

"LITERATURE REVIEW OF ADOPTION OF E PROCUREMENT PRACTICES BY CONSTRUCTION INDUSTRIES"

Avinash Shukla  
Research Scholar in Department of Business Administration, Faculty of Management studies & Research, of Aligarh Muslim University, Aligarh

Dr Mohd Afaq Khan  
Assistant Professor in the Department of Business Administration, Faculty of Management Studies & Research, Aligarh Muslim University, Aligarh

Dr Mrinalini Shah  
Professor Operations Management, Chairperson Entrepreneurship cell  
Institute of Management Technology (IMT), Ghaziabad

Abstract: Advent of information technology (IT) has provided more competitiveness in business operation. Construction industry is also gearing up towards the more usage of information technology driven platform. Cost is the main factor for construction industry. Construction Industry Development Council of India (CIDC) has estimated that approx. 40-50% cost belongs to material in total building project. Therefore, it is imperative to optimize the material purchasing in construction activities. E procurement has emerged as panacea to address most of the problems- cost saving, time saving and best quality, minimization of malpractices associates with purchasing.

We have reviewed 103 research papers from various countries and collated the adoption practices of e procurement. Interestingly TOE and TAM model has used by many of researchers.

Keywords: E-procurement, adoption of E-procurement

E- Procurement –Paradigm shift

Invention and adaption of new technologies and ideas increase the productivity of the business organization, which will in turn translate to high economic growth. Recent technology advancements in information and communication technologies (ICT) have made a paradigm shift in the way business processes are conducted. Electronic procurement (E-procurement) is one of the technological solutions to facilitate corporate buying. E-procurement is the electronic (B2B or B2C or B2G) sale and purchase of goods and services. Procurement supports a delivery relationship between buyers and sellers (Subramaniam & Shaw 2004, Saeed et al. 2005). Raghavan and Prabhu (2004) defined E-procurement as -
“the electronic acquisition of goods and services including all processes from the identification of a need to purchase of products, to the payment for these purchases, including post-contract/payment activities such as contract management, supplier management and development”. Traditionally, procurement processes between various parties were organized through mail, phone, fax and electronic data interchange (EDI) and more recently internet. E-procurement has evolved into the use of electronic technologies to streamline and enable the procurement activities of an organization (Hawking et al., 2004). The benefit of procurement has contributed great saving in bottom line costs of many companies worldwide and hence procurement is a significant tactic in most companies’ E-business strategies. It is claimed that a company engaging in E- procurement can cut cost by 8 to 15% (Ghazaly, 2005). E- Procurement is driven by automated procurement process, integrating the functional processes and purchase management. The emergence of Web-based E-procurement is expected to reduce the order fulfilment cycle time, lower the inventory levels, reduce the administrative cost of procurement, cost of procurement, and enhance the order fulfilment and performance of suppliers (Subramaniam and Shaw 2002, Son and Benbasat 2007).

Most of the times, terms ‘procurement’ and ‘purchasing’ are used interchangeably. However, both differ significantly in their scope. Overall objectives of purchasing are to buy quality materials at competitive prices, in bulk quantities, at the required time, and from reliable sources (Fung, 1999).

Procurement is broadly defined to include a company’s requisitioning, purchasing, transportation, warehousing, and in-bound receiving processes, also linking suppliers and buyers into the purchasing network and rethinking of inter-organizational processes driven by transaction. Various countries have adopted E-Procurement due to inherent advantages. As per Chhattisgarh government e procurement portal (http://www.chips.gov.in/projects/e-procurement 16 Dec-15), e-Procurement is helps to bring transparency and efficiency to the Government Procurement and adoption of e procurement is being increasingly by the Centre and many states for their procurement needs.

