashed (eRA) use, how much reserve funds is impressively lower than for (eRA) upheld new purchases) or diverse organic market conditions on specific business sectors.

Masters, Cons, Risks and Ethical Considerations of (eRA)

A few upsides and downsides are related with (eRA). Kumar and Maher (2008) guarantee that (eRA) gives advantages to the two purchasers and merchants; nonetheless, purchasers can help more. Aside from value reserve funds, time reserve funds and improved straightforwardness of the buying system (Hawkins et al., 2014; Standaert et al., 2015; Hanak and Selih, 2017) are by and large considered as the other principle benefits. Then again, the reluctance of providers to take part, damage of Business-to-business (B2B) connections, securing costs just as IT necessities and abilities, e.g., e-readiness, are the most frequently referenced boundaries for executing (eRA) (Amelinckx et al., 2008; Caniëls and van Raaij, 2009; Wamuziri, 2009; Hanak and Selih, 2017; Mora Cortez and Johnston, 2019). Mora Cortez and Johnston (2019) even contend that bombed (eRA) frequently brings about the end of a long-term buyer-supplier relationship. To not get the feeling that eRA contributes just to the

purchasers, a few advantages for providers ought to likewise be referenced. These advantages can be summarized in time investment funds, equivalent conditions to getting into the business (urgent in nations with a more significant level of debasement), and finding the genuine market cost for things being bought (Schoenherr and Mabert, 2007; Hawkins et al., 2014; Standaert et al., 2015).

The last issue that ought to be referenced has a place with the morals of (eRA). Charki et al. (2011) have researched moral worries of (eRA) use and how they can impact eRA use later on. In their discoveries, the meaning of bits of hearsay in the spread of anecdotes about unscrupulous conduct is featured. Pawar et al. (2017) have given a far reaching rundown of dishonest practices in (eRA) on the two purchasers' (e.g., equivocal or moving sale rules, ghost offering) and providers' side (e.g., conspiracy or ridiculously low offers). In open acquirement, for offers giving off an impression of being strangely low contracting authority will demand recorded as a hard copy subtleties of the constituent components of the delicate which it considers important before it might dismiss them (Directive 2004/18/EC, Article 56). Giving clarifications to unusually low offers empowers the end of offers that may be subject of the victor's course peculiarity (Soudry, 2004). The motivations behind why project workers experience the ill effects of the victor's course are given by Ahmed et al. (2016, for example, mistaken assessments of venture cost or solid rivalry inside the market. In this connection, Emiliani (2005) states that keeping away from moral wrongdoing, e.g., with help of sets of accepted rules for (eRA), will prompt decreasing provider's questions and an expanded degree of trust. Assuming that the (eRA) adds to higher straightforwardness of the buying system, all sales rules and conditions should be given and obviously disclosed to providers.

Result:-

1. It is essential to characterize the extent of the (eRA) and set clear determinations and sensible targets. Nearby specialists need to recognize the sort of items that are helpful for effective (eRAs) and the cycles that can be embraced to accomplish economies of scale. They ought to in this way, guarantee that normalization supports

any (eRA) detail. Item customization ought to just happen in extraordinary, appropriately considered and approved cases. Additionally, each progression of the interaction should be ready, upheld, and executed with intensive data dividing among both the purchaser and provider associations. Not all items are appropriate to (eRAs). Items that are intricate to determine are hard to convert into unambiguous details. This has inconvenient ramifications for the effectiveness of any (eRA).

2. The contextual analysis (eRA) was for the most part effective and represents that specific relevant conditions impact the achievement of any (eRA). This finding agrees with creators like Jap (2002), Beall et al. (2003) and Smeltzer and Karr (2003). These logical conditions incorporate a high volume of merchandise, maybe created by totaling all authoritative IT use, good economic situations, high rivalry and items that are easy to determine.

3. One significant issue that ought not to be over-looked, is that item clients ought to be involved at all phases of acquirement project and in addition to the client necessity and determination stage. Clients ought to be counseled and informed when the agreement is granted and engaged with the sending or rollout of the new item. This will assist with reducing protection from change and guarantee that the obtainment administration and the hardware secured meets client necessities. Another arising issue is that of an absence of eye to eye contact among purchaser and provider can be adverse to any future provider account the executives.

