ASSESSMENT OF DETERMINANTS OF EMPLOYEE ADOPTION OF E-PROCUREMENT SYSTEM

By

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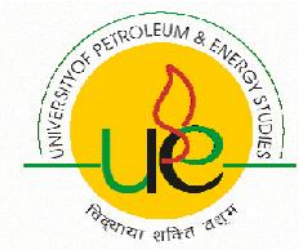
COLLEGE OF MANAGEMENT AND ECONOMICS STUDIES

SUBMITTED

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

TO



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This is to certify that the thesis on **"Assessment of Determinants of Employee Adoption of E-Procurement System"** by **Inder Singh** submitted to the University of Petroleum & Energy Studies, Dehradun, India in Partial completion of the requirement for the award of the Degree of Doctor of Philosophy (Management) is an original work carried out by him under our joint supervision and guidance. It is certified that the work has not been submitted anywhere else for the award of any diploma or degree of this or any other University.

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I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text.

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Inder Singh

Dated: April 24, 2012

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ABSTRACT

Enormous investments have been made by Organizations in Information Technology (IT). Productivity gain of the organizations can be achieved by investing in IT infrastructure which is an important aspect for creating economical values. Asia-Pacific Small to Medium Businesses (SMBs) spending was $153 billion in 2009 on IT and Telecom. More than 50% of Asia-Pacific spending is done by Chinese, Korean, and Indian small and medium businesses. Productivity (return on investment) gain from IT is not only related with the amount of the investment in IT, but the potential productivity gains can be more related with individuals' acceptance and actual usage of the technology. Uttarakhand Government invested huge amount in e-governance effort, but the National Informatics Centre (NIC) in a report highlighted that the project was a "total failure" in major departments. An extended TAM was developed and Structural Equation Modeling (SEM) used to assess the impact of individual factor (computer self-efficacy), organizational factors (infrastructure support and employee training) on intention to adopt and use e-procurement system mediated through perceived usefulness and perceived ease of use. In this quantitative correlation study sample data was collected from 416 respondents out of total 1500 distributed questionnaires, using online survey and personally collect them. This survey data was used to assess eleven hypotheses. The result obtained from the survey suggest, there is no statistical evidence was found that infrastructure support influence perceived usefulness of e-procurement system [r (416) =.06, p= .505] and

computer self-efficacy [r (416) = -.01, p = .938], but infrastructure support influence perceived ease of use of e-procurement system [r (416) = .44, p <.001]. Statistical evidence shows that computer self-efficacy influence e-procurement system usage mediated through perceived ease of use of e-procurement system [r (416) =.25, p < .001], but statistical evidence obtained, represents that there is a significant negative relationship of computer self-efficacy with perceived usefulness of e-procurement system [r (416) = -.19, p = .013]. Statistical evidence was found that employee training influence the computer self-efficacy [r (416) = .54, p < .001], statistical evidence was also found that employee training significantly influence the intention to use e-procurement system mediated through perceived usefulness of e-procurement system [r (416) =.36, p < .001] and perceived ease of use of e-procurement system [r (416) = .32, p < .001]. It was found that no such statistical evidence suggest that infrastructure support influence perceived usefulness of e-procurement system or computer self-efficacy. In this study employee training plays a critical role in technology acceptance and usage.

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LIST OF ABBREVIATIONS

AGFI	Adjusted Goodness-of-fit Index
AMOS	Analysis of Movement of Structure
BI	Behavioral Intention
CFI	Comparative Fit Index
CSCs	Common Service Centres
CSE	Computer Self-Efficacy
CSFs	Critical Success Factors
EDI	Electronic Data Interchange
EPS	Electronic Procurement System
ET	Employee Training
GFI	Goodness-of-fit Index
IS	Infrastructure Support
MMPs	Mission Mode Projects
MRO	Maintenance, Repair, and Operating
NeGP	National e-Governance Plan
NFI	Normed Fit Index
NIC	National Informatics Centre
OGP	Oil, Gas and Power
PBC	Perceived Behavior Control
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
RMSEA	Root Mean Square of Approximation

ROI	Return on Investment
SEM	Structural Equation Modeling
SMBs	Small to Medium Businesses
SN	Subjective Norm
SWANs	State Wide Area Networks
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of Acceptance and Use of Technology
XML	eXtensible Markup Language
XSL	eXtensible Stylesheet Language

Chapter 1 : Introduction

This chapter introduces the background, problem statement, need for the research, and the potential significance of the research. It elaborates upon the research objectives.

Enormous investments have been made by organizations in Information Technology (IT), researchers and academicians have struggled to document the organizational gains from IT (Mitra, 2005). Many firms reengineer their business processes by spending more on their IT infrastructure. Spending on IT in the global marketplace exceeded $3.7 trillion in 2008 and will top $4 trillion by 2011 (Lumpur, 2008). Productivity gains in the organizations can be achieved by investing in IT infrastructure which is an important aspect for creating economical value. Asia-Pacific Small to Medium Businesses (SMBs) spending was $153 billion in 2009 on IT and telecom. More than 50% of Asia-Pacific spending is done by Chinese, Korean, and Indian small and medium businesses (Laudon et al., 2011). Senior executives have traditionally viewed IT as a back office function that is a “necessary cost” of doing business, without any strategic implications (Mitra, 2005). In recent years, senior managers are now looking at IT as a strategic resource and key enabler of growth. Organizations are investing huge amount in Information Technology to achieve the following (Kenneth C. Laudon, Laudon, & Dass, 2011):

(i) Customer and supplier relationship enhancement

(ii) Operation excellence

(iii) New products, services, and business models

(iv) Competitive advantage

(v) Improved decision making

(vi) Survival

Productivity (return on investment) gains from IT is not only related with the amount of the investment in IT (Brynjolfsson & Hitt, 2000), but the potential productivity gains can be more related with individuals' acceptance and actual usage of the technology (Devaraj & Kohli, 2003). Once IT applications, tools and software are implemented in the organization, the gains in productivity can only be achieved by acceptance and usage of these tools and software by employees.

Though, Uttarakhand state has not been highly rated in the National eGovernance readiness Index (2005). E-governance projects are "total failure" in major departments (NIC, 2006). The state is trying to take some steps towards moving up in the pyramid to achieve the leadership position in e-governance implementer states (eGRM, 2007).

During a press release, principal secretary (Finance), Mr. Alok Jain stated that Government of Uttarakhand has prepared rules and regulation to implement e-procurement system to enhance transparency and improve the efficiency of procurement processes. All purchases of goods and services amounting to more than ₹ 5 lakhs and all construction works over ₹ 1 crores would be undertaken under this

scheme (Jain, July 7, 2011), the prime objective of introducing e-procurement systems in Uttarakhand is to bring transparency in the procurement process (Prashant, July 08, 2011).

1.1 Background

During extensive review of literature, organizational and individual factors were found to be important factors that influence employees to use Information Technology (Compeau & Higgins, 1995; Bhattacherjee & Hikmet, 2008; Obeidat & Abu-Shanab, 2010). Therefore, if Uttarakhands' Oil, Gas and Power public sector managers understand about organizational and individual factors that influence the adoption of e-procurement system, they can proactively develop intervention programs to reduce the underutilization problem of e-procurement system. This would help the employees of organization to adopt and utilize e-procurement system to achieve high productivity (return on investment).

There have been numerous researches in the field of determinants of IT adoption and usage (Adams, Nelson, & Todd, 1992; Amoako-Gyampah & Salam, 2004; Davis, 1989; Shih, 2006; Venkatesh, 2000). Finding out why IT is accepted or rejected by an individual is still considered a major issue by the researchers. Most of the technology acceptance studies have been conducted in the developed countries and its states. Within a specific country also there seems to be a different acceptance level of technology adoption among its constituent states, so these finding cannot be applicable to the developing states like Uttarakhand. An extensive literature review

revealed that there were no previous researches conducted to assess the determinants of technology acceptance and usage in Uttarakhands' Oil, Gas and Power (OGP) sector.

This research study assesses the organizational and individual factors that influence the adoption of e-procurement system in the Oil, Gas and Power (OGP) public sector companies of Uttarakhand state. Since, Organizational and individual factors play a key role in influencing employees to adopt and use Information Technology that have an effect on the organizational performance (Compeau & Higgins, 1995; Bhattacherjee & Hikmet, 2008). Individual factors based on their skills and competencies along with organizational support assist in the optimum usage of technology. In this research study, organization characteristics such as infrastructure support, employee training; and individual characteristic such as computer self-efficacy were assessed to find the impact of these factors on employees' intention to adopt and use e-procurement system.

1.2 Problem Statement

Most of the organizations are investing heavily in Information systems (enterprise application used to improve the efficiency and effectiveness of employees using it) in order to gain productivity (return on investment); but the information systems are underutilized by the employees. Thus organizations fail to achieve optimal

productivity gain from investing in IT (Almutairi, 2007; Jasperson, Carter, & Zmud, 2005).

In Uttarakhand state, e-procurement system implemented by many Oil, Gas, Power and other public sectors but it fails to provide the desired results because of problem in acceptance level by the employees (NIC, 2006). The research problem for this study "understands the factors for acceptance or rejection of technology would help organization managers to develop the intervention programs to improve the utilization of information system, and assist the employees to adopt and using the information system more efficiently".

The Technology Acceptance Model (TAM) was developed by (Davis, 1989), and is widely used in information systems research to find out the acceptance and usage of IT by individuals. There are many components of IT such as hardware, software, database, office automation applications (e.g. MS Office), and enterprise applications (for reengineering the business processes). This study focuses on e-procurement system or tool used by Oil, Gas and Power (OGP) public sector companies of Uttarakhand. In this quantitative correlation study, the Technology Acceptance Model (TAM) was extended to assess the impact of infrastructure support, computer self-efficacy, and employee training on the behavior of individual employee to adopt and use e-procurement system mediated through two key determinants of TAM model:-

- Perceived usefulness
- Perceived ease of use.

1.3 Need for the research

In the internet era and networked world, there are many shortcomings identified by the enterprises in their procurement processes. Automating the business processes results in significant benefits for the enterprise. Firms, who have implemented e-procurement systems successfully, are enjoying significant savings in their business processes in millions of dollars. In National e-Governance Plan (NeGP), states are required to have e-procurement systems for G2B, B2G, G2E and B2E applications. There are no exact figures on benefits of e-procurement system (Sharma & Vaisla, 2011). However, there have been estimates of benefits of using e-procurement systems. According to one study, e-procurement systems will help vendors to save approximately 70% in their costs of transaction (e.g. eliminating travel, courier costs, bribes, etc.) (Sharma & Vaisla, 2011). For the procurement firm, it will reduce the advertisement costs by approximately 75% and printing costs by approximately 90% (Sharma & Vaisla, 2011). E-procurement systems improve the speed of the tendering/procurement process. The estimated average of tenders floating annually by Uttarakhand State government is 10000 tenders; this represents a total procurement budget of 50 million, of which some proportion is spent on the costs of the tendering/procurement process (Sharma & Vaisla, 2011).

As mentioned above, implementing e-procurement system has many benefits but still its expected growth rate has been revised downwards. Recent market research

indicates that the adoption of e-procurement technology into the enterprises is at much slower rate than expected (Pardita, Sophonthummapharn, & Parida, 2011). Computer illiteracy is prevalent amongst senior employees, who have traditionally relied on juniors for their electronic data-entry activities. The tender management system requires decision-makers to make direct use of system (Sharma & Vaisla, 2011).

National Informatics Centre (NIC) in a report highlighted that the Uttarakhand government's e-governance efforts are "total failure" in major departments (NIC, 2006). In Uttarakhand state, if managers understand why technology innovation is accepted or rejected, they can more proactive in developing intervention programs to reduce the problem of underutilized information systems, and assist employees in adopting and using IT more effectively towards achieving greater productivity levels by improving their effectiveness and efficiency in their jobs.

The findings from this research study can used to provide Uttarakhands' Oil, Gas and Power sector managers with the valuable information to take more proactive and effective interventions to achieve greater acceptance or usage of e-procurement systems as a result they will be able to achieve optimal productivity gain.

1.4 Potential Significance

With the emergence of Internet, and ICT applications, the companies are strained to shift their operation from tradition way to the virtual e-business, e-procurement and e-

supply chain philosophy (Pardita, et al., 2011). Uttarakhand government has invested huge amount in IT in public sector to improve the efficiency of their employees but the return on investment is still a major concern (NIC, 2006). In studies conducted in many developed countries, it was suggested that underutilization of information technology is a major concern for poor return on Information Technology investments (Alshare & Alkhateeb, 2008; Almutairi, 2007; Jasperson, Carter, & Zmud, 2005). These studies were conducted with college students or individuals from the private sector, therefore, there is need to study public sector organizations in Oil and Gas and Power sector (Almutairi, 2007). It is believed that technology acceptance and its usage influenced by the national culture (Chen, Chen, & Kazman, 2007; Chu & Lu, 2007; Rouibah, 2008), therefore, the finding from these studies may not be applicable to Uttarakhands' public sector Oil, Gas and Power organizations.

Organizational and individual factors are important factors that influenced the individual intention to accept and use Information Technology (Walker & Johnson, 2008), which is based on capability of individuals and organization support. In this research study, individual and organizational factors were determined, to advance the body of knowledge on determinants of technology adoption in a developing state like Uttarakhand with special focus on Oil, Gas and Power public sector organizations.

1.5 E-Procurement

Procurement is defined as "to satisfy internal demand with external sources which adhere to objectives set at the strategic level". E-procurement is use of information

systems in organizations to automate the business processes and link with other business organizations to procure the required direct and indirect material for proper functioning of the organization and to enhance the efficiency and effectiveness. Various authors have defined e-procurement in number of ways as given below:-

"E-Procurement is the use of IT (and the internet) for procurement purposes, including both the technology mediated exchanges between parties and the electronically based intra- or inter -organizational activities facilitating such exchanges" (Knudsen, 2003).

E-procurement is "the electronic acquisition of goods and services for organization" (Turban, et al., 2009).

E-procurement is an "internet-based purchasing system that offers electronic purchase, ordering processing and enhanced administrative functions to buyers, suppliers (Panayiotou, Tatsiopoulos, & Gayialis, 2004) and management" (Atkinson, 2007).

E-procurement can be defined as "using Internet technology in the purchasing process" (Boer, Harink, & Heijboer, 2002).

"E-Procurement is the use of Web-based technology to support the key procurement processes, including requisitioning, sourcing, contracting, ordering, and payment." (Turban, King, Viehland, & Lee, 2009).

> *"Electronic Procurement (e-procurement) is electronic integration and management of all procurement activities including purchase request, authorization, ordering, delivery and payment between a purchaser and a supplier." (Chaffey, 2009).*

The common theme across the definitions is electronic facilitation of activities related to procurement processes in the firms. An e-procurement technology is defined as any technology designed to facilitate the acquisition of goods by a commercial or a government organization over the Internet (Davila, Gupta, & Palmer, 2003).

"**Electronic Procurement System (EPS)** is an electronic system used to automate all or part of the procurement function by enabling the scanning, storage and retrieval of invoices and other documents; management of approvals; routing of authorization requests; interfaces to other finance systems; and matching of documents to validate transactions". E-Procurement System (EPS) improves the efficiency and effectiveness of employees, reduce the transaction cost, reduce the cycle time of manufacturing goods. Today, e-procurement systems are not only used to reduce the paper work but also to compete with other organizations as well. Every organization, firm in any industry wants to integrate their different departments using IT infrastructure and tools as well as to connect with outside business units to employ several web-based functions such as online catalog, purchase orders, shipping invoices, and make online payments to speed up their business processes.

1.5.1 Direct and Indirect procurement

According to Weele (2002), purchasing, material and services can be grouped into the following categories:

- Raw Materials;
- Supplementary Materials;
- Semi-manufactured Materials;
- Components;
- Finished Products;
- Investment goods or capital equipment;
- Maintenance, repair, and operating materials (MRO goods)
- Services.