Through implementation of comprehensive integrated e procurement solution will enhance the efficiently and transparency in public procurement system. AS per CI (http://www.c1india.com/are-you-hesitant-of-adopting-e-procurement/ 16 Dec-15)

Now days every business is trying to reap benefit of advent of information technology. The internet has opened the avenue beyond the boundaries of earth; business can stay connected with suppliers from around the globe. Organization has benefited in terms of dearth of suppliers, cost competitiveness, better quality due to enhance competitions and advantage of new technologies. Some the challenges refrain people not to use information technology in procurement or tendering:

a) Unwilling to change
b) Security concern about portal
c) Acquiring digital signature certificate

Ramkumar & Jenamani(2012) Adoption of e procurement can be two way, one optional and other mandatory from the law like in India as per Central vigilance commission Act mandate
e procurement in public sector organization. Since e procurement is not core business for many organization in that case three option available: a) Develop in house b) service provider and c) Both a and b. Many of organization opting for service provider option to utilize the expertise of service provider. Selection of service Provider Company should be based on main criteria’s like technology, vendor base, technical competence, performance, flexibility of service, worthiness and reputation. To remove the biasness Analytical network process (ANP) approach also being used in selection of e procurement service provider.

Carayannis & Popescu(2005) european union seen the improvement in its ability to meet the high expectations from e procurement due to more transparent and efficient manner because of advent in internet technology. SIMAP is the main platform used in public procurement in European Union. Information technology created more transparent information made available to all the stakeholders, standardize the forms and notification. Major challenge in adoption for e procurement in public procurement is cost factor.

Stefano Ronchi et al. (2010) adoption of e procurement technology created advantage over competitors’ ability to charge high and build the relationship with suppliers. Value assessment is very important generated through e procurement. Various method is being used to asses value creation- pragmatic way is cost benefit; theoretical way through decision theory. Two level of framework develop to assess the value of e procurement: one financial level through order cost, administrative cost, lead time and opportunity cost of capital; second organization level measuring the control, transparency, maverick buying, decentralization and supply base rationalization.

Corina(2011) Discussed about the major impediment in adoption of e procurement. Broadly four head in barriers:
   a) Management barriers- limited resource, resistance in change and information sharing  
   b) Organization barriers- different culture, different compatible internal and external, post supplier relationship  
   c) IT barriers- security, lack of compatibility, no common technology  
   d) User barriers- fear, change, lack of information skill system

Focusing on training of employees explaining the benefit of e procurement will provide environment conducive for adoption of e procurement. Collaborative workings with suppliers are very important in e procurement.

Bof & Previtali(2010) public procurement has three relevant- a) impact on economy b) government public service( provide goods & services) c) affect National’s competitiveness and citizen’s welfare. Researcher has evaluated the Italy public procurement. E procurements provides acceleration in execution times of procedure, reducing time of purchasing process, reducing expenses, simplification of processes, direct and constant monitoring of public spending to compare the benefits, more time for strategic thinking, transparency due to uniform success.

Ali & Alrayes (2014) explained the variables that might affect e procurement adoption in Kingdom of Bahrain. Researcher has studied perceived organization e readiness factors (POER) and perceived external e readiness factors (PEER). POER factors comprise of
awareness, commitment, governance, resources (human, business and technology) effect the institutional adoption. Main PEER factors are market forces, supporting industries and government. Licker model called perceived e readiness model (PERM) which includes internal and external factors for IT adoption. Researcher also define the status of adopters of e procurement- Non adopters (no connection to web, only email), Initial adopters (web with interaction with email query etc.) and Institutional adopters (transaction web online selling and purchasing, integration with suppliers, customers and other back office).

Ruey-Lin Hsiao and Thompson S. H. Teo(2005) explained the three stage e procurement implementation model.– access the applicability of e procurement, determine e procurement objective, overcome the barriers of e procurement and finally deliver e procurement promise. CIO9chief information officers) are key role in implementation of e procurement. CIO should focus broad technology in e procurement can be used to steam line procurement and improve the procurement spending. In fact research shows the 10% decrease in procurement cost can result in 50% increase in profit margin.

Kevin Moindi Omai(2013) data of the study showed that sharing information demonstrated the development of partner relationship and support the supply chain integration. Partner relationship has different variant level of importance across different tea factories (capture through survey) but price and quality emerged very important. Researcher has defined supply chain performance depend on four factors- information sharing, partnership relationship, supply chain integration and suppliers appraisal.