4. One region for thought in what's to come is that of (eRA) cooperation between open area bodies. Cooperation might work on the advantages from (eRAs) and lessen hazards. For instance, more prominent item accumulation, improvement, time and cost efficiencies. There is additionally, for the providers, the fascination of managing one enormous agreement rather than a few more modest agreements. Any provider might be more disposed to offer for one enormous agreement rather than a few more modest ones. A public area key obtainment organization might offer systems administration valuable chances to further develop public area acquisition practice.

Discussion:-

Future Challenges of (eRA) in Construction Industry

Thinking about that development projects address long-term speculations, it is important that they give effectiveness from the whole life-cycle viewpoint. Wamuziri and Abu- Shaaban (2005) underline the essential target of involving (eRA) in development acquisition not simply to bring down the agreement cost, yet rather to get the best worth. What's more, they guarantee that the best worth is feasible assuming different models are thought about alongside the cost. In such a case, the lowest-price bidder isn't naturally the champ of the delicate (Ballesteros-Pérez et al., 2015c). Such practice offers more chance to include different multi-criteria choice techniques into the most common way of deciding the best incentive for the given delicate.

The issue of best worth has been recognized in few papers examined. Hatipkarasulu and Gill (2004) contended whether the (eRA) cycle will offer the best benefit over the long haul to the purchaser. Hanak and Selih (2017) referenced accomplishing the best worth through (eRA) multi-criteria assessment, which requires the execution of scoring rules where both bid and specialized standards are involved (Ballesteros-Pérez et al., 2016). Additionally, the part of life-cycle and life-cycle costing shows up in the broke down sets of papers once in a long while (e.g., in Nesan Lenin, 2011; Hanak et al., 2017; Hanak, 2018). Starting here of view, best worth and life-cycle issues require more nitty gritty investigation by the exploration local area in the particular (eRA) setting. This connects with the investigation of the productivity of utilizing distinctive multi-criteria assessments of offers for particular sorts of public activities like streets, schools, and clinics. For these reasons, Marovic et al. (2014) fostered a multi-criteria decision-making model to assess and rank policy implementation projects to accomplish better caliber and consistency of decision-making in choosing the best speculation project from a policy implementation portfolio. They accentuated the variety of development projects and the requirement for their definite assessment while characterizing rules and appointing weight for their correlation. This different assessment is truly significant as various development projects have particular highlights

and prerequisites. For instance, for remaking of streets, the conveyance season of the works is vital to limit disturbance to the traffic stream; for schools, works must be ideally gotten ready for summer occasions, and for emergency clinics, it is important to limit office personal time and to empower full lift activity to accommodate the vehicle of stationary patients. Appropriately, it is particularly imperative to investigate the three fundamental task limitations (price-time-quality) considering (eRA) applications in genuine development projects. Particularly, it is probably not going to accomplish the best quality and best expense simultaneously as greater requires the utilization of better materials and profoundly talented laborers (which require greater expenses).

As referenced over, the essential (eRA) benefit comprises of monetary investment funds. Appropriately, for purchasers, it is indispensable to have the option to anticipate likely reserve funds. Prescient models to assess reserve funds sum in (eRA) have effectively been proposed by Hanak and Serrat (2018). Nonetheless, as the development project has a few stages (arranging, development, activity, and destruction), the (eRA) reserve funds potential ought to likewise be dissected in this more definite view. It very well may be fascinating to uncover how (eRA) reserve funds vary among the task stages. How much eRA reserve funds might be connected with explicit highlights of individual stages, e.g., enormous reproductions projects are ordinarily followed with a more elevated level of vulnerability contrasted with new development. Thusly, it tends not out of the ordinary that the affinity for artful offering will be higher for reproduction projects as providers would accomplish a monetary recuperation on additional works. Future examination ought to look at this angle further in more detail likewise considering the genuine value/grant value proportion. Therefore, it will be feasible to anticipate future life-cycle costs all the more exactly on the off chance that the (eRA) is utilized.