According to Chaffey (2009), there are two categories of procurement:

- Procurement that are directly related with manufacturing of product (production-related procurement)
- Those that are not directly related with manufacturing of products and support the operations of the whole business and includes office supplies, furniture, maintenance, repair and operating (MRO) goods.

Chaffey's classification is used more widely in industry to categorize procurement.

1.5.2 Benefits of E-Procurement

Numerous studies have proven the potential of e-procurement, according to these studies, e-procurement facilitates organizations to decentralize their operational procurement processes and centralize strategic procurement processes which results in providing higher supply chain transparency using e-procurement systems (Puschmann & Alt, 2005). In the mid to late 90s, B2B automation was considered a trend that had profound impact on Supply Chain performance. During 1998-2000, many industries from chemical and steel to utilities and human resources implemented e-markets and increased the market reach for supplier and buyers, reduced procurement costs, and brought in paperless transactions. Ariba and Commerce One were founded on the premise that e-procurement software which automates the requisitioning process will be able to reduce processing cost per order from as high as $150 per order to as low as $5 per order (Simchi-Levi, Kaminsky, & Simchi-Levi, 2004). Compared to traditional procurement transactions, using e-procurement can reduce cost per transaction by 65% (Davila et al., 2003). According to Presutti (2003), e-procurement used for inter-organization transactions can also enhance the benefits of e-procurement within an organization. Companies using e-procurement systems reported savings up to 42% in purchasing transaction cost allied with less paperwork, which enables transaction processes to have lesser mistakes, and more efficient purchasing.

Government of Andhra Pradesh achieve many benefits from implementation of e-procurement (Bikshapathi & Raghuveer, 2007), few of these are given below:

- ***Transparency***: Transparency reduce the corruption in procurement process
- ***Reduced tender cycle time*** (using e-procurement system significantly reduced the tender lead-time from 120-180 days to 36 days)
- ***Saving the Taxpayer's Money*** (The citizen is satisfied that the taxpayer's money is being spend wisely, the overall cost saving from the operations are estimated to be around ₹ 2,800 crores during last four years by Andhra Pradesh Government and also government departments saved considerable amount ₹ 3-4 crores per year on advertisement cost.)
- ***Empowerment of Bidders*** (Now suppliers can participate effortlessly in the government's bids round-the-clock, remotely.)
- ***Eliminate of Contractors Cartels*** (The genuine supplier is benefited by way of getting more opportunities.)
- ***Streamlining the Processes*** (An effort was made to standardize the procurement processes and bid forms across various works departments.)
- ***Management Information System*** (e-procurement platform provides a cross-section of management information system reports)

E-procurement users also report a reduction in the number of suppliers with the associated cost benefits of lower managerial complexity, lower prices, and headcount reduction in the purchasing process (Davila, et al., 2003) as shown in Figure 1.

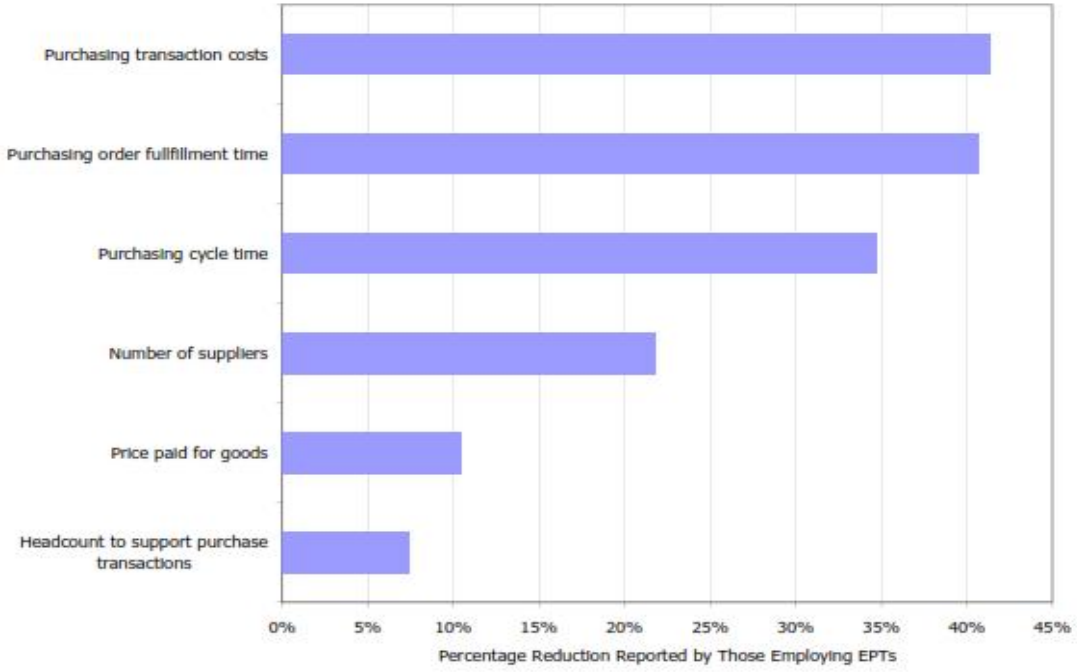

Figure 1: Efficiencies Generated from the Adoption of EP Technologies

According to Giunipero & Sawchuk (2000), the main aim of using internet technology in procurement process is to realize a faster and more efficient operational procurement process which enables people to bypass the purchasing department and concentrate on more strategic tasks as shown in Figure 2.

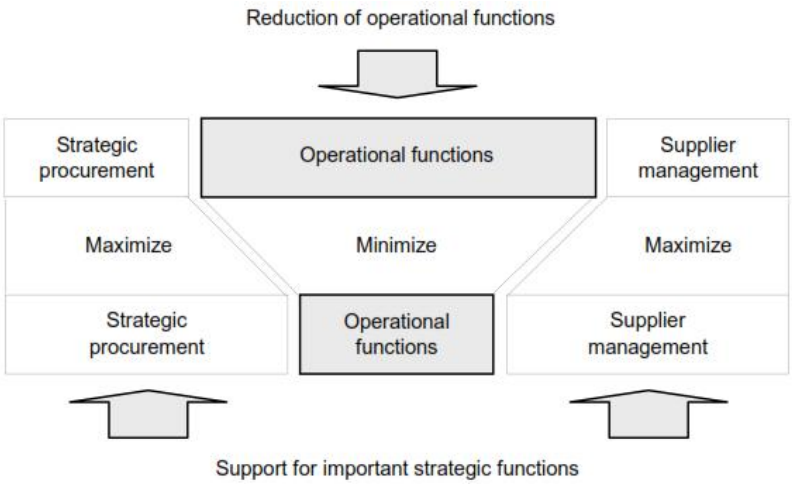

Figure 2: Effects of E-Procurement

Table 1 presents the many benefits of implementing e-procurement as identified by various researchers.

Table 1: Benefits of Adopting E-Procurement

	Benefits of e-procurement	**Literature**
(a)	Reduces procurement cost	Hiller and Belanger (2001), Neef (2001), Boer et.al (2002), Davila et al. (2003), Moon (2003), Panaiotou et al(2004), Gansler et al. (2003), Croom and Brandon-Jones (2005), Barbieri and Zanoni (2005), Vaidya et al. (2006),Gil-Garcia (2006), Zaharah (2007), Maniam et al (2007)
(b)	Electronic transactions offer improved efficiency for both the supplier and government (procurement office)	Henriksen and Mahnke (2005), Callender and Schapper (2003), Callender and Matthews (2002)
(c)	Increases accountability and transparency	Jones (2002), Henriksen and Mahnke (2005)
(d)	Improves G2B collaborative relationships	Dyer (2000), Tang et al. (2001)
(e)	Improves the internal service and purchasing function	Stanley and Wisner (2001), Croom and Brandon-Jones (2005)
(f)	Efficiency gains and price reductions	Boer et al. (2002), Panayiotou et al.(2004)
(g)	Increases customer satisfaction	Thai and Grimm (2000)

The new services of E-Procurement are now on-demand or a software-as-a-service. Turban et al. (2009) summarize the benefits of e-procurement as follows:

- Increasing the productivity of purchasing agents (providing them with more time and reduced job pressure)
- Lowering purchase price through product standardization, reverse auctions, volume discount, and consolidation of purchases

- Improving information flow and management (e.g. supplier's information and pricing information)
- Improving the payment process and saving due to expedited payments (for sellers)
- Establishing efficiency, collaborative relations
- Ensuring delivery on time, every time
- Reducing the number of suppliers
- Streamlining the purchasing process making it simple and fast (may involve authorizing the individuals to procure items from their desktops, bypassing the procurement department)
- Reducing the administrative processing cost per order by as much as 90 percent (e.g. GM achieved a reduction from $100 to $10)
- Finding new suppliers and vendors that can provide goods and services faster and/ or cheaper (improved sourcing)
- Integrating budgetary controls into the procurement process
- Minimizing human errors in the buying or shipping process
- Monitoring and regulating buying behavior.

1.6 Definition of Key Terms

Attitude: Attitude refers to an individuals' positive or negative reaction towards the target behavior (Fishbein & Ajzen, 1975). An attitude is usually viewed as an enduring disposition to respond consistently in a given manner to various aspects of

the world, including persons, events, and objects (Zikmund, 2003). The three components of attitude are the affective, the cognitive, and the behavior. The affective component reflects on individual general feeling towards an object. The cognitive component explains the individuals' awareness about an object. The behavioral component includes both intentions and behavioral expectations; therefore, it reflects a predisposition to action.

Behavioral Intention: Behavioral intention refers to individuals' performance of a target behavior is determined by his or her behavioral intention to perform the specified behavior (Fishbein & Ajzen, 1975). According to Fishbein & Ajzen (1975) behavioral intention can be jointly determined by attitude and subjective norm.

Complementary Asset: Complementary assets are those additional assets which are required to derive value from the primary investment (Teece, 1998).

Computer Anxiety: Computer anxiety is defined as the tendency of an individuals' apprehension, uneasy, or fearfulness about the use of computers (Igbaria & Nachman, 1990).

Computer Playfulness: Computer playfulness refers to the extent of cognitive spontaneity in microcomputer interactions (Webster & Martocchio, 1992).

Computer Self-Efficacy: Computer self-efficacy refers to the opinion of individual regarding his or her ability to use a computer to perform a job task (Compeau & Higgins, 1995).

Image: Image refers to the degree to which use of an innovation is perceived to enhance one's status in one's social system (Moore & Benbasat, 1991).

Infrastructure Support: Infrastructure support refers to a shared information technology platform, which includes computer software, hardware, and network technologies, that are necessary to adequately and appropriately implement information technology solutions throughout an organization (Ross, Beath, & Goodhue, 1996).

Job Relevance: Job relevance refers to a persons' perception about the degree to which the target system is applicable to his job (Venkatesh & Davis, 2000).

Organizational Support: It refers to those factors that can directly managed by the organizational managers such as infrastructure support and employee training, in contrast to those factors which can't directly controlled by the organizational managers like climate, culture, and structure of the organization (Bhattacherjee & Hikmet, 2008).

Output Quality: Output quality refers to individuals' perception about the capability of the system, that how well the system performs the specified tasks to match his or her job goals (Venkatesh & Davis, 2000).

Perceived Behavioral Control: Perceived behavior control defined as individuals' perception of the ease or difficulty of performing the behavior interest (Ajzen, 1991).

Perceived Ease of Use: is defined as the degree to which an individual believes that using a specific system is free of efforts (Davis, 1989).

Perceived Usefulness: Perceived Usefulness in contrast, refers to the degree to which an individual believes that using a specific system would increase his or her job performance (Davis, 1989).

Result Demonstrability: Result demonstrability refers to the tangibility of the result of using the Information system innovation that includes their communicability and observability (Moore & Benbasat, 1991).

Self-Efficacy: Individuals' judgment of his or her ability to organize and execute courses of action required to attain designated types of performances. It's not only related with the skills of individuals but with the judgment of what he or she can do with whatever skills he or she possesses (Bandura, 1986).

Subjective Norm: Subjective norm defined as the individuals' perception that the persons important to him or her think that, he or she should or should not perform the target behavior in question (Fishbein & Ajzen, 1975).

Volitional Control: Volitional control refers to the ability to use one's own free will. The concept of volition control applies to an individuals' mental and capability to act freely and with an understanding of the outcomes.

Chapter 2 : Literature Review

An extensive review of literature has been done on TAM, IT, and e-procurement. During review of literature, different individual and organizational constructs were determined (Compeau & Higgins, 1995; Bhattacherjee & Hikmet, 2008; Obeidat & Abu-Shanab, 2010). In this study, extensive review of literature has been done in the other related theories such as TRA, and TPB.

In this quantitative correlation study, the TAM has been extended to determine the adoption of e-procurement system in Uttarakhands' OGP public sector companies. TAM was widely used by many researchers and practitioners to assess the adoption of Information Technology. In this research study, Infrastructure Support, Computer Self-efficacy and Employee Training were used as external independent variables to assess the impact of these variables on behavioral intention to use e-procurement system mediated through two key determinants of TAM model perceived usefulness and perceived ease of use. Organization performance can only improved if its implemented technologies were not underutilized. Assessing the employees' adoption and utilization of e-procurement system was necessary to find the potential gain from investing in e-procurement system. If organization managers understand why particular technology accepted or rejected they can proactively develop some intervention programs to reduce underutilization of e-procurement system and assist employees to adopt and use e-procurement system effectively to improve the efficiency of employees using e-procurement system.

There are many sections included in the chapter that have some relation with this research work. The first section discussed about business value of Information Technology investment and its impact on organization performance, so that organizations continue to implement Information systems.

2.1 Information Technology and its Impact on Organizational Performance

From many decades, Researchers and practitioners have debated on whether investment in Information Technology improves the organizational performance or not? This debate has coin the term information technology productivity paradox.

2.1.1 IT Productivity Paradox

There is a debate from many decades that whether the computers contributes to productivity growth or not. According to economist Paul Krugman, that productivity is almost everything in the long run. As productivity growth increases, it affects our living standards and wealth of the nation. The success of a business is generally depends on the ability of the firm to provide real value to their customers without using much labor, capital, or other inputs (Brynjolfsson & Hitt, 1998). However, productivity is just a simple concept. It is the amount of output produced per unit of input. However, it is very easy to define but very difficult to measure in the new economy. There are only two aspects of productivity measurement: input and output. 50 years ago, tons of products produced were a reasonable proxy for the value of

output. Nevertheless, in the new economy, value is not only depends on the number of product produced but on product variety, timeliness, quality, customization, convenience and other intangible values. Productivity growth doesn't come from working harder but primarily from working smarter. Productivity growth comes from working smarter usually means adopting new technology and techniques. There have been many anecdotes about whether IT investment gives any productivity gain or not. On the one hand, there are many success stories like Dell and Cisco those transected billions of dollars via internet. On the other hand, there are many stories about abandoned systems investment, cost overrun, and IT failure (Brynjolfsson & Hitt, 1998). The aggregate statistics suggest that productivity has grown more between 1950 and 1973 and become slow down since 1973. In the late 1980, payoffs from IT have been debated among the researchers and practitioners resulting in coining the term "IT Productivity Paradox" (Brynjolfsson, 1993; Brynjolfsson & Yang, 1996). "We see the computer age everywhere except in the productivity statistics" as stated by Robert Solow in the New York Times Book review (July 12, 1987). According to Morrison & Berndt, study at economy level of manufacturing segments determined that a $0.80 margin was realized per dollar invested in IT, and at the industry level studies results found that IT investment does not lead to greater productivity than other types of investment (Morrison & Berndt, 1991),. The results from firm level studies show the positive correlation between IT and productivity gain (Devaraj & Kohli, 2000).

2.1.2 Information Payoff

There have been many studies at different level – that is, the economy level, industry level and firm level (Devaraj & Kohli, 2000). Studies during late 1980s focused IT investment impact on whole economy, but in early 1990s, researchers had reexamined the data and look at the IT investment behavior of firm level. Researchers also measure some intangible value created by IT at firm-level. Firm-level studies found that there is positive relation of IT investment and productivity and contradicting claims of "Productivity Paradox" (Brynjolfsson & Hitt, 1995, 1996; Malone, 1997). Organizations adopting IT technologies at a faster rate found to be getting more benefits from IT. Survey suggests that the prime motive of managers to use IT is to improve customer services and quality consistently above cost savings (Brynjolfsson & Hitt, 1997).