**Introduction of construction industry**

Construction is the Latin word (from com- "together" and struere "to pile up") means the arts and science to form material, system and organization to build some structures.

Building Construction is the process of sequencing activities start from planning, design and financing and continues until the structure is ready for occupancy.

From being single activity to large scale construction is the process of human multitasking. Normally, jobs are managed by project manager, supervisors, site workers, architects and project engineers.

Since these activities involved the entire eco system of environment as well as human society. So it is very important those involved with design and execution must consider the zooming of requirement, environment impact, successful scheduling, budgeting, construction site safety and transportation & logistic of building material.

**Definition**

Russell Sturgis distinguished between architecture as being artistic structure, where a building is unadorned and can be "...poor...commonplace, ugly, insufficient, or otherwise of small importance; " and the use of the word construction as meaning built using scientific principles in a highly skillful way.

**Type of Construction**

Broadly construction sector has divided into two sectors- real estate and infrastructure
sectors, out of which major share holds by infrastructure and is key driver of the overall growth in construction sector. Residential building, township, commercial, SEZ/IT parks come under real estate sector. Heavy projects executed on massive scale like roads, railways, ports, airports come under the infrastructure segment. As per planning commission D&B report show the data:

**Civil Construction**
Infrastructure is back bone for any construction activity, civil construction majorly contribute to infrastructure. Generally government as well as international government agencies are the typical the builder of this construction. Civil construction primarily serves the interest of the public interest.

**Building Construction**
Building constructions are acquired both privately and publicly. Residential, corporate office and commercial include retail, shopping malls, showroom, hotels are comes under building construction segment.

**Industrial Construction**
Usually, this type of construction required a highly specialised skill in construction, planning and design. The industries which fall under this segment are medicine, power generation, chemical and petroleum manufacturing.

According to National building code of India (SP :7 – 1983) ,classification of the building based on occupancy. Different types of buildings:

Group A: Residential buildings: Building in which sleeping accommodation is provided, with or without cooking or dining or both facilities.

Group B: Educational buildings: Building used for school, college or day care purpose.

Group C: Institutional buildings: Building or part of building is used for medical, disease or infirmity; convalescent etc.

Group D: Assembly buildings: Group of people congregate or gather for amusement, recreation, social, religious, patriotic, civil and travel purpose.


Group F: Mercantile buildings: Building is used for shops, stores, market for display and merchandise.

Group G: Industrial buildings: Wherein products or material of all kind and properties are fabricated, assembled, manufactured or processed.

Group H: Storage building: Primarily used for storage or sheltering of goods, wares or merchandise.

Group J: Hazardous buildings: Used for storage, handling, manufacturing or processing of highly combustible or explosive materials.
E Procurement adoption in different countries

Every country has different challenges in adoption of E-procurement in construction industry. Research has been conducted for different countries with respect to E-procurement in construction industry based on country wise challenges but no comprehensive study has done.

India

The Government of India approved the National e-Governance Plan (NeGP) on 18 May 2006 (http://india.gov.in/govt/national_egov_plan.php). Government of India can achieve e-governance through NeGP programme. E-Procurement is an integral component of NeGP. According to a recent estimate, government is buying five lakh crore materials per annum. Single portal for E-procurement for all the government departments and agencies can elimination of ‘aberration and malpractices’ in existing procurement procedure. (Prabir Panda, GP Sahu and Pramod Gupta, 2010)

Many companies used the E-procurement to achieve greater efficiencies. Some of the examples are Tata, Wipro, MUL (Maruti), LML, HDFC, Amtrex, Blue Star, Ballarpur Industries, Grasim, Asian Paints, Marico Industries, Nerolac Paints. Engineering, Construction & Contracts (ECC) division of Larsen & Turbo Limited also adopted vertically integrated supply chain management initiatives implemented in Management (SCM) initiatives. (Sri Devi Bulusu, ITC., Proceedings of the Fifth Asia Pacific Industrial Engineering and Management Systems Conference 2004)