At long last, inside the writing being broke down, the issue of the task conveyance technique has not showed up by any stretch of the imagination. An extensive number of papers have been distributed on project conveyance techniques, contrasting e.g., the appropriateness/execution of design-bid-build

versus design-build (Hale et al., 2009; Park and Kwak, 2017) or design-bid-build versus development chief in danger (Carpenter and Bausman, 2016). As individual venture conveyance strategies enjoy benefits and impediments, a few models must be thought of as to choose the suitable one (Moon et al., 2011). According to this point of view, the suitability and advantages of (eRA) use for various venture conveyance techniques ought to be tended to also, e.g., consideration of the worker for hire during the plan stage with the intend to give a superior plan arrangement (Turina et al., 2013) has all the earmarks of being a difficult issue inside the (eRA) idea. The part of maintainability can likewise be engaged with thought, e.g., if talking about public- private-partnership projects (Gao, 2018).

Conclusions & Findings:-

In view of the basic conversation of a broad writing survey, certain particular elements of (eRA) reception and use in the development area have been featured. Past research zeroed in basically on the reasonableness of (eRA) for construction-related tenders, assessment of drivers and obstructions that influence (eRA) reception, the reluctance of providers to take part, assessment of reserve funds potential, moral contemplations, too measurable investigation of offering conduct and bid conveyance. This audit opens an entryway for another viewpoint, particularly as to long-term consequences for development project results. Along these lines, the creators recommend seeking after future exploration in three testing ways, specifically (1) assessment of (eRA) impacts in individual venture stages and according to life-cycle costs viewpoint;

(2) Contemplations of accomplishing best worth in connection with (eRA) use; lastly (3) investigation of the reasonableness and advantages of (eRA) for various undertaking conveyance strategies.

It is accepted that new discoveries that can be accomplished inside the three proposed headings that will add to the advancement of hypothetical information in the concentrated on region, just as to more educated choices and use regarding (eRA) by development buying specialists. In such manner, the information

acquired in the future may essentially advance more proficient spending with respect to public organizations in development projects.

Limitation of study:-

- The study is limited in the field of Indian public area like streets, rail routes, and medical clinics. The findings and conclusion may not be applicable for the other parts of country.
- The research is specific to reverse auction specific goods. The different types of products and services were not considered in this research project

References:-

- [1] Ahmed, Muaz O., El-Adaway, Islam H., Coatney, Kalyn T., and Mohamed S. Eid. 2016. Construction bidding and the winner's curse: Game theory approach. *Journal of Construction Engineering and Management* 142.
- [2] doi: 10.1061/ (ASCE) CcssO.1943-7862.0001058.
- [3] Aloini, Davide, Dulmin Riccardo, and Valeria Mininno. 2012a. E-procurement: What really matters in B2B e- reverse auctions. *E-procurement Management for Successful Electronic Government Systems* 87–113. doi:10.4018/978-1-4666-2119-0.ch006.
- [4] Arai, Koki, and Emi Morimoto. 2019. The construction industry and (dis)economies of scope: Empirical research in the Hokkaido procurement auction. *Journal of Industry, Competition and Trade* 19: 281–92. doi: 10.1007/s10842-018-0285-4.
- [5] Cabral, Oscar, Ferreira Luis, and Goncalo P. Dias. 2016. Adoption of reverse auctions in public e-procurement: The case of Portugal. Paper presented at Iberian Conference on Information Systems and Technologies (CISTI), Las Palmas, Spain, June 15–18. doi:10.1109/CISTI.2016.7521405.
- [6] Amelinckx, Isabele, Muylle Steve, and Annouk Lievens. 2008. Extending electronic sourcing theory: An exploratory study of electronic reverse auction outcomes. *Electronic Commerce Research*

- and Applications 7: 119–33.
doi:10.1016/j.elerap.2007.11.003.
- [7] Ballesteros-Pérez, Pablo, and Martin Skitmore. 2016. Estimating the number of new and repeated bidders in construction auctions. *Construction Management and Economics* 34: 919–34.
doi:10.1080/01446193.2016.1231408.