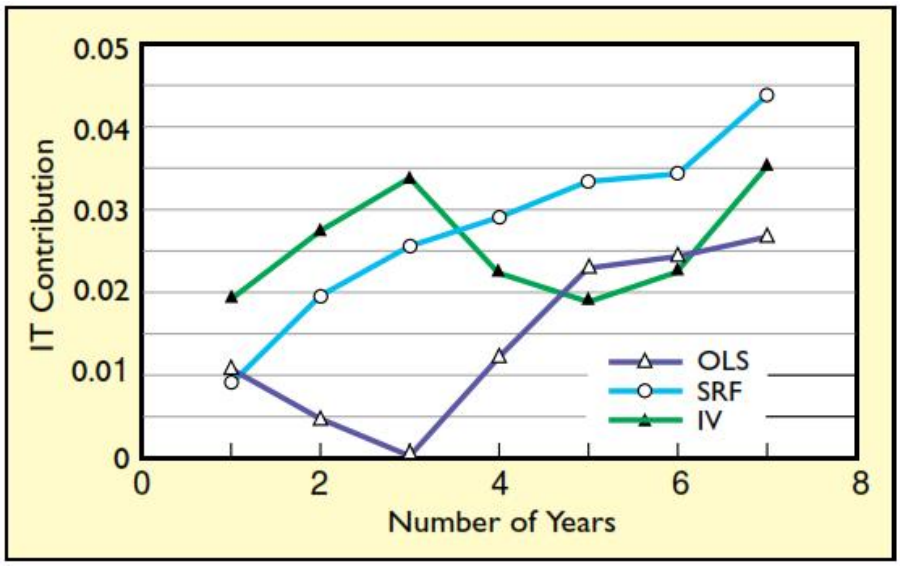

Figure 3: Productivity of IT Investments Over Time

In the above figure, the vertical axis represents estimates of the productivity growth contribution of IT capital. The numbers are estimated output elasticity of IT capital, which represent the percentage change in output for a small percentage change in the quantity of IT. The value would be approximately 0.01 if IT has a "normal" rate of return. These estimates were computed by linear regression and the different lines represent different statistical techniques. "OLS" refers to ordinary least squares. "SRF" (semi-reduced form) is similar to OLS except that labor expense was not included in the list of inputs to reduce biases on the IT estimates from reverse causality between output and labor expense. "IV" represents instrumental variables regression which is an alternative way of addressing reverse causality (Brynjolfsson & Hitt, 1998).

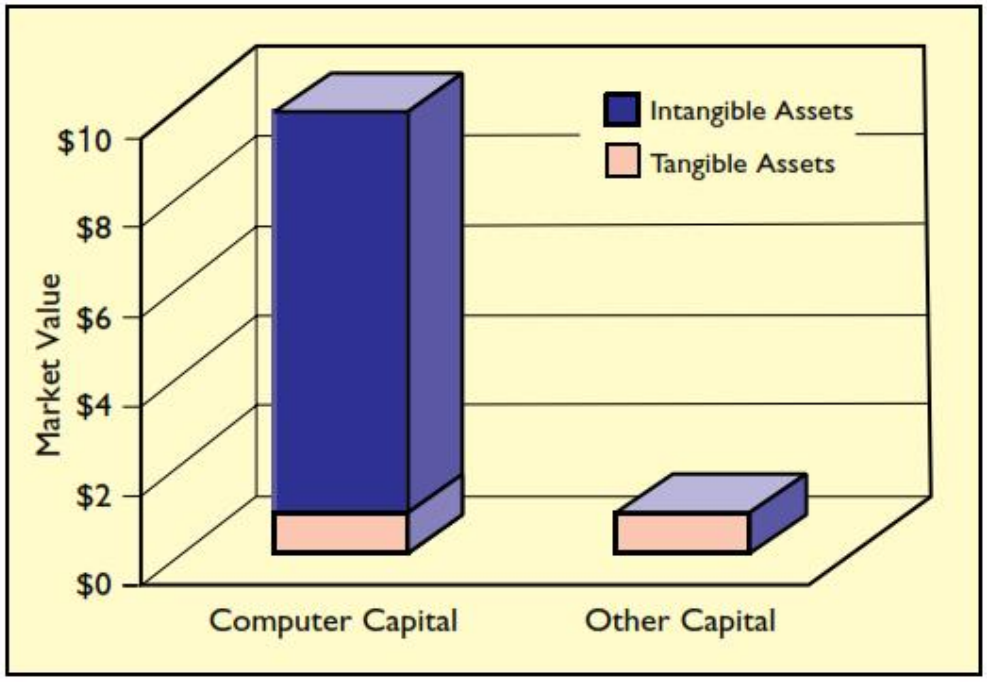

Figure 4: Relative Market Value of Computer Capital

This analysis suggests that a one-dollar change in IT capital is associated with a change of about $10 in market value for the average firm in our sample. For this to be equilibrium there must be about $9 of unmeasured intangible associated with each dollar of measured IT capital (Brynjolfsson & Hitt, 1998).

There were several studies, which assessed about IT investment and its effect on organizational performance. Researchers and academicians uses different variables, levels (economy, industry, and firm), and technologies to determine IT payoff. Some studies found positive relationship between IT investment and organizational performance, but other studies found negative relationship between technology investment and organization performance. According to Devaraj & Kohli, the main effect of Information technology on organizational performance is not because of enormous investment in it but the adoption and actual use of Information Technology. The adoption of technology may be mandatory or voluntary. In mandatory adoption, subjective norms have a significant effect on intention. In Voluntary, the adopters perceive that adoption is non-mandatory (Devaraj & Kohli, 2003).

2.2 Evolution of Technology Acceptance Model

There are several theories which have been used to determine the individual's behavioral intention to accept or reject technology, such as the Theory of Reasoned Action (Fishbein & Ajzen, 1975), the Theory of Planned Behavior (Ajzen, 1991), and the Technology Acceptance Model (Davis, 1989). The TAM is most popular model in the field of information systems to determine the individual's behavioral intention to

use information technology (Alshare & Alkhateeb, 2008), was used in this study to assess the determinants of employees adoption of e-procurement system in Uttarakhands' OGP public sector companies. The TAM was developed by (Davis, 1989) to find out the user acceptance of information technology.

The Technology Acceptance Model developed from two foundation theories, TRA and TPB. The TRA and TPB are the general purpose theoretical models from social psychology usually used to determine the behavioral intention of individuals to perform a particular behavior, where Behavioral intention can jointly determined by individual's attitude towards that behavior and subjective norm (Davis, Bagozzi, & Warshaw, 1989).

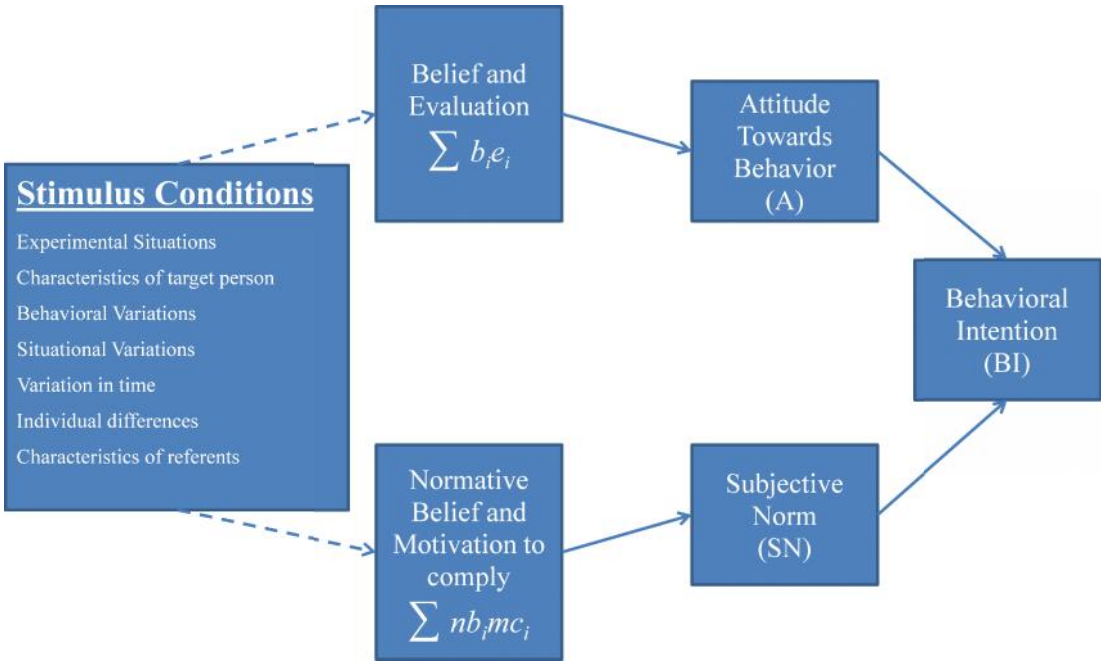

Figure 5: The Theory of Reasoned Action Model

Figure 5 obtained from Fishbein/Ajzen, Belief, Attitude, Intention, and Behavior, Figure 7.2(*Schematic representation of effects of stimulus variables on intentions*), p. 334

Behavioral intention is a measure of the strength of an individual's intention to perform a particular behavior (Davis, et al., 1989). Attitude refers to an individual's favorable and unfavorable feelings about performing an intended behavior (Fishbein & Ajzen, 1975, p. 216). Subjective norm refers to "the person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein & Ajzen, 1975, p. 302).

According to TRA, there are two factors that have been used to determine the behavioral intentions: an individual factor or "attitudinal" factor and social or "normative" factor. The symbolical representation of equation of the theory is as follows:

$$BI = (A_B)\, w_1 + (SN)\, w2 \qquad (1)$$

Where, *B* belongs to the Behavior; *I* belong to the intention to perform behavior; A_B is the attitude towards performing behavior; *SN* is the subjective norm; w_1 is empirical weight assigned to *A* and w_2 is empirical weight assigned to *SN* (Fishbein & Ajzen, 1975, p. 301), where, the relative weights of the attitudinal and normative factors may vary from one person to another. Behavioral Intention (BI) is a linear function of sum of two weighted variables Attitude (A_B) and Subjective Norm (SN).

According to Theory of reasoned action, a person's attitude toward performing a specified behavior can determined by his or her salient beliefs about perceived

outcomes or consequences of performing the behavior multiplied by evaluation of those consequences or outcomes:

$$A^B = \sum_{i=1}^{n} b^i e^i \qquad \textbf{(2)}$$

Where, A_B is the attitude toward behavior, b is the salient belief about performing the specified behavior B leads to consequence or outcome *i*, e is the person's evaluation of consequence or outcome *i* and k is the number of beliefs a person hold about the specified behavior (Fishbein & Ajzen, 1975, p. 301).

The above equation represents information-processing view of attitude structure and change, which posits that external stimuli do not affect person's attitude directly but can influence the person's belief formation which influence the person's attitude.

The normative component of the TRA model, SN, deals with influence of the behavior through social environment. According to TRA, a person's subjective norm (SN) is determined by sum of his or her normative beliefs (nb_i) about perceived expectation of specified referent individuals and groups and multiplied by his or her motivation to comply (mc_i) with those expectations (Fishbein & Ajzen, 1975, p. 302):

$$SN = \sum_{i=1}^{n} nb^i mc^i \qquad \textbf{(3)}$$

Where, SN is the subjective norm, nb_i is the normative belief (i.e. the person's belief that referent individual or group i think that he or she can or can't do the specified task), mc_i is the motivation comply with referent individual or group i, k is the number of individual or group referents.

According to Davis, et al., TRA is a general model as such; the belief construct is not included for performing a particular behavior (Davis, et al., 1989). Researchers those who are using TRA model in his or her research to study human behavior should first identified the belief construct for that particular behavior being assessed (Davis, et al., 1989). (Fishbein & Ajzen, 1975) suggested that eliciting five to nine salient beliefs are sufficient to conclude the individual's behavior to do the specified behavior.

The theory of reasoned action has been widely used in many domains and applied research (Davis, et al., 1989). The TRA deals with prediction and explanation of behavior that is usually under an individual's volitional control. In TRA, behavioral intention can be determined by attitude towards the behavior and subjective norms, under a person's volitional control (Ajzen, 1991). Theory of planned behavior is an extension of the theory of reasoned action that will allow us to include consideration of non-volitional factors as determinants of behavior.

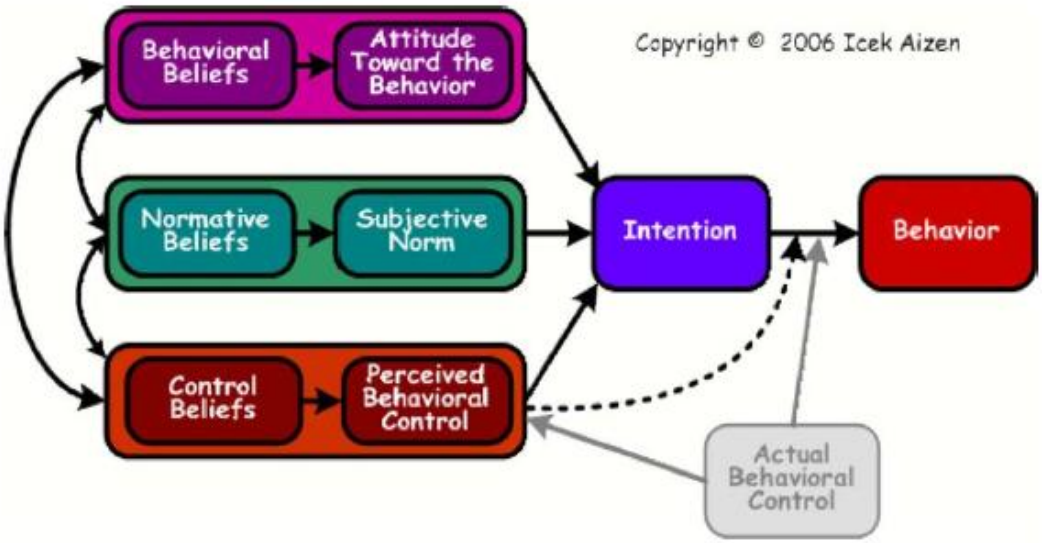

Figure 6: Theory of Planned Behavior

Source: http://people.umass.edu/aizen/tpb.diag.html

The TRA was not use for prediction of a specific behavior in a given situation. The TPB framework designed to predict human behavior in specific contexts. TPB differs from TRA by adding perceived behavioral control, which plays an important part in the TPB (Ajzen, 1991). Perceived behavioral control differs from Rotter's (1966) concept of perceived locus of control, locus of control remain stable across situations and actions, whereas perceived behavioral control vary across situations and actions (Ajzen, 1991). According to TPB, perceived behavioral control refers to the individual's perceived ease or difficulty of performing a specific behavior. According to Ajzen, behavioral achievement can be determined by perceived behavior control and behavioral intention (Ajzen, 1991).

$$BI = (A_B)\, w_1 + (SN)\, w_2 + (PBC)\, w_3 \qquad (4)$$

According to above formula of behavioral intention, behavioral intention to perform behavior at different situation and kinds can predicted by attitude towards behavior, subjective norm, and perceived behavioral control. Where, w_1 is the empirical weight assigned to A, w_2 assigned to SN, and w_3 assigned to PBC respectively. Performance of the behavior can facilitate by multiplying each control belief (c) with the perceived power (p) of the particular control factor.

actor.

$$PBC = \sum_{i=1}^{n} cb^i p^i \quad \textbf{(5)}$$

The results of products are the summation of the n salient control beliefs to produce the perception of behavioral control.