<table>
<thead>
<tr>
<th>Financial Year</th>
<th>No. of Tenders</th>
<th>Value Crores (INR)</th>
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<td>3623</td>
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<tr>
<td>2004 - 2005</td>
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<td>30822</td>
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<tr>
<td>2005 - 2006</td>
<td>9930</td>
<td>11892</td>
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<tr>
<td>2006 - 2007</td>
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<td>31487</td>
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<tr>
<td>2007 - 2008</td>
<td>33904</td>
<td>75119</td>
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<tr>
<td>2008 - 2009</td>
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<td>130061</td>
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<tr>
<td>2009 - 2010</td>
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<td>28208</td>
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<tr>
<td>2010 - 2011</td>
<td>47182</td>
<td>19675</td>
</tr>
<tr>
<td>2011 - 2012</td>
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<tr>
<td>2012 - 2013</td>
<td>67593</td>
<td>25191</td>
</tr>
<tr>
<td>2013 - 2014</td>
<td>93566</td>
<td>3684</td>
</tr>
</tbody>
</table>

Source: http://www.eprocurement.gov.in/

Austria

In Austria E-procurement adoption is low in construction industry compare to automotive industry. Probable reasons for low adoption rate are customized project which differ from each other in material ordered etc. On contrary, automotive industry concentrates on mass production and distribution of nearly similar products. The Austrian construction industry is
constituted of numerous small and medium sized firms (SMEs) but only few big players (Zunk et al, 2014) which might be a reason for the low adoption rate. Austrian construction companies use E-procurement order to enhance their efficiency due to reduce complexity in procurement process, improved collaboration with the suppliers and a possibility to reduce process cost.

Canada
Rankin et al (2005) opined E-procurement as one of the way to increase the top line. The main barriers for adoption of E-procurement in Canadian construction industry are organizational and technical issues. Organization characteristics also have an impact on E-procurement and broadly depend on organizational type, structure, revenues and management level. In today’s competitive world personal contact is important for long – term relationships with customer, as well as the learning curve of using new technologies.

United Kingdom
Eadia et al (2010) has discussed barriers and drivers for E-procurement in UK construction industry. The most important drivers of E procurement were identified as process, transaction & administration Cost saving. The most important barriers were Prevention of tampering with Documents, followed by insufficient assessment of systems prior to installation and confidentiality of Information or unauthorised viewing.

Malaysia
Deraman et al (2012) has found out 26 critical success factors (CSF) in E- purchasing through literature review. Nevertheless, results from the exploratory study reveals that only fourteen factors exist and specific to construction organization in context of Malaysia.

Daud et al, (2013) has applied an extended Technology Acceptance Model (TAM) (Davis et al., 1989) model in a new context of E-procurement. Study has used descriptive analysis for finding out the factors influencing the usage of E- procurement among contractor companies in Malaysia. Five factors identified in the study are : Usage of E- procurement, Perceived ease of use, Perceived usefulness, Attitude toward using E-procurement to understand, Intention to use E- procurement.

Hashim et al, (2013) has studied perceived value of E-Procurement in the construction industry in Malaysia. This study concluded that tactical and operational values are more important than strategic values. Important variables in different heads were defined as follows:

Tactical Value
- Lower procurement cost
- Reduced time of preparing cost plans

Operations Value
- Reduced non value added activities
- Order process more efficient

Strategic Value
- Improved firm growth and success
- Reduced and eliminate problem with suppliers
Kuwait
Baladhandayutham & Venkatesh (2012) had defined model from supplier’s perspective. Cost, time and opportunity benefits were positively correlated whereas relationship barrier was negatively correlated in E-procurement adoption in Kuwait construction industry.

Kuwait construction material suppliers can develop appropriate E-procurement strategies base on drivers and barrier.

Exhibit1:E-procurement adoption model in Kuwait construction industry (Baladhandayutham & Venkatesh 2012)

Tanzania
Mohamed, Kayungi S.(2013) had explained that manual procurement system is considered inadequate for construction industry due to lack of transparency in various stages of construction procurement such as tender evaluation and award. The Manual procurement system is full of tedious paper work leading to wastage of time and money. Research (Towards E-procurement implementation in Tanzania: construction industry preparedness) has found out that low adoption of E-procurement in Tanzania construction industry is mainly due to of lacks policies & frameworks and low level of awareness of E-procurement to stakeholders. Model for E-procurement adoption for Tanzania construction industry has explained three stages for E-procurement adoption, first policy framework stage, second technology, people and process stage and finally efficiency and transparency stage.

Turkey
Isikdag et al( 2011) has explained the E-procurement provides opportunity for improving communication and coordination along with expanding marketplace for both suppliers and buyers. The study has discussed about E-procurement from both supplier and buyer perspectives in relation to the Turkish Architect, Engineering and construction (AEC) industry. Legal issues and lack of a legal infrastructure in particular (i.e. rules and regulations for support of E-Procurement), were identified as a key barrier towards industry-wide adoption of E-Procurement within the Turkish AEC industry. From strategic perspective, the top-management of organisations are still very much focused on operational everyday tasks not focusing on E-procurement for long term benefit. Furthermore, there is a lack of
awareness towards the real benefits of E-Procurement.

Key technological issues that were identified in the Turkish AEC Industry are mainly related to security of exchanging information (i.e. protecting competitively advantageous information, digital signature). The lack of capabilities of re-engineering processes to facilitating the new way of procurement also major barriers. The results indicate that the stakeholders within the Turkish AEC Industry continue to refrain from implementing E-Procurement unless E-procurement as a sine-qua-non in contract.

China
Tran et al (2011) had developed theoretical model to assist the importance of government, organization, and technology on a construction enterprises’ E-procurement implementation readiness level in developing countries. Readiness of enterprise depends on two factors-enterprise’s propensity and available capability in implantation of E-procurement. Organization readiness level is changed over time in the innovation process. After analysing the adoption of innovation theory was carried out and a Government-Organization-Technology framework was proposed (GOT). The provided conceptual model needs to be tested in actual world.

Exhibit 2: Impact-role-factor structure in E-procurement readiness by Tran et al (2011)

Review of Literature

E-Procurement adoption in construction industry
The term “E-business” has described Internet-enabled systems that provide information, facilitate transactions or provide shared business processes (Bloor Research, 2005). There are a number of processes that can be associated with E-business, four of the major processes related to E-business are depicted in table 3 (MOIE,2003).
Table 2: E- business process (source: Guillermo et al, 2003)

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-procurement</td>
<td>Procuring material, services, expert and manpower. Dissemination and</td>
</tr>
<tr>
<td></td>
<td>gathering information about project</td>
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<tr>
<td>E-transactions</td>
<td>Transactions across the space between the buyer and seller in the supply</td>
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<tr>
<td></td>
<td>chain</td>
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<tr>
<td>E-logistics</td>
<td>Delivering parts, components, materials, plant, information</td>
</tr>
<tr>
<td>E-collaboration</td>
<td>Facilitates coordination of various among supply chain partners. Collaboration</td>
</tr>
<tr>
<td></td>
<td>among teams in a virtual space such as collaborative design, planning and</td>
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<tr>
<td></td>
<td>project management.</td>
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</tbody>
</table>

E-procurement system adoption has been conducted across various geographies and sectors/industries like manufacturing, construction and healthcare. Procurement process has evolved electronically with the growth of electronic commerce (Carter et al. 2000). A study conducted by Malhotra & Galletta (2003) found culture and organization structure play a vital role in E-procurement adoption. Knowledge management (KM) can address the culture and organization structure issue by communicating the benefit and the concern by regular interaction with all the stakeholders. (Malholtra and Galletta, 2003).

E- Procurement benefit can be classified in different categories according to different researchers as follows:

a) Strategic, tactical and operational benefits (Irani, 2002);
b) Tangible and intangible benefits (Gunasekaran et al., 2001; Irani and Love, 2002);
c) Financial and non-financial benefits (Irani and Love, 2002);

Adoption of E-Procurement is considerably low in construction industry, compare to other industries such as manufacturing and retail industry (Alam, & Ahsan, 2007, Mansor & Abidin 2010., Tan et al., 2009., Pierre & Robert 2010).