According to Ajzen, the strength of individual's intention to perform the specific behavior is determined by the favorable attitude and subjective norm towards that behavior, and the perceived behavior control (Ajzen, 1991). According to TRA, the attitude, subjective norm, and perceived behavior control relatively vary across the behaviors and situations. In the previous researches', TPB have been widely used across many domains such as meat consumption (Bonne, Vermeir, Bergeaud-Blackler, & Verbeke, 2007), intentions to smoke (Smith, Bean, Mitchell, Speizer, & Fries, 2007; Walker, Courneya, & Deng, 2006), leisure (Walker, et al., 2006), condom use (Bryan, Kagee, & Broaddus, 2006), technology adoption and use (Baker, Al-Gahtani, & Hubona, 2007; Brown & Venkatesh, 2005).

2.3 Information Technology Acceptance

The Theory of Reasoned Action and the Theory of Planed Behavior were widely used to examine human behavior in general.

2.3.1 Technology Acceptance Model

The Technology Acceptance Model has been used specifically to determine technology acceptance and usage behavior. Technology acceptance model was developed by Devis (1986). TAM was an adaptation of Theory of Reasoned Action, and it was specifically tailored to find out the determinants of technology acceptance of new technologies, used by the end users. TAM is theoretically justified and parsimonious model to predict user behavior across wide range of end user computing technologies. Researchers and practitioners can utilize TAM model to predict why a particular technology accepted or rejected by the end user, so that they can pursue corrective steps. The key purpose of TAM model is to determine the impact of external factors on internal beliefs, attitudes and intentions (Davis, et al., 1989).

There are two main beliefs used in TAM, perceived usefulness and perceived ease of use, which were primary used for computer acceptance behaviors. Perceived usefulness (PU) defines that using the particular technology improve his or her job performance. Whereas, perceived ease of use (PEOU) defines that using a particular technology is free of efforts (Davis, et al., 1989).

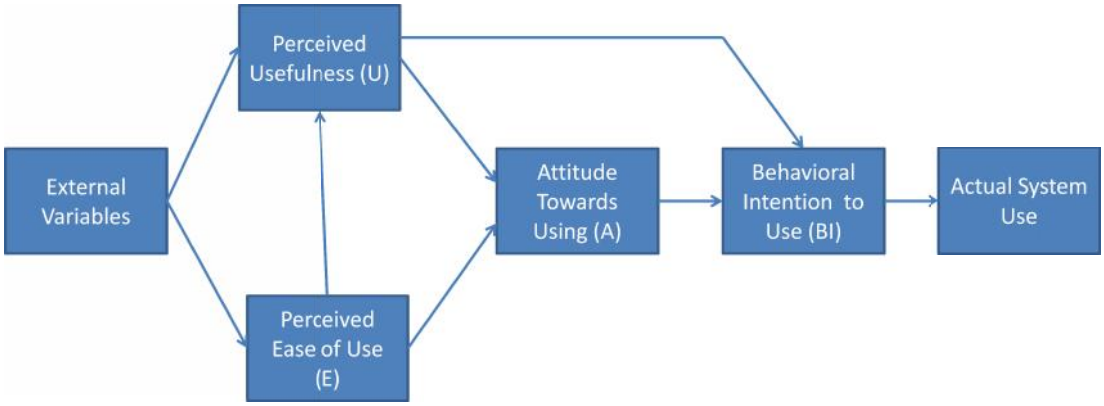

Figure 7: Technology Acceptance Model

The TAM model shows that actual usage of technology can determined by behavioral intention to use technology, but behavioral intention can be jointly determined by attitude towards using technology and perceived usefulness, with relative weights, forming the following equation:

$$BI = A + U$$

Form the equation, the A-BI relationship explain that people attitude to perform particular behavior have positive effect on his or her intention. The U-BI relationship explains that people form positive behavior about intention to use particular technology, if he or she thinks that using the technology improves his or her job performance. Subjective Norm was not included in TAM, just because of its uncertain theoretical and psychometric status (Davis, et al., 1989).

According to TAM, Attitude towards a particular technology can jointly determined by perceived usefulness (U) and perceived ease of use (EOU), with their relative weights estimated by linear regression:

$$A = U + EOU$$

TAM model represents that there is direct effect of Perceived usefulness (U) on behavioral intention over and above attitude (A). The above equation also posits that perceived usefulness also influence the attitude (A). Perceived ease of use (EOU) has also significant positive effect on attitude.

The TAM model also represent that improved perceived ease of use (EOU) contributes to improve the performance. So, perceived ease of use (POU) has direct effect on perceived usefulness (Davis, et al., 1989). Perceived usefulness also effected by external fcators over and above perceived ease of use (EOU) and forming the following equation:

$$U = EOU + \text{External Factors}$$

According to TAM, perceived ease of use can be influenced by extrenal factors. There are many features of an interface such as menus, icons, etc. which enhace the usability of particular computer system.

$$EOU = \text{External Factors}$$

The impact of external factors on perceived ease of use has been documented by many researchers(Davis, et al., 1989).

There is a controvesy in the literature regarding inclusion of attitude in the final model of TAM. The Attitude towards using a technology was omitted by (Davis, et

al., 1989) in their final model. Based on empirical analysis in their final model it was found that there is weak link between perceived usefulness and attitude, and there is strong link between perceived usefulness and behavioral intention. On the basis of empirical analysis attitude was excluded from the final TAM model. An exhaustive literature review reveals that many researchers have not included attitude in their research model. But in few studies (Sanchez-Francis & Roldan, 2005) and (Gong, Xu, & Yu, 2004) it was found that attitude has a positive correlation with other contructs (perceived usefulness, perceived ease of use and behavioral intention) of TAM model. (Gong, et al., 2004) have not given any explanation about inclusion of attitude construct in their research model. Accroding to (Sanchez-Francis & Roldan, 2005), though, there were many researchers including Davis (1989), suggested it was not meaningful to include attitude construct in TAM model, but they obtained positive correlation suggest otherwise. So, (Sanchez-Francis & Roldan, 2005), suggested to include attitude construct in TAM studies.

Subjective Norm (SN) was a critical construct of theory of reasoned action and theory of planned behavior, but this construct was also exlcuded from the TAM to detremine the behavioral intention to use technology. It was acknowledged by (Fishbein & Ajzen, 1975) that subjective norm is the least understood facet of theory of reasoned action. There was no significant relation found between subjective norm and behaviornal intention to use (Davis, et al., 1989). Hence, there was no evidance which shows significane relationship beween subjective norm and behavioral intention, this construct was not included in the original TAM model (Davis, et al.,1989).

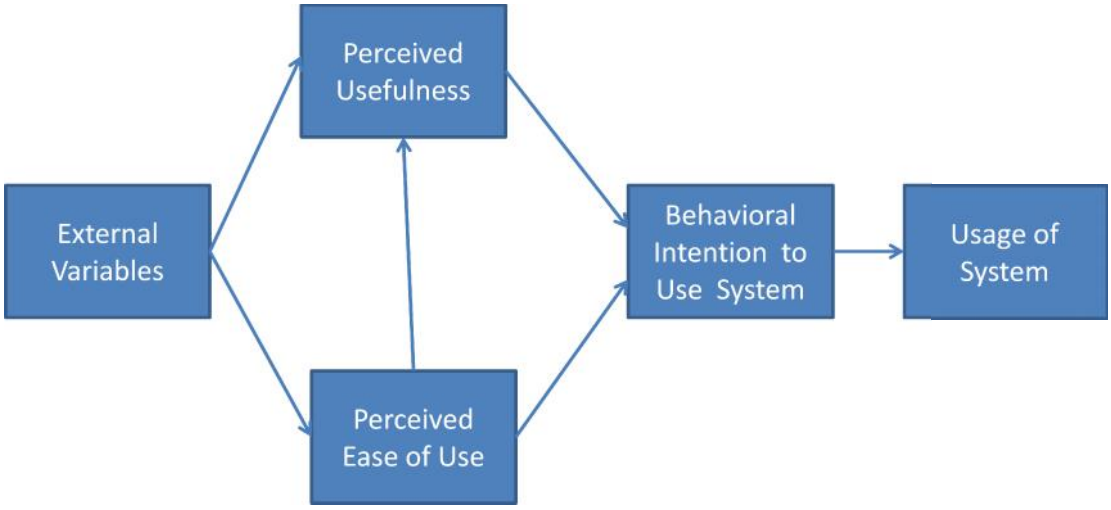

Figure 8: Technology Acceptance Model

Source: (Venkatesh & Davis, 1996)

While TAM model has been widely used to predict acceptance and usage behavior by using two key construct perceived usefulness and perceived ease of use, but still, it is limited to provide sufficient information to IT professional and managers to be in a better position to conduct effecitve intervantion programs to improve user acceptance of new technologies. This limitation influence the researchers (Venkatesh & Davis, 2000) to focus on the antecedents of perceived usefulness and perceived ease of use. As depicted in the TAM model that there are few other external factors which impact on intention to use computer system.

According to Davis, et al., there are various external factors such as individual differences, situational constraints and managerial controllable intervantion that impinging on behavioral intention to use system mediated through two key beleifs

about system usage: perceived usefulness and perceived ease of use (Davis, et al., 1989).

2.3.2 Antecedents of Perceived Usefulness

TAM has been found as well-established robust and parsimonious model for predicting user acceptance and usage. Many empirical test on TAM model suggests that perceived usefulness has consistently been a strong determinant of technology usage intention, with standard regression coefficeints typically around 0.6 (Venkatesh & Davis, 2000). During study it was found that perceived usefulness is a fundamental driver of usage intentions, it was important to determine the determinants of this construct and how its influence changes over time with increasing experience using the system(Venkatesh & Davis, 2000). Perceived ease of use is also a direct construct to predict usage behavior and has a less consistant effect on intention across many studies, but there are many studies in which researcher have detremine the determinants of perceived ease of use, but detreminants of perceived usefulness have relatively overlooked (Venkatesh & Davis, 2000).

A better understanding of detreminants of perceived usefulness will provide us useful information to design organizational intervantions to improve user acceptance and usage of new information systems. (Venkatesh & Davis, 2000) extnded the TAM by adding additional determinants of TAM's percieved usefulness and assessed that how these determinants will change over time and gaining experience with the target system. The TAM model they extended referred to as TAM2.

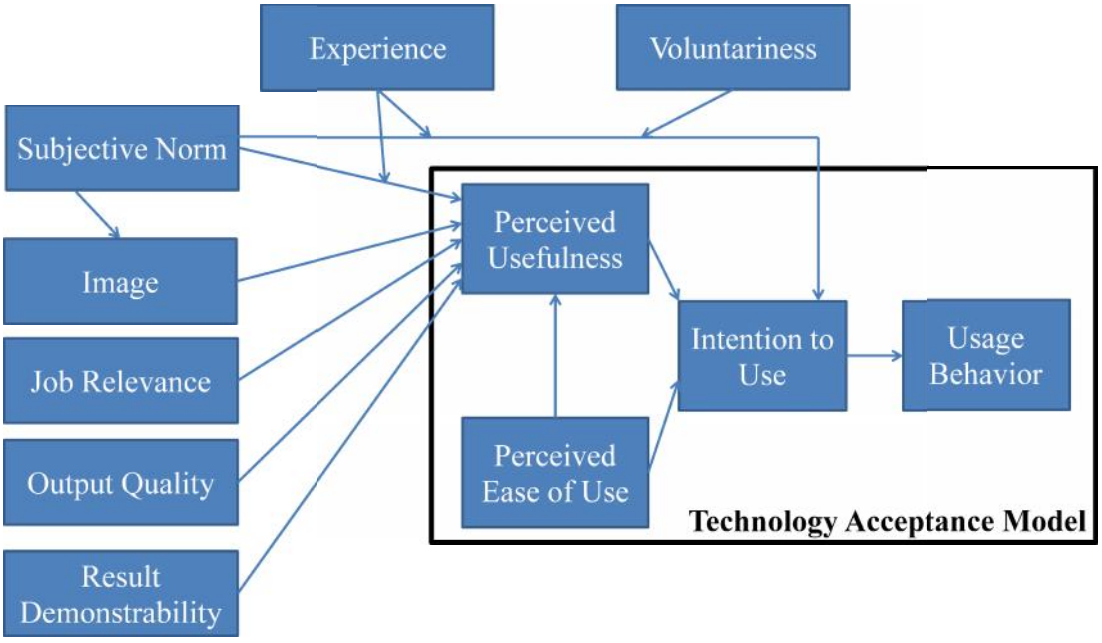

Figure 9: Antecedents of Perceived Usefulness

Using TAM as strating point, in TAM2 (Venkatesh & Davis, 2000) included some additional theoretical constructs spanning social influence processes (Subjective norm, voluntariness, and image) and cognitive instruments processes (job relevenace, output quality, result demostrability, and perceived ease of use). TAM2 was tested using four logitudinal field studies. These four sites spanned a range of industries, organizational contexts, functional areas, and the type of systems be used. From these four sites two sites were choosen, where the usage was mandatory and the other two sites chooses where the usage was voluntary. The questionnaires were distributed to potential users at three different points in time: after initial training (T1), on month after implementation (T2), and three months after implementation (T3). Self-reported usage behavior was measued at T2 and T3, and also five months after implementation

(T4). The results from the study suggests that study 1 and 2, the use of the new system was voluntary while study 3 and 4, the use of new system was mandatory. TAM2 was strongly supported in all the four organizations and three time periods. The results explaining upto 60% of the variance in perceived usefulness. Futhermore, TAM2 extends TAM by showing that subjective norm exerts a significant direct effect on usage intention over and above PU and PEOU for mandatory system use but not for voluntary system use.

2.3.3 Antecedents of Perceived Ease of Use

Previous studies suggest that perceived ease of use is an important determinant that influences user acceptance and usage behavior of new computer systems. Although, there have been several researches conducted in order to determine the impact of perceived ease of use on behavioral intention to use system, very less work has been conducted to understand the other determinants that influence the TAM's perceived ease of use (Venkatesh, 2000). There were many studies conducted by many researchers with emphasize on system design characteristics or training when trying to enhance user perception of the ease of use of the system, but they overlooked the other controlled variables such as individual difference and variables that were a results of a new system-user interaction (Venkatesh, 2000). A theoretical model was developed by (Venkatesh, 2000), based on anchoring and adjustment-theoretical framework.

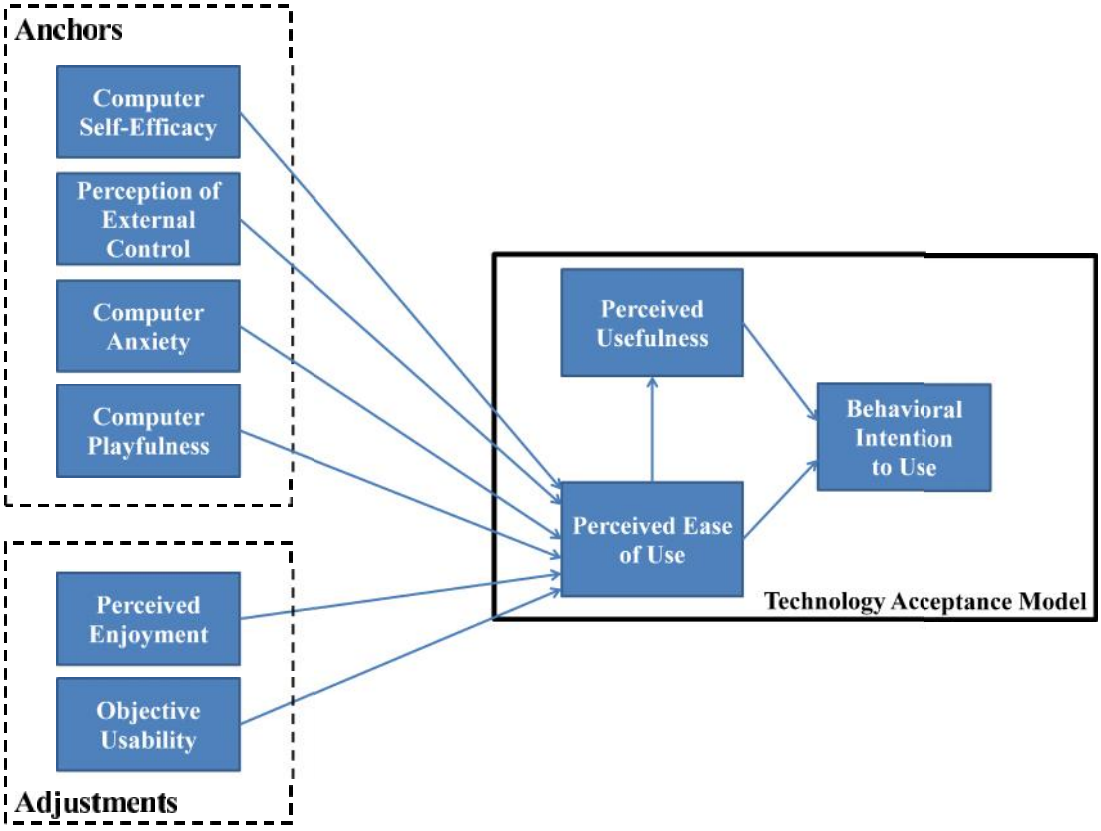

Figure 10: Antecedents of Perceived Ease of Use

Source: (Venkatesh, 2000)

The proposed model control (internal and external – conceptualized as computer self-efficacy and facilitating conditions, respectively), intrinsic motivation (conceptualized as computer playfulness), and emotion (conceptualized as computer anxiety) as anchors that determine early perceptions about the ease of use of new system.

The extended TAM was tested in three different organizations among 246 employees over three-month period to test the impact of computer self-efficacy, perception of external control, computer anxiety, computer playfulness, perceived enjoyment,

objective usability on intention to use new system mediated through a key construct of TAM model perceived ease of use. The results obtained from the regression analysis shows that all the determinants were significantly relate with the perceived ease of use, and there was 60% of the variance in the system-specific perceived ease of use. The findings from this research model suggest that there is a need for an increased focus on individual difference variables in order to enhance user acceptance for new system, rather than more emphasize on perception and design characteristics (Venkatesh, 2000). Results also suggest organizing basic training programs to improve computer skills, as they have strong impact on acceptance and usage behavior.

2.3.4 Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology (UTAUT) Venkatesh et al. (2003) Unified Theory of Acceptance and Use of Technology (UTAUT) proposes that an individual's intention to use an information system is driven by performance expectancy, effort expectancy, and social influence. Actual system usage is driven by intention to use the system and by facilitating conditions. In the model, these constructs are moderated by gender, age, experience, and voluntariness of use. The model draws from a number of earlier models that attempt to explain an individual's behavior (theory of reasoned action, technology acceptance model, motivational model, theory of planned behavior, and a combined theory of planned behavior/technology acceptance model, model of PC utilization, innovation diffusion

theory, and social cognitive theory). Validation tests conducted by Venkatesh et al., (2003) found that UTAUT explained 70% of the variance in information system usage intention.

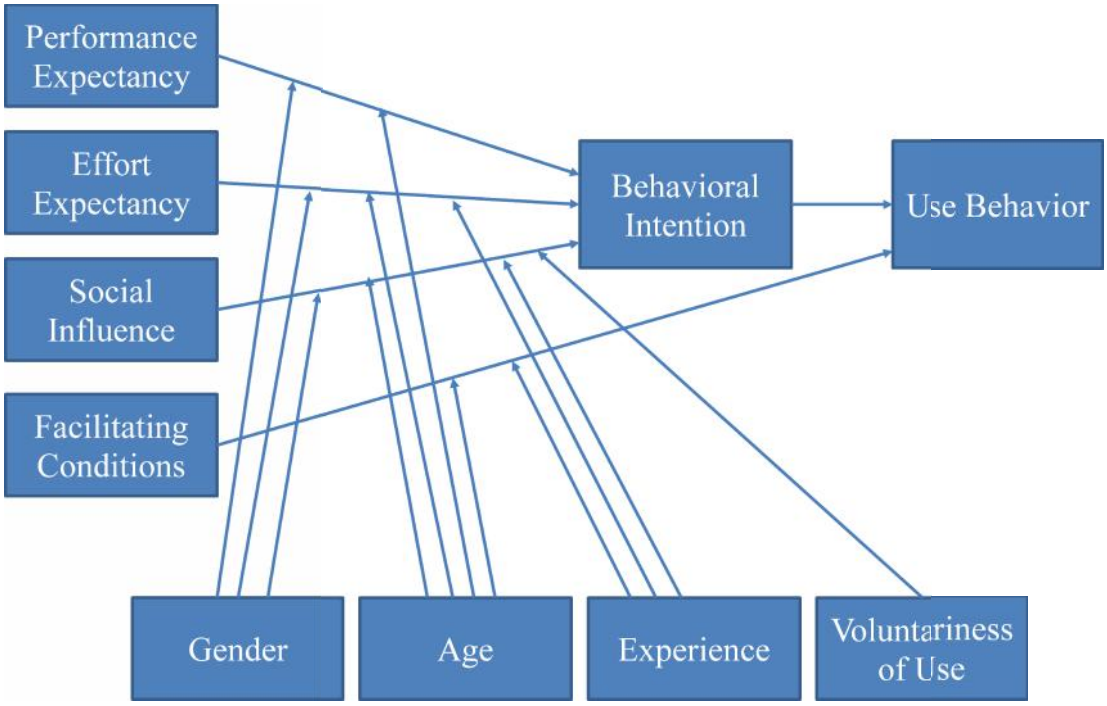

Figure 11: Unified Theory of Acceptance and Use of Technology

Source: (Venkatesh, Morris, Davis, & Davis, 2003)

The four constructs that directly affect intention and behavior in UTAUT are performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to an individual's expectation that using the system will result in better job performance. Effort expectancy refers to an individual's expectation about the difficulty involved in using the system. Social influence refers to an individual's perception of how other individuals of importance

to him/her feel about him/her using the system. Last, facilitating conditions refers to an individual's perception of factors that exist within the organization that would encourage his/her use of the system.

2.4 Computer Self-Efficacy

The Computer self-efficacy construct derived from Bandura (1986) social cognitive theory. Computer self-efficacy was widely used to determine its impact on usage of information technology, by many researchers and practitioners. Social cognitive theory was widely accepted and empirically validated model of individual behavior (Compeau & Higgins, 1995). Social cognitive theory based on social pressures or unique situational characteristics, cognitive and other personal factors, which include personality as well as demographic characteristics, and behavior, are reciprocally determined. In a given situation behavior affected by environmental and situational characteristics, which in turn affected by behavior. Behavior also influenced by cognitive and personal factors (Compeau & Higgins, 1995). (Bandura, 1977, 1982) defines self-efficacy as, people's judgment of their capability to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with the judgments of what one can do with whatever skills one possesses. Social cognitive theory incorporates two specific expectations: (1) outcome expectations (2) expectation related to self-efficacy (Igbaria & Iivari, 1995). Here, outcome expectations are similar to perceived usefulness construct. Both the expectations are the basic determinants of user behavior (Bandura, 1977).

Computer self-efficacy is a special application of self-efficacy in management information system (He & Freeman, 2010). According to Compeau & Higgins, computer self-efficacy refers to one's ability to use computer system. It is not related with what an individual has done in his past, but about the judgment of individual that what he can do in future (Compeau & Higgins, 1995). Computer self-efficacy judgment differs in three distinct, but interrelated dimensions: magnitude, strength, and generalizability (Compeau & Higgins, 1995). The magnitude of computer self-efficacy construct can measured as the level of capability expected. A person with high magnitude of computer self-efficacy, perceived itself to accomplish more difficult task as compared to a person with less computer self-efficacy magnitude (Compeau & Higgins, 1995). A person with high magnitude of computer self-efficacy might judge themselves as capable of operating with less support and assistance than those with lower magnitude of computer self-efficacy (Compeau & Higgins, 1995). The strength of computer self-efficacy judgment refers to the level of confidence a person has on his or her ability to perform the computer task (Compeau & Higgins, 1995). A person with high generalizability of computer self-efficacy might judge himself or herself as capable of working with different software packages and computer systems, while those who have lower computer self-efficacy generalizability would judge himself or herself to work with particular software packages or computer systems (Compeau & Higgins, 1995).

Computer self-efficacy has been repeatedly used within the TAM framework. It is an important construct to determine the individual responses to technology acceptance

and usage. Computer self-efficacy viewed as an important construct in the recent studies such as computer usage (Fagan & Neill, 2004), effect of computer self-efficacy on ERP usage (Shih, 2006), understanding general computer self-efficacy (He & Freeman, 2010), user attitude and computer self-efficacy (Torkzadeh, Pflughoeft, & Hall, 1999), web-based electronic records (Ma & Liu, 2005). There were many studies, which assessed the impact of computer self-efficacy on intention to use technology mediated through perceived ease of use and not through perceived usefulness (Ma & Liu, 2005). There are many studies, which assessed the impact of computer self-efficacy on behavioral intention to use information technology mediated through perceived usefulness but not perceived ease of use. Some other studies examined the impact of computer self-efficacy on intention to use technology mediated through both perceived usefulness and perceived ease of use.

2.5 Computer Self-Efficacy and Perceived Usefulness

The impact of computer self-efficacy on perceived usefulness shows mixed of results. (P. Chau, 2001) collected the data from business student to assess the impact of computer self-efficacy on intention to use technology mediated through perceived ease of use and perceived usefulness. The results obtained from the study suggest that computer self-efficacy has a small negative effect on perceived usefulness, and no impact found on perceived ease of use. Seyal and Rehman (2007) found positive impact of computer self-efficacy on intention to use technology mediated through perceived usefulness. (Reid & Levy, 2008), found that there is a significant impact of

computer self-efficacy on perceived usefulness but not on perceived ease of use. (Shih, 2006), found the positive significant impact of computer self-efficacy on attitude and actual usage mediated through both perceived usefulness and perceived ease of use.

Admin extended the TAM model and collect the survey data from the undergraduate students who have never used internet banking, to test the impact of computer self-efficacy on intention to use. He found that computer self-efficacy has a significant positive impact on perceived usefulness and perceived ease of use (Amin, 2007).

Scott & Walczak (2009), assessed the impact of computer anxiety, experience, engagement, and organizational support on computer self-efficacy, and also determined the impact of computer self-efficacy on behavioral intention to use mediated through perceived usefulness and perceived ease of use.

2.6 Computer Self-Efficacy and Perceived Ease of Use

Igbaria & Iivari (1995) extended the TAM model to determine the impact of computer self-efficacy on intention to use computer system. Igbaria & Iivari (1995) incorporated self-efficacy and its determinants such as experience and organizational support, as factors affecting computer anxiety, perceived ease of use, perceived usefulness and the use of computer system. They survey across 450 microcomputer users in Finland, and found that computer self-efficacy has a strong impact on perceived ease of use.

Venkatesh (2000) found computer self-efficacy as an important determinant of perceived ease of use. He extended the TAM, and tested the proposed model using three different organizations among 256 employees using three measurements taken over a three-month period. In his study, Venkatesh found that computer self-efficacy has a significant direct effect on perceived ease of use.

Table 2: Impact of Computer Self-Efficacy on Information Technology Usage

Studies	Impact of CSE on BI mediated through	
	Perceived Usefulness	**Perceived ease of Use**
Igbaria and Ivari (1995)	Not tested	Tested
Venkatesh and Davis (1996)	Not tested	Tested
Venkatesh (2000)	Not tested	Tested
Chau (2001)	Tested	None
Ma and Liu (2005)	Tested	Tested
Hasan (2007)	Tested	Tested
Amin (2007)	Tested	Tested
Reid and Levy	Tested	None
Scott and Walczak (2009)	Tested	Tested

According to Venkatesh & Davis (1996), they have collected data from 108 subjects using 6 different information technology systems to assess the impact of computer

self-efficacy on perceived ease of use. The results found after correlation analysis suggest that computer self-efficacy has a significant impact on perceived ease of use.

2.7 Employee Training

IT infrastructure is not only consisting of telecommunication and related equipments, but it requires e-readiness and IT literacy. For Information Technology acceptance and usage, it is required to give training to employees, so that they can build their basic needed knowledge about system (Obeidat & Abu-Shanab, 2010). The use of corporate IT resources are positively affected by individuals' greater computer related skills, education, and experience (Cronan & Douglas, 1990), therefore, computer training to end user influence user involvement, user confidence, user satisfaction, and system usage (Torkzadeh, et al., 1999). There are many theoretical and empirical supports for the use of managerial intervention such as training, which influence the acceptance and usage of technology (Amoako-Gyampah & Salam, 2004). Igbaria, Zinatelli, Cragg and Cavaye examined the impact of internal and external training on perceived usefulness and perceived ease of use, and concluded that while internal training do not have any significant effect on perceived ease of use, but have a significant effect on perceived usefulness. External training does not have any significant effect on perceived usefulness, but it has a significant effect on perceived ease of use. Training mechanism aimed to improve the computer self-efficacy of user, to gain user acceptance (Amoako-Gyampah & Salam, 2004). Previous research suggests that training influence user attitudes, behavior, and performance and further

the impact of training behavioral intention to use mediated through belief mechanisms (Galletta, Ahuja, Hartman, Teo, & Peace, 1995; Yi & Davis, 2001).

2.8 Infrastructure Support

Organizational support is a key factor, which influence the usage of information technology within organization (Ginzberg, 1981; Igbaria & Iivari, 1995). Organizational employees want to use Information technology and use it effectively, if they will get necessary support from their organization, in the form of infrastructure support (Bhattacherjee & Hikmet, 2008). There are many research studies, which gives strong explanations of personal use of IT resources such as spreadsheet or online banking, but there is very less literature, which gives explanation about that what organizational managers can do to proactively motivate organizational end-users in utilization of enterprise resource planning systems, forecasting systems or accounting applications (Bhattacherjee & Hikmet, 2008). Bhattacherjee & Hikmet (2008) examined the factors that can be directly controlled by the organizational managers, in contrast to factors like culture, organizational climate that may be not directly under control of organizational managers. These controllable factors, labeled as organizational support factors. (Ross, et al., 1996), defined infrastructure as a shared technology platform, which includes computer software, hardware, and networking technologies, that are necessary to adequately and appropriately implement Information Technology solutions throughout an organization. From an employee perspective lack of requisite infrastructure dampen the individuals'

perceptions of the utility of Information Technology usage. In contrast to above, availability of a well design infrastructure signals shows organizational commitment to IT implementation efforts and influence greater satisfaction from IT usage and positive perception of IT usefulness (Bhattacherjee & Hikmet, 2008).

2.9 E-procurement Models

In literature, many researchers and practitioners discussed about e-procurement models (Chaffey, 2009; Kalakota & Robinson, 2011; Subramaniam & Shaw; Turban, et al., 2009). According to J. Y. Bakos, the availability of domain specific B2B exchanges and e-markets, provide organizations to manage their procurement, by adding different availability of choices (J. Y. Bakos, 1998). Many e-procurement models have identified by researchers and practitioners. These models provide the flexibility to buyer and seller to choose the model according to the need of organization or business transaction, and organizations can use more than one model (Kalpana & Sawhney, 2000; Mahadevan, 2000).

Subramaniam & Shaw has identified four basic models of e-procurement. These models are

(i) Buy-side procurement system

(ii) Private B2B e-market

(iii) Industry B2B Exchange

(iv) Third-party E-market.

Turban, et al., 2009, has discussed about B2B transaction models such as (i) Sell-Side (ii) Buy-Side (iii) Exchange (iv) Collaborative commerce. Chaffey (2009), explained three main e-procurement model alternatives for buyers such as One-to-many (sell-side @ supplier side), Many-to-one (buy-side @ buyer site), and Many-to-many (neutral exchange). Kalakota & Robinson (2011) discussed and compare various e-procurement models.

2.9.1 Buy-side Procurement System

Buy-side procurement system developed and implemented by buyer firms to do procurement transaction using web with selected suppliers (Subramaniam & Shaw).