E- Procurement in construction industry can be improved by showing the value gain of manufacturing industries by using E-procurement (Chen and Rankin, 2006). Constructions companies are using web-based inter organizational information systems (IOISs) (Cash and Konsynski, 1985) to support their inter-organizational processes with their key suppliers. Oyegoke et al (2009) In construction projects many stakeholders are involved therefor important to define the type of procurement route. Generally four type of procurement route:

a) Traditional – lump sum
b) Design and build – degree of risk transfer
c) Management routes – degree of risk transfer (combination of traditional and design build route)
d) Partnering - very strong in public procurement
e) Cost reimbursable – contract provision of incentivize

Construction procurement categorization also depends on organization and method of finance.

Exhibit 3: Construction procurement categorisation based on organisation and financing strategies by Miller (2002)

Naoum & Egbu (2015) elaborated a critical review of procurement method. Knowledge of emerging trend in procurement method, will allow practitioners to appreciate as well as concern in development of new techniques and principles such as build ability/constructability, innovation, lean construction, supply chain management, sustainability and value engineering. Integration of construction industry though continuous improvement and value creation through team is paramount importance. Construction industry can deliver best to changing client need by adopting better standardization and use of technology: e-procurement.

Lam et al (2015) due to increase complexity of building need to reduce design and time of construction and improvement in project performance creates pressure to gets the project through tradition method. CSF (critical success factor) is very important for successful completion of the project. Since all activities are interrelated, therefore, very important to have integrated view of the projects. Six CSF are important as postulated in this paper-project characteristic, project procedure, project management strategy, project work atmosphere, project environment and project participants.

Md Mahbubur Rahim (2008) posit the point that majority of research focused on factor effecting adoption of e procurement but not much of focus of factors effecting adoption of e procurement by the employee. To find out the factor important for employee adoption of e
procurement, researcher has done empirical case study of Australian city council. Below are the factors affecting employee adoption?

Exhibit 4: Identifying factors affecting acceptance of E-procurement systems:

An Initial qualitative study at an Australian City Council By Md Mahbubur Rahim (2008) Qualitative analysis of case study has established the facts about e procurement adoption by employee that active support of council management indirectly supported the acceptance level of employee. Through its influence by factors: employee involvement, customized training and ease of use.

Onosakponome et al (2011) this research investigate the impact of procurement system on the performance of East Malaysia construction project in the aspect of time, cost and quality. Tradition procurement system (TPS) Design and construction carried out by different companies. In TPS system cost and quality are being achieved but on the cost of time. There are four stages in TPS:

a) Design build and procurement system (DBPS) single organization is responsible for design and construction. DBPS achieves the cost and time but not quality.

b) Construction management procurement system (CMPS) All the construction activities base on fee basis between the client and speciality firm for particular domain like design, construction etc. DBPS achieves the cost and time but not quality.

c) Management construction procurement system (MCPS) Construction organization appoints the professional team during initial stage of a project to provide expertise of construction management under the direction of contract administration. This fast track procurement system which overlap the design and construction stage and al-
allows early alignment of construction process. MCPS achieves the quality as well as time but on the cost.

Gioconda Quesada et al (2010) defined the research framework on three aspects- e procurement technology usage (EPT), procurement practice (PPR) and procurement performance (PP). A empirical data shows that EPT has positive impact on PPR. E procurement impacts on strategically nature in longer terms. Firms pursue better PPR achieve higher level of PP. Mukhopadhyay et al(2002) explained the operation and strategic benefit of B2B procurement. A supplier gets the strategic inputs as soon as customer initiates the order process. Fast order processing is the operation benefit. Research framework explains the three steps approach- 1) EDI technology adoption 2) Direct strategic and operational impact 3) Longer term strategically impact.

Shamil Naoum and Charles Egbu(2015) in construction industry various procurement method has been used like management contracting, project management and design and build. All the method has been selected on criteria of time, cost and quality. Also depicted the various trend in procurement method which allow the practitioner to appreciate the key concern in developing their modern principle and techniques such as supply chain, innovation, lean construction, sustainability, value engineering and e procurement and BIM (building information modelling).