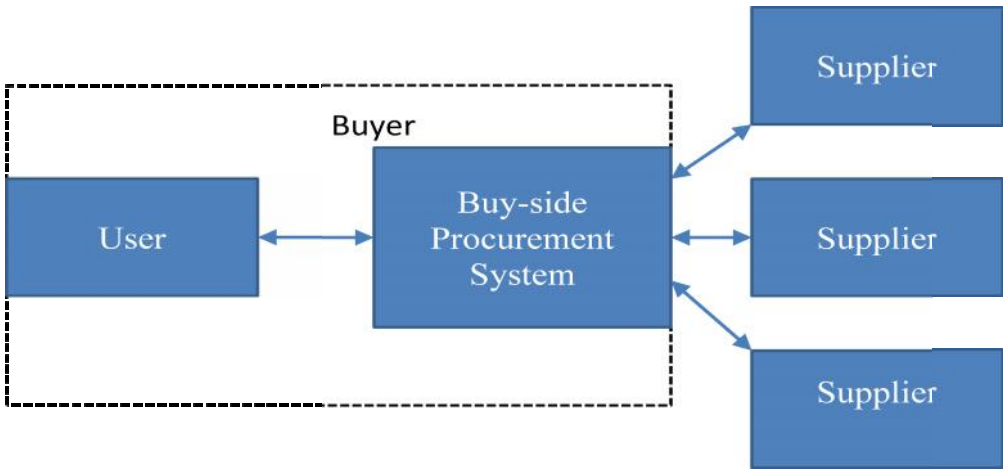

Figure 12: Buy-side Procurement System

In Buy-side procurement system, there is one buyer and multiple suppliers. Therefore, buyers have wide choice to select the desired material from the suppliers in terms of direct and indirect commodities.

2.9.2 Private Electronic Marketplace

Many organizations maintain their own electronic marketplace to aggregate their suppliers and achieve completive price for products (Subramaniam & Shaw). Interested suppliers do trade with the buyer-owned private electronic market.

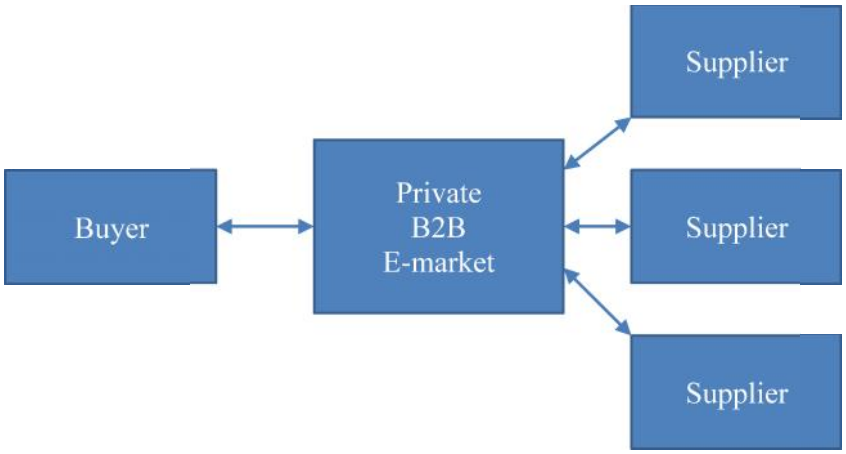

Figure 13: Private Electronic Marketplace (Buy-side)

The main aim of forming e-market is to reduce the procurement price of the items as well as reduce the search cost for locating suppliers (Subramaniam & Shaw).

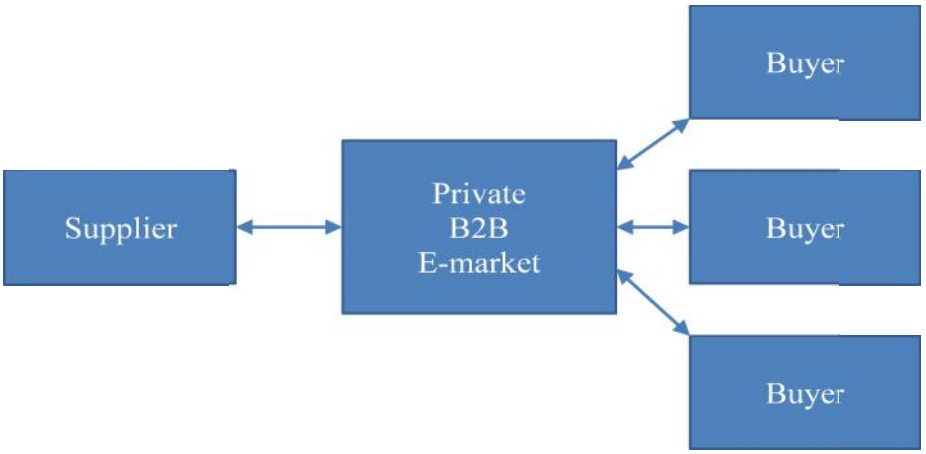

Figure 14: Private Electronic Marketplace (Sell-side)

Table 3: Industries with B2B Electronic Markets

INDUSTRY	B2B E-MARKETS	COMMENTS
Metals	e-STEEL.com MetalSite.com	E-markets for steel and metal products
Autos	AutoXchange.com GMTradeXchange.com	Buyer driven e-markets in a concentrated industry
Energy	Altra.com YOUtilities.com	Trading portals for electrical power and natural gas
Life Science	SciQuest.com Chemdex.com	E-markets for chemical reagents and lab instruments
Petroleum	Petrocosm.com WorldOil.com	E-markets of equipment and services for oil and gas companies
Construction	Bidcom.com Buzzsaw.com	E-markets integrating business models of building industry
Foods	Inc2Inc.com Instill.com	E-markets for food wholesale
Chemicals	ChemConnect.com CheMatch.com	E-markets for bulk chemicals

Source: (Dai & Kauffman, 2001)

2.9.3 Industry B2B Exchange

In industry specific B2B exchange, many organizations form industry specific B2B exchange and consortiums.

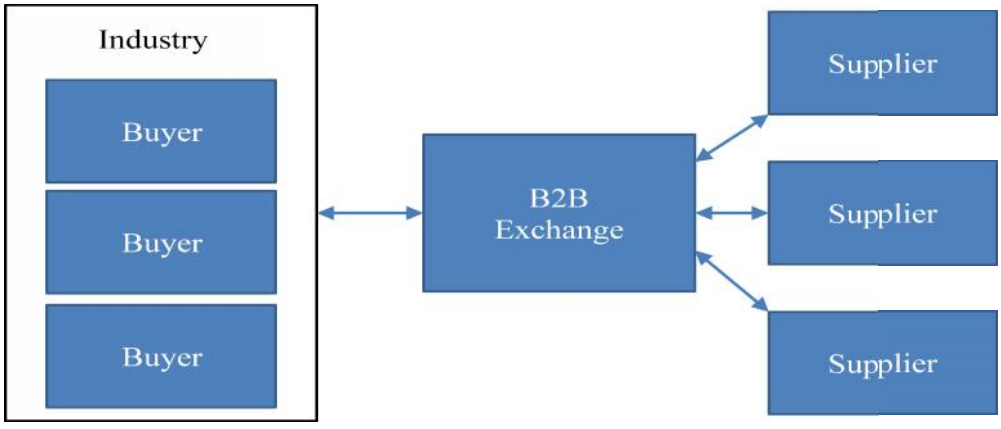

Figure 15: Industry B2B Exchange

This model typically used to aggregate buyer and suppliers in the specific industry. It reduces the cost of search for both, buyers and suppliers (Subramaniam & Shaw).

It forces the competition among sellers and increases the transparency of the process, which provides lower prices to buyers.

2.9.4 Third-party B2B E-Market

These type of markets or exchanges are usually run and owned by a third party or by a consortium (Turban, et al., 2009), also known as exchanges, trading communities, neutral exchanges, many-to-many exchange, public e-marketplace, or trading exchanges (Chaffey, 2009; Turban, et al., 2009).

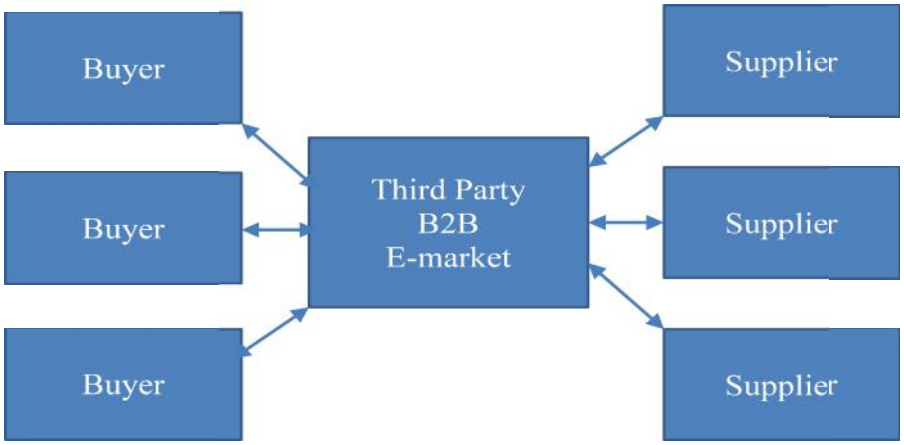

Figure 16: Third-party B2B Electronic Market

These types of markets created by companies called intermediaries or market makers. These companies intermediaries companies have both technological and domain expertise, and market created by these companies can be horizontal or vertical (Subramaniam & Shaw). Third-party markets reduced the products price and cost of

search for buyers and suppliers (J. Y. Bakos, 1998). Kalakota & Robinson (2011) has compared various e-procurement models. The comparison table is below:

Table 4: Comparison of E-Procurement Models

Trading Model	Characteristics
EDI networks	• Handful of trading partners and customers • Simple transactional capabilities • Bath processing • Reactive and costly value-added network (VAN) charges
Business-to-Employee (B2E) requisitioning applications	• Make buying fast and hassle-free for a company's employees • Automated approval routing and standardization of requisition procedures • Provide supplier management tools for the professional buyer
Corporate procurement portals	• Provide better control over the procurement process and let a company's business rules be implemented with more consistency • Custom, negotiated prices posted in a multi-supplier catalog • Spending analysis and multi-supplier catalog management
First-generation trading exchanges: community, catalog, and storefronts	• Industry content, job postings, and news • Storefronts: new sales channel for distributors and manufacturers • Product content and catalog aggregation services
Second-generation trading exchanges: transaction-oriented trading exchanges	• Automated requisition process and purchase order transactions • Supplier, price, and product/service availability discovery • Catalog and credit management
Third-generation trading exchanges: collaborative supply chains	• Enable partners to closely synchronize operations and enable real-time fulfilment • Process transparency resulting in restructuring of demand and the supply chain • Substitute information for inventory
Industry consortiums: Buyer and supplier led	• The next step in the evolution of corporate procurement portals

2.10 E-Procurement Architecture and Applications

According to Bikshapathi & Raghuveer, Government of Andhra Pradesh (GoAP) has developed its e-procurement system using three-tier architecture (Presentation Tier, Business Logic Tier and Database Tier). The application they have used to develop e-procurement system is on Microsoft platform using the following key technologies, given below (Bikshapathi & Raghuveer, 2009):

Table 5: Applications used to develop e-procurement system

Web technologies	Multimedia	Database	OS
ASP 3.0 Web Services C# .NET XML VB 6.0 ASP.NET Visual Basic	Adobe Photoshop 6.0 Dreamweaver 3.0	SQL Server 2000 Standard edition	Windows 2000 Server

For any secure transaction, the primary requirement of any organization is to use security components. Andhra Pradesh Government is using class 2 certificate issued by certifying authority which is recognized by CCA India in compliance with IT Act 2000 (Bikshapathi & Raghuveer, 2009).

Table 6: Security Components

Component	Standards
Digital certificate	X509 v3 certificates
Certificate revocation List	X509 v2
Communication with external cryptographic modules (such as smart card/hardware token)	PKCS # 11
Storage and transmission of private key and certificate	PKCS # 12
Communication with directory services	LDAP v3, X500
Standard for SHA-1 message digest algorithm	FIPS 180-1
Asymmetric key algorithm	RSA
Hash algorithm	SHA-1/MD5
Symmetric key algorithm	3-DES, DES

For secure transaction between server and client, public key infrastructure was implemented for encryption.

The three-tier architecture of e-procurement is scalable to n-tier. For the presentation tier, they are using two load-balancing web servers. These serves are running with Microsoft Windows 2000 Advance Server and Internet Information Services (IIS). Authentication, authorization, and workflow are handling using Microsoft COM+ technology for business tier (Bikshapathi & Raghuveer, 2009). Extensible markup language (XML) is used to create common information format, so that data and its formats can be shared online (Bajaj & Nag, 2008). Database tier is used to store information, and retrieve the data, if disaster happens (Bikshapathi & Raghuveer, 2009). Given below are the Technical Architecture, Logical Architecture, and Application Architecture used by Government of Andhra Pradesh (GoAP).

TECHNICAL ARCHITECTURE

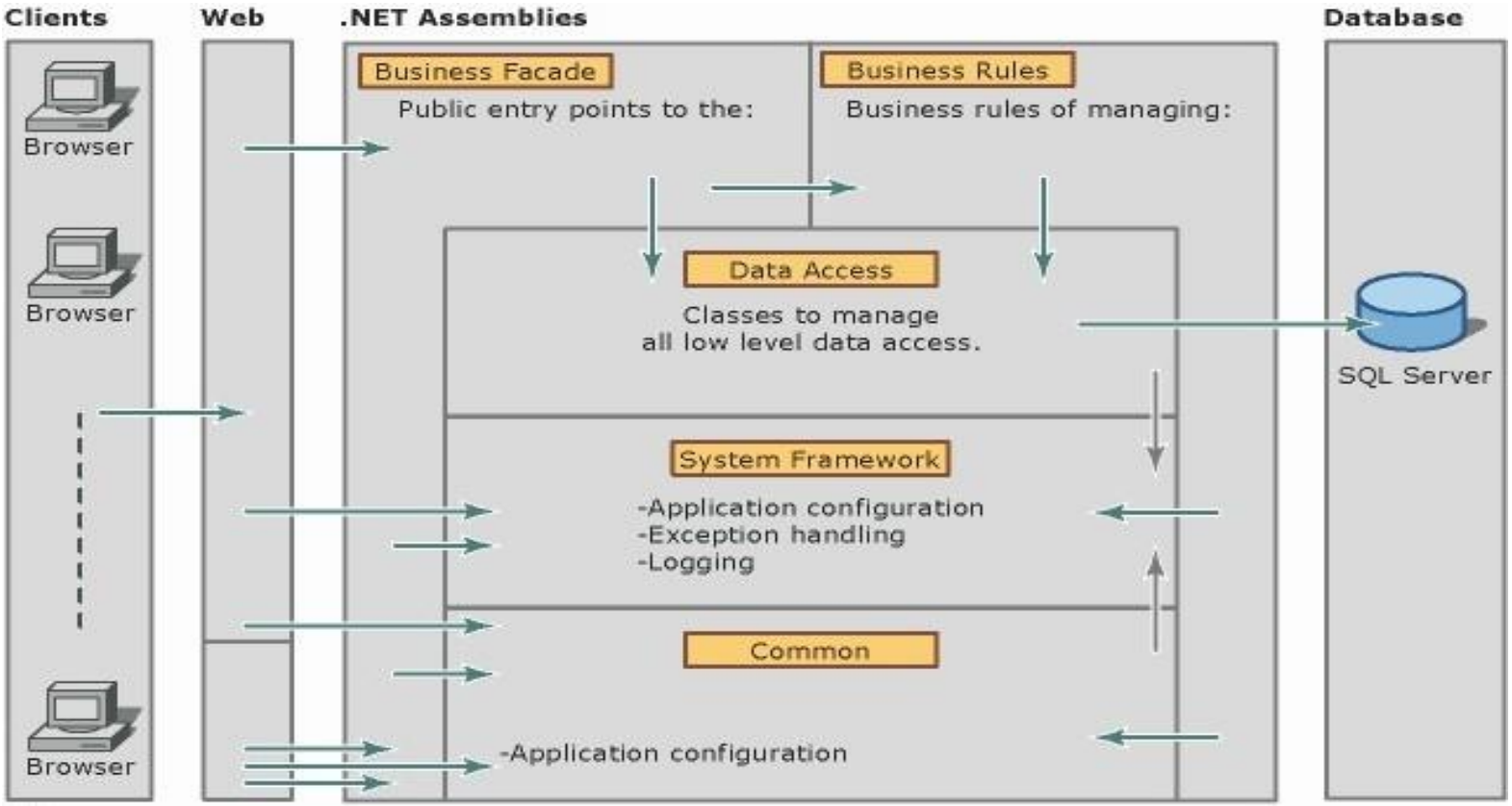

Figure 17: Technical Architecture

Source: (Bikshapathi & Raghuveer, 2009)

LOGICAL ARCHITECTURE

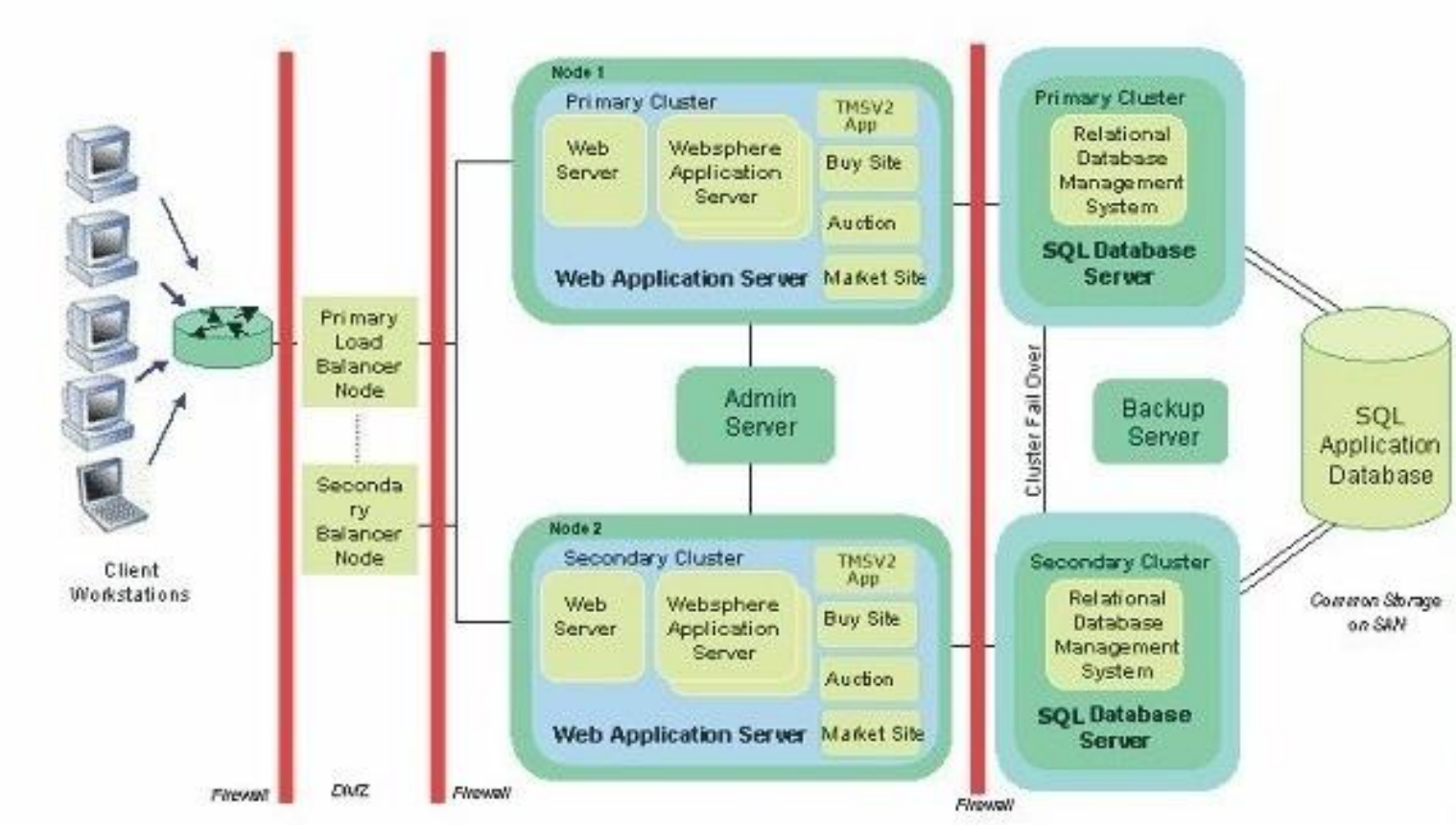

Figure 18: Logical Architecture

Source: (Bikshapathi & Raghuveer, 2009)

APPLICATION ARCHITECTURE

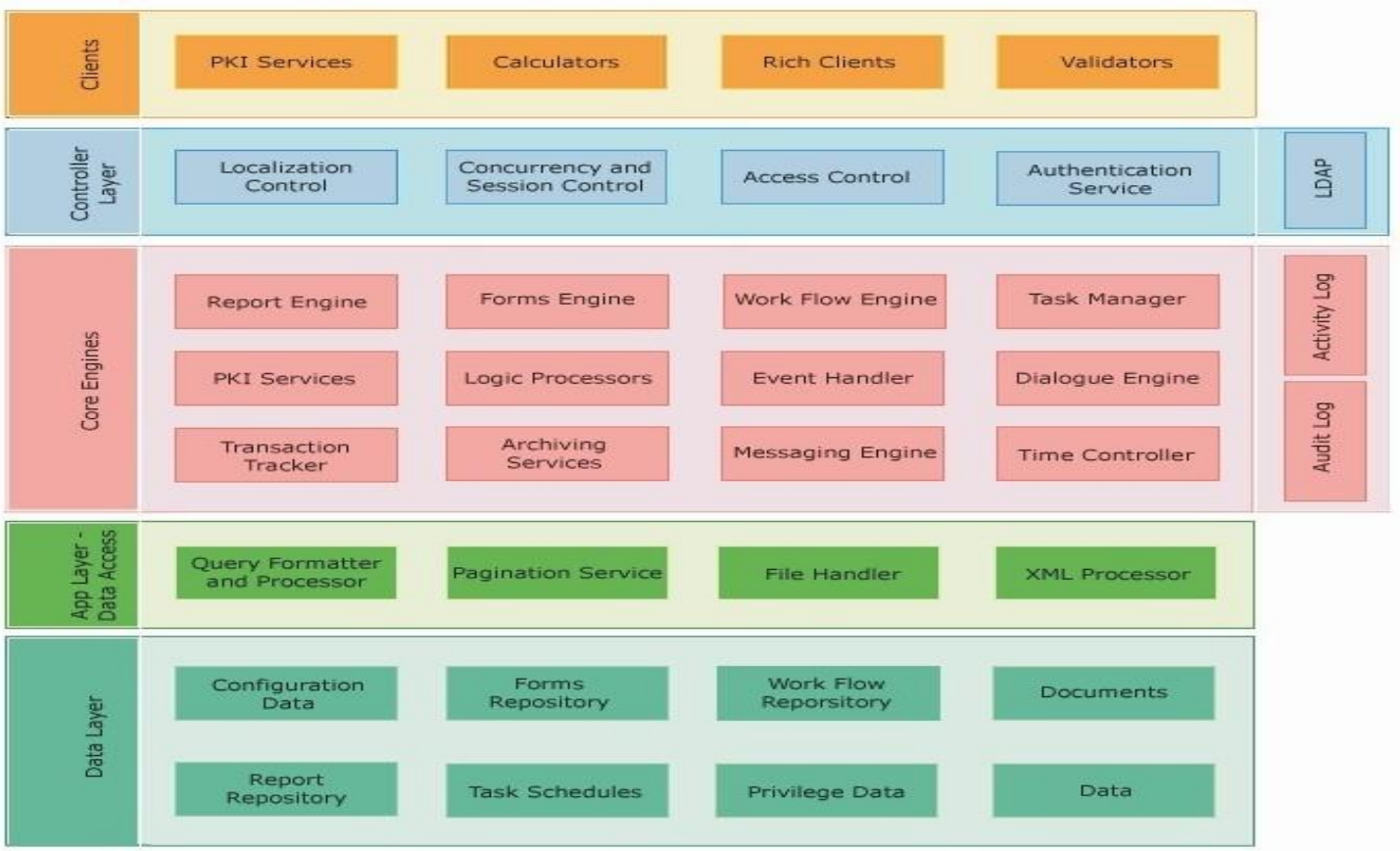

Figure 19: Application Architecture

Source: (Bikshapathi & Raghuveer, 2009)

2.11 National e-Governance Plan (NeGP)

National e-Governance Plan is a major initiative of government of India. The National e-Governance Plan (NeGP) of Government of India aims to "make all Government services accessible to the common man in his locality through common service delivery outlets and ensure efficiency, transparency and reliability of such services at affordable costs to realize the basic needs of the common man."

In the global IT sector, India has a very strong presence, yet the benefits of the IT revolution have not truly filtered into the everyday life of the common person, particularly in rural areas. Experiments in IT based service delivery had started early this decade. Some of these, such as eSeva and Bhoomi, were more successful. These early successes as well as failures showed that online services, served citizens better by reducing the burden of having to physically visit separate agencies, make contact with public officials, and subjected to their discretion (NeGD, 2011). National e-Governance Plan using three-tier architecture (1) Common Service Centres (CSCs) (2) State Wide Area Networks (SWANs) (3) Mission Mode Projects (MMPs). Common Service Centres (CSCs) are front-end delivery point for the citizens. When a common person able to get transparent services with convenient location and cost, he feel himself empowered. State Wide Area Networks (SWANs), the second tier provide common and support infrastructure to share information between government agencies and with citizens such as converged backbone network for data, voice and video throughout a state/UT. The third tier, which comprises the 27 Mission mode

Projects (MMPs). These 27 Mission mode Projects (MMPs), transforms critical citizen services from their manual delivery to e-delivery (NeGD, 2011).

There are 27 Mission Mode Projects under e-Governance Plan which include nine central Mission mode Projects (MMPs), eleven State Mission Mode Projects (MMPs), and seven integrated Mission Mode Projects (MMPs) (NeGD, 2011).

The vision of e-Procurement MMP is "To create a national initiative to implement procurement reforms, through the use of electronic Government procurement, so as to make public procurement in all sectors more transparent and efficient" (NeGD, 2011). The diagram below represents the objectives of implementing e-Procurement MMP (NeGD, 2011).

Figure 20: Objective of e-Procurement MMP

2.11.1 Status of e-Governance Projects

According to Das, from the 27 Mission Mode Projects, under the National e-Governance Plan (NeGP), 14 MMPs already started delivery of services. The remaining 13 MMPs may be start services from 2014. The NeGP was approved in year 2006. The Integrated Mission Mode Projects (MMPs) includes seven projects namely e-biz, e-courts, e-procurement, India Portal, CSC, National Service Delivery Gateway (NSDG), and EDI for e-trade (Das, 2010).

Table 7: Mission Mode Projects Status

MMPs Status at a Glance	
Mission mode project	**Status update**
Banking	Formation of National Payments Corporation of India; rollout of interbank Mobile Payment Service
National Citizen Database	Formation of Unique Id Authority; Enrolment crossed the one lakh mark
MCA21	Setting up of helpdesks at ROC; showcase facilitation centres at metros continue; 200 CFCs in operation
Automation of Central Excise and Service Tax (ACES)	Setting up of www.aces.gov.in;national rollout in 2009
IVFRT	To be implemented between April 10 to September 14 for connecting 169 Indian missions, 77 Immigration Check Posts
e-office	Rollout in Kerala NIC
Passport Seva Project	Setting up of Passport Seva Kendras in Bengaluru
e-distinct	West Bengal rolled out in Bankura & Jalpaiguri; Tamil Nadu government implemented in Krishnagiri, Coimbatore, Thiruvaruvar & Nillgiris districts; Maharashtra selected Pune, Nagpur & Latur for pilot phase.
Gram Panchayat	A total of 97,392 village *Panchayats* broadband enabled; Gujarat the only state to connect all 13,716 village *Panchayats.*

Land Records management	Punjab investing ₹. 115 crores and looking to computerize all 153 tehsils; Maharashtra government extended the scheme to municipal corporations of Mumbai suburban, Kolhapur, Nagpur, Raigadh, Nashik, and Latur in addition to Pune. An online facility for 7*12 extracts and property cards of 7 districts had already been launched in Pune; Orissa too has joined the league with online registration of land records earlier this year.
Employment exchange	In Tamil Nadu, 4 exchanges have gone online using a centralized online service
Treasuries	Envisages computerization of 625 state treasuries; Jammu & Kashmir government has decided to computerize 11 treasuries- 6 in Kashmir & 5 in Jammu division in this fiscal.
Commercial Taxes	Tamil Nadu has initiated the project; Chandigarh too has followed suit, to be implemented in next 2 years.
Police	The Criminal Tracking & Network System (CCTNS) - a central sector scheme with 100% funding by the central government, the Planning Commission had approved an outlay of ₹. 2,000 crores in the 11th Five- Year-Plan for covering 14,000 police stations, 6,000 higher offices, National Crime Records Bureau (NCRB) and State Crime Records Bureaus (SCRB) during the plan period
e-biz	In 2009 the ₹ 15 crores scheme was rolled out; in the pilot phase spanning over 3 years, the scheme will cover Delhi, Haryana, Andhra Pradesh, Maharashtra, and Tamil Nadu-offering 50 services; when completed in 2019, the portal will offer 205 G2B services
e-courts	Karkardooma court in Delhi becomes first district court to become e-court, Cabinet Committee on Economic Affairs revised the allocation to ₹ 9.4bn, up from Rs 4.4 billion, allocated in 2007
e-procurement	Last year DGS&D launched live opening of e-bids for DGS&D rate contracts; Indian railways using e-procurement for reducing the procurement and advertisement cost by approximately 30%
India Portal	Functional in 5 regional languages- Gujarati,

	Assamese, Tamil, Oriya and Bengali; a web based secured Content Management System & an external website opening in a new window has been developed.
National e-governance Service Delivery Gateway	Went live on August 2008; fully integrated with MCA21; systems integration with India Portal, trademarks, Pan, e-district, e-forms & State Portals is in progress; testing with eBitz for NSDG 2.0 is underway, Application security Testing for NSDG version 2.0 completed at both the DC and DR site
EDI for e-trade	All 12 major ports identified for connecting electronically with PCS like Kolkata, Paradip, Vishakhapatnam, Chennai, Ennore, Tuticorin, Cochin, New Mangalore, Mormugao, Mumbai, Jawaharlal Nehru Port Trust & Kandla
Municipalities	The ₹ 787 crores project under the Ministry of Urban Development proposes to offer services like registration, issue of birth/death certificates; payment of property taxes; payment of utility bills; grievance and suggestions & building plan approvals
Common Service Centres	More than 85K CSCs rolled out; 31 InfoTech & Comat technologies Pulled out; Target of 1 lakh CSCs to be rolled out by March'11.

State-owned organizations such as, Steel Authority of India (SAIL), Hindustan Copper Limited, Mangalore Refinery and Petrochemicals Ltd, Central Coalfields Limited, West Bengal State Electricity Distribution Company Limited and Bharat Heavy Electricals (BHEL) have implemented e-procurement solutions to increase efficiency of processes (Oberoi, 2011).

2.11.2 E-Governance Uttarakhand

All Government Departments and its agencies using core IT Infrastructure to reduce project and operation costs for each department. Theoretically, there is a need of backbone IT infrastructure for every e-Governance projects.

Uttarakhands' state information architecture will work on three tier architecture, at the back-end repository all the data and applications are stored (such as State Data Centres), at connectivity level, back-end systems with the front-end system, which includes offices (such as State Wide Area Networks), and the front-end delivery services (such as Common Service Centres). The Uttarakhand state government intended to provide connectivity, access and services from Secretariat/Sate Headquarters to the block level, which includes horizontal connectivity to all the important government offices at each of these levels (eGRM, 2007).