Rafikullah Deraman and Abdul Aziz Abdullah(2012) Many of organizations undertaking the B2B e commerce initiatives. E procurement is one of the initiative that has a far reaching impact on electronic communication, information exchange and business transaction. Driving factors that promote e procurement can be categorised into four groups- cost, time, quality and competitive advantage.

Alan Smart (2010) this paper has investigated, the extent of business adoption of e procurement in Design/methodology/ approach. Researcher has developed four level frameworks of drivers for e procurement adoption:

1) Establish a business case for e procurement
2) Criteria- control, cost, process, suppliers and role
3) Compliance, buying leverage, common process, reduce suppliers number and knowledge sharing

T.Baladhandayutham, Shanthi Venkatesh(2015) Macro economic factors such globalization, rules & regulations, outsourcing and supply market instability are driving more companies to see procurement as catalyst not only for cost reduction but also for market expansion , product innovation and compliance. Enterprises are working hard for optimization and continuous improvement in supply cost and performance of supply chain. Therefore, increase number of organizations is transferring towards centre led procurement (CLP). The hybrid model of CLP comprise of spend leverage, process standardization, procurement automation, knowledge resource sharing, local empowerment and execution characterises of decentralized model. Since Indian has proposed infrastructure investment of around $1 trillion in twelfth five year plan (2012-17). This investment will create more infrastructure job and intent lead
to more of e commerce in India due to poor distribution network in the manufacturing sector and large demand of construction materials. Success of construction procurement is being monitored on service, cost and time basis. Mainly two type of procurement methods used by construction companies:

a) De centralized procurement
b) Centralize procurement

None strategic commodity suited for de centralized procurement and strategic commodity suited for centralize procurement.

T.Baladhandayutham, Shanthi Venkatesh(2015) explained the hybrid CLP for construction projects

<table>
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<tr>
<th>High R is k / Low Value</th>
<th>High R is k / High Value</th>
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<td><strong>Contributes:</strong></td>
<td><strong>Contributes:</strong></td>
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<td>5% of Transactions</td>
<td>5% of Transactions</td>
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<td>5% of Value of S pend</td>
<td>80% of Value of S pend</td>
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<td>Centralized Procurement</td>
<td>Centralized e-Sourcing &amp;</td>
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<td>at Regional Procurement Dept</td>
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<td>Using Hosted VMI e-Catalogs</td>
<td>Regional Procurement Dept</td>
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<td>Low R is k / Low Value</td>
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<td>10% of Transactions</td>
<td>80% of Transactions</td>
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<td>5% of Value of S pend</td>
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<td>De-Centralized Procurement</td>
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<td>at Projects Using P-Cards and</td>
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<td>and Procurement Automation</td>
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</table>

There are major Indian companies like L& T, HCC and Bechtel are using CLP in their construction projects. Success of CLP depends on cross functional team, standard process and policy, incentives and coordination metric and procurement information systems.

T.Baladhandayutham, Shanthi Venkatesh (2012) B2B has developed the efficient procurement process between the business relationships. Primarily B2B relationship is buy side market place. E markets needs to adopt the supplier’s part in online market place. Common perception of e procurement has explained buyer’s benefits than suppliers. Many suppliers forced to e market place, fear to lost trade. Since the surge of growth, the construction industry faces issue of material price fluctuation and limited availability of skill resources. Today big challenge of construction industry to improve supply chain to improve the efficiency and effectiveness through innovative project delivery mode and procurement practices.

Study posited the not enough awareness in Kuwait market about e procurement. However, cost saving is the only perceived factor by construction material buyers in the adoption of e procurement.
Supplier’s adoption is very critical in successful implementation of e procurement. Since every supplier had different needs, hence, once size fit for all cannot be application in supplier’s adoption strategy.

Prabir Panda and GP Sahu (2012) adoption of e procurement in government entities to optimise and rationalize the public procurement considered as panacea from all the major issues like corruption and bureaucratic red-tapism. To achieve the objective of optimization of government procurement, govt. has introduction of National e Governance project (NeGP) in 2006, but e procurement progress has been dismal. Researcher has explained Critical Success Factor (CSF) for successful implementation of e procurement projects.

a) Top management support; Chhattisgarh and Andhra Pradesh successful implemented e procurement because of top management support.

b) E-procurement implementation strategy; major focus on existing opportunities, aggregation of demand is very important in government procurement (cost reduction).

c) Business case and project management; proper addressable of inertia of procurement officers can be address with best case and this success story will ensure the project management.

d) Business process Re-engineering; redefining all the process will assisting in e procurement project.

e) Technology standard; implementation would undergo all side of the system, it is important that system should adopt best and well accepted technical, content and process.

f) Security and authentication; ensure the best security due to financial data and dealing involved.

g) System integration; system should integrate with existing system

h) Change management; effective change management plan and training of all the stakeholder will help to address their concerns.

i) Performance measurement; system objective will clearly spell

j) Training and education

k) Adoption by all the stakeholders

Elena Vitkauskait, Rimantas Gatautis (2008) In European economics construction sector plays an important role, but the adoption of information communication technology (ICT) is very low, in spite of potential increase of productivity and efficiency through e business. However, current selection process of construction SMEs is based on four important factors: e tendering, e site, e procurement and e quality. Now a day’s construction is moving towards demand driven sector where in product quality, user requirement and sustainability are much more important than traditional objective of cost reduction. E procurement is very important process to achieve the current pre requisition of construction industry that is demand driven. Three important steps are followed by e procurement: discovery, evaluation and selection of appropriate suppliers. Future of e procurement scenario would be based on two steps selection of suppliers and analysis of quotation & selection of suppliers.

Hashim et al (2014) has investigated resource and capabilities affecting e procurement value in Malaysian construction firms. Research has taken resource base view (RBV) as well as capabilities base on framework of technology- organization- environment (TOE). RBV the-
ory explained technological, organization resource and capabilities with competitive advantages. Two factors very important in e procurement value in construction firms in Malaysia-IT competencies, trading partner relationship. Below is the conceptual model of e procurement value in construction firms.

Exhibit 5: E-Procurement Implementation in Malaysian Construction Industry by Hashim et al (2014)

Guangdung Tran et al (2014) has done empirical study in Vietnam find out the important factors in initial adopters of construction firms and construction firms institutionalized the e procurement in developing countries. Researcher has frame the conceptual model base on technology-organization-environment (TOE) framework and theory of reasoned action (TRA). Conceptual model:

<table>
<thead>
<tr>
<th>Factors important-Initial adopters of e-procurement by construction firms</th>
<th>Factors important- Institutionalization propensity of e-procurement by construction firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government leadership, legal and regulatory infrastructure</td>
<td>Government leadership, Information technology infrastructure</td>
</tr>
<tr>
<td>External business characteristics, Top management leadership style</td>
<td>Internal business characteristics, Manager ability and perception</td>
</tr>
<tr>
<td></td>
<td>Subjective norms,</td>
</tr>
</tbody>
</table>

As per study the synch between the technology and internal organization characteristics are very important factors in successful adoption of e procurement by construction firms, otherwise same set of firms are not able to successfully implement the e procurement because of no well thought strategy and no proper technology in business strategy.

Conclusions
Below is the conclusion on the above detailed analysis on e-procurement adoption in construction industry:

a) Construction industry adoption of e procurement is low compare to automotive industry. Since automotive industry concentrates on mass production and nearly distribution to similar product. On contrary, construction industry highly customized and every project is different from other project. Adoption of e procurement can be improved in construction industry by showing the value gain of manufacturing industries by using e procurement.

b) Main barriers in adoption of e procurement in construction industry are organizational, technical, legal aspects

c) Main drivers in adoption of e procurement are transaction & administration cost saving, reduce time, more transparency, improved communication between suppliers and buyers.

d) Practitioners can use develop various new techniques like build ability, construction ability, innovation, lean construction, sustainability and value engineering vario through critical review of procurement method.

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