2.11.2.1 Architecture of USWAN

The State Wide Area Network (USWAN) aims to provide a reliable, integrated and robust connectivity infrastructure, which provide high capacity and high speed delivery of voice, data and video transmissions along with setting up an open standard based, interoperable, scalable network infrastructure providing a ubiquitous communication backbone for the State's distributed information processing environment in addition to enabling connectivity to various government departments (eGRM, 2007). Hierarchal structure from State HQ to District HQ to Sub Division HQ / Block HQ is given in Figure 22.

STATE INFORMATION ARCHITECTURE

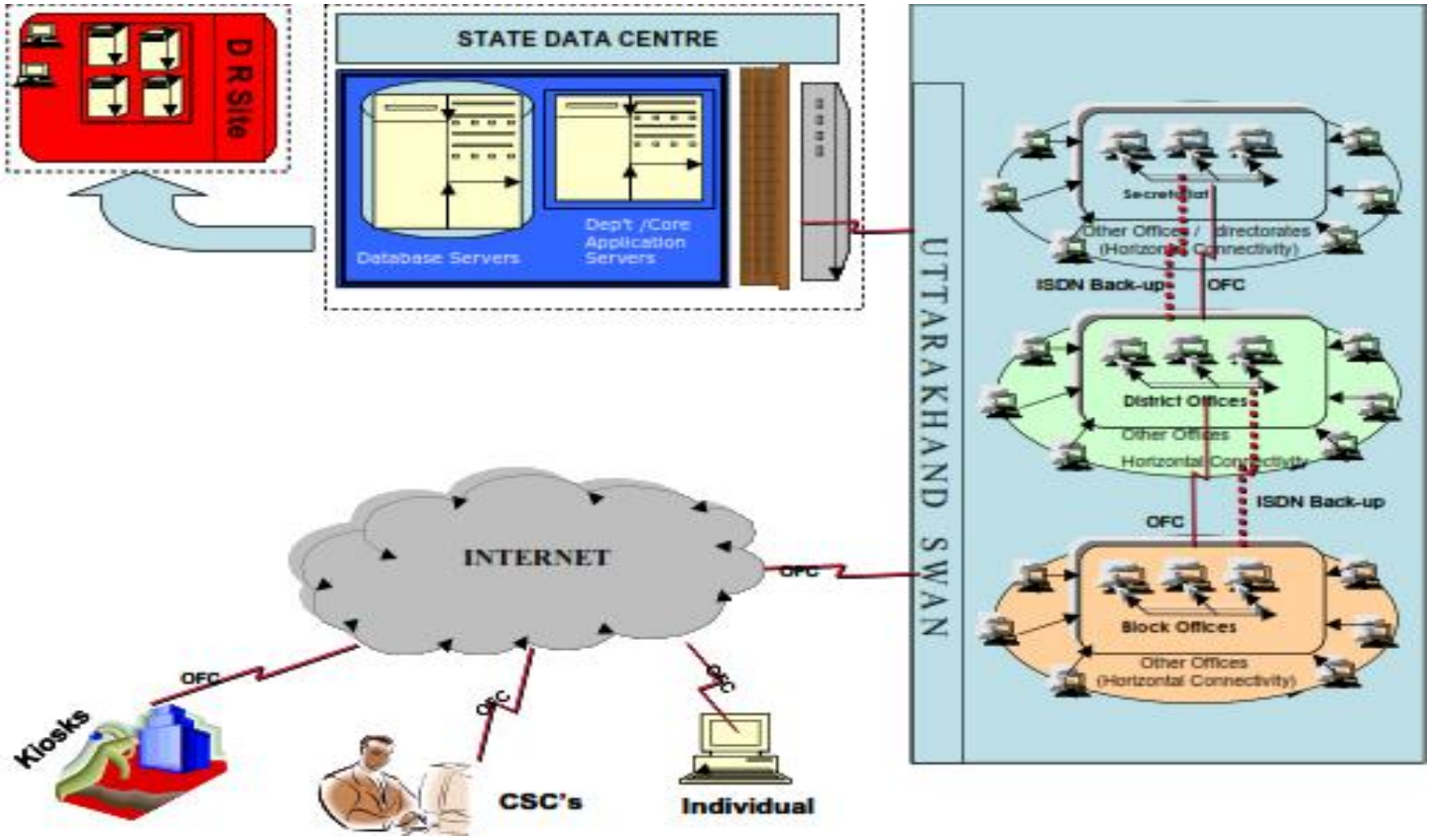

Figure 21: State Information Architecture

Source: (eGRM, 2007)

ARCHITECTURAL FRAMEWORK FOR USWAN

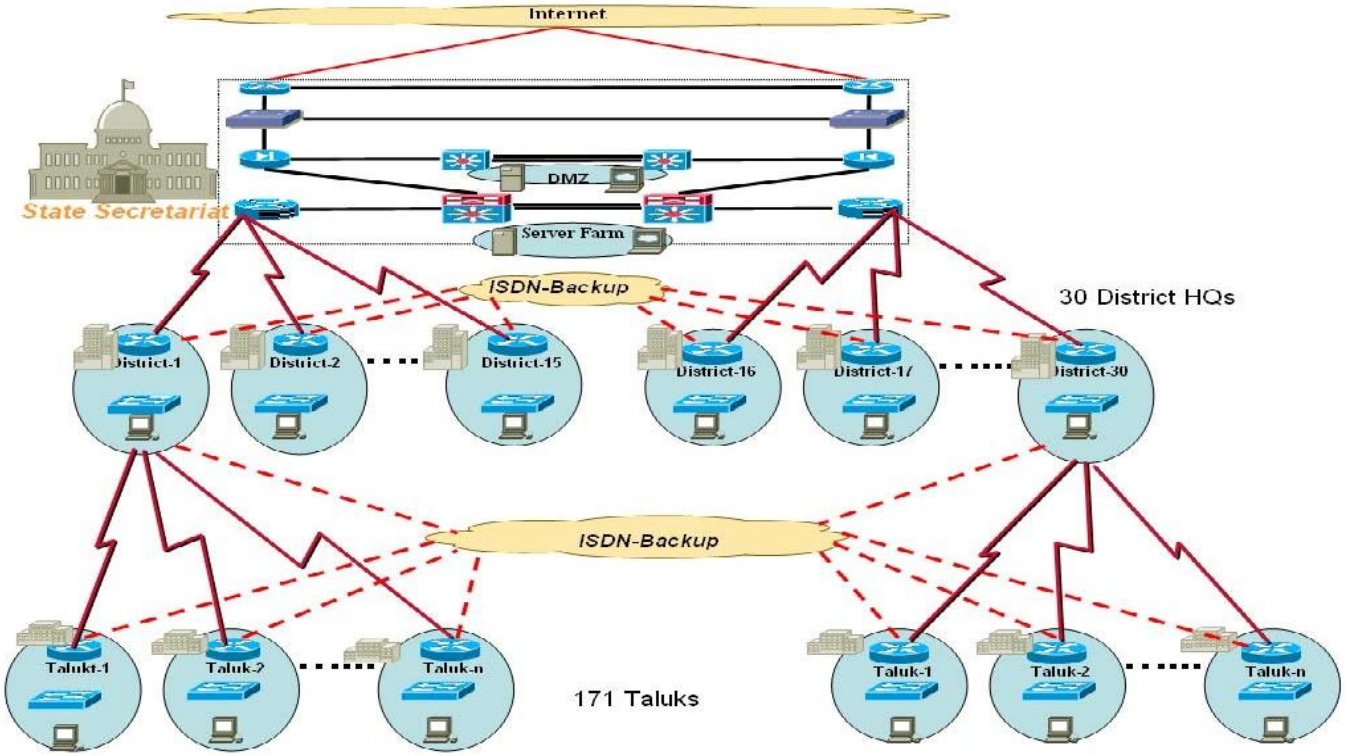

Figure 22: Architectural Framework for USWAN

Source: (eGRM, 2007)

The network shall follow STAR topology ultimately with horizontal PoP connected at different levels.

2.12 IT Readiness of Uttarakhand and its Comparison with Other States

Though, Uttarakhand state has not been highly rated in the National eGovernance readiness Index (2005). The state has taken quick steps towards moving up in the Pyramid and achieves the Leadership position (eGRM, 2007). E-Readiness status of Uttarakhand state (Exhibit 4) and comparison with other states is given below:

Figure 23: E-Readiness for the state (2005)

2.13 E-Procurement Implementation in the States of India

The government undertook the e-procurement project in 2006 and directed that all tenders were issued by Directorate General of Supplies & Disposals (DGS&D) for

conclusion of rate contract for all items were to be invited only through e-tendering for ensuring participation from traders and suppliers based out of remote areas.

Last year, the DGS&D launched the live opening of e-bids for DGS&D rate contracts marking the computerization of all of DGS&Ds major procurement and related activities. The project includes four components such as e-purchase, e-tendering, e-inspection, and e-payment (Das, 2010). The total value of supply orders based on DGS&D rate contracts is valued at approximately ₹ 3,500 crores.

Indian Railways used e-procurement effectively for reducing the procurement and advertisement cost by approximately 30% and reduced aberrations, malpractices, and reduction in procurement process in the existing procedure. Indian Railways launched e-procurement in 2008, till date more than 80,000 tenders have been uploaded by various offices and there are more than 10,000 tenders per month are being uploaded by Indian Railways (Das, 2010).

There are many states in India, those who have implemented and successfully using e-procurement, to reduce cost and enable transparency in procurement process. Governments of Andhra Pradesh and Chhattisgarh have successfully implemented and using e-procurement. There are few other states, who have not yet initiated the e-procurement implementation. This e-procurement implementation is an initiative of government of India under Nation e-Governance Plan. There are seven integrated Mission Mode Projects (MMPs) under e-Governance Plan (NeGP). E-Procurement MMP is one of them.

E-procurement operations were rolled out on July 2004, in all the departments of Government of Andhra Pradesh (GoAP). The aim to implement e-procurement in Andhra Pradesh Government departments is to achieve simplification of procurement processes, enhance transparency, improve the quality of work, and fair competition (Bikshapathi & Raghuveer, 2009). The tradition procurement process has many flows such as manual mode process suffered from inordinate delays (approx. 4/5 months) in tender/order processing, massive paper work, a lot of time consumed in multi-level scrutiny, physical threat to bidders, human interface at all the stages, insufficient transparency, etc (Bikshapathi & Raghuveer, 2009). According to Bikshapathi & Raghuveer, e-procurement was launched in the early months of 2003, the web portals has processed nearly 30000 transaction of worth ₹ 46500 crores and yielded cost savings to a tune of ₹ 2800 crores. Government of Andhra Pradesh has implemented e-procurement in 16 government departments, 22 public sector corporations, 89 municipalities, and 5 autonomous institutes (Bikshapathi & Raghuveer, 2009).

An end-to-end e-procurement solution was implemented by Chhattisgarh government on August 14, 2007. The aim of implementing e-procurement in Chhattisgarh is to induce transparency, reduce cost of commodities purchased and the administrative costs of purchasing them using a comprehensive procurement and web enabled system to control and streamline the purchasing process. (Mishra, 2011). According to Mishra, the adoption status as in May, 2009 is, total tenders processed 2259 @ the cost of ₹ 3343.59 crores (Mishra, 2011).

An E-procurement initiative was started by government of Himachal Pradesh on June 27, 2011. E-tendering process for procurement of different supplies launched by (Dhumal, June 27, 2011) in major departments through the Department of Information Technology in association with the National Informatics Centre of the State to improve the efficiency and transparency in procurement processes.

Around 15,000 tenders were being floated in the State every year and at the estimated cost of ₹ 2,000 crores. The manual procurement process takes more time and leaving less time to monitor and implementation of procurement projects (Dhumal, June 27, 2011). Implementing e-procurement will improve the procurement process efficiency, reduce costs, and strengthen the transparency in overall procurement process (Dhumal, June 27, 2011).

During a press release principal secretary (Finance) Alok Jain stated that government of Uttarakhand has prepared rules and regulation to implement e-procurement system to enhance transparency and improve the efficiency of procurement processes.

All purchases of goods and services amounting to more than ₹ 5 lakhs and all construction works over ₹ 1 crores would be undertaken under this scheme (Jain, July 7, 2011). “We believe that through this process, Uttarakhand will enter into a new phase of reforms where the entire tending system has to be transparent,” said Jain (Prashant, July 08, 2011).

2.14 Impact of e-Procurement on Procurement Work

There are many positive impact of web-based procurement on procurement process. E-procurement has improved many functional processes of procurement. Implementing e-procurement has improved the transparency across the departments, suppliers, and citizens. It has reduced the pre- and post-tendering human interaction. Using e-procurement system tender were hosted on web site and can be downloaded free of cost from the day of publication of tender (Bikshapathi & Raghuveer, 2009). E-procurement system significantly reduced the tender lead-time from 120-180 days; it takes in convention manual system to 36 days in the e-procurement mode. The overall cost savings from operation was estimated to be around ₹ 2800 crores, and saved considerably amounts ₹ 3-4 crores from advertisement cost. E-procurement provides empowerment to bidders because they don't have to physical go through the newspapers to keep track of tenders. E-procurement system provides real-time MIS report to the senior managers (Bikshapathi & Raghuveer, 2009).

According to Seong (2004), e-procurement system facilitate with better quality information which help to provide better services and goods to organizations. Paper based processes required red tape activities both regulating and controlling, which increases the transaction and administrative cost. Simplified and digitized procurement processes reduced the paperwork. E-procurement system also reduced the unnecessary submission of the documents, by the vendors and public agencies. The expanded range of commodity selection, improves the quality of procurement.

According to Pardita, et al. (2011), cost saving is the main aim of any organization to implement e-procurement system. Organizations implemented and using e-procurement system reported savings up to 42% in purchasing transaction cost by reducing paperwork. E-procurement system also reduces the manual error occurred using paper based procurement system. Using paper-based procurement process, transaction cost per purchase order can range from $70 to $300. Many firms saw cost drop to 30%, even greater than 30%. E-procurement system improves the inter-organizational relationship.

According to Subramaniam & Shaw (2004), e-procurement system implementation is expected to reduced two B2B measures (1) the transaction cost (2) the price paid for goods purchased. The value of implementing e-procurement, can determine by quantifying the economical impact of the improvements in procurement performance measures. Organizations using e-procurement system found that e-procurement system has reduced the inefficiencies in the manual processes.

There are many risk involved in e-procurement system as well as many electronic market has failed, there are also many evidence of failure of e-procurement. Therefore, there is a need to determine the critical success factors and adoption models of e-procurement, which influence the organizations to implement, as well as employees of organization to adopt it (Chang, Wang, & Chiu 2008; Kauffman & Mohtadi, 2004; Ordanini, Micelli, & Maria, 2004; Yen & Ng, 2003).

2.15 Critical Success Factors & Adoption Models of E-Procurement

Implementing E-procurement system in the organization improves the efficiency of procurement process and reduced the inefficiency of traditional manual process. Any organization, those want to gain the competitive advantage in the global market, must implement the e-procurement system. Although, e-procurement system implementation facilitate with many automated functionality, if it not utilized properly tend to losses. Therefore, there is a need to find out the critical success factors that influence its adoption in organizations as well as by the employees. From decades, researches and practitioners have a thirst to determine the critical success factors that influence the implementation and utilization of e-procurement system, critical success factors on B2B e-marketplace from buyers and sellers perspective. Researchers and practitioners keen to know that what are the critical success factors and adoption determinants that influence its adoption.

Public sector organizations identified e-procurement as key priority agenda of e-government. Most of the public sectors agencies have already implement e-procurement, and other are in the process of implementing e-procurement system. The key requirement of public sector organization is to find out the critical success factors that can used to implement e-procurement successfully. (Vaidya, Sanjeev, & Callender, 2006) has developed a framework of critical success factors (CSFs) that can utilized, to implement e-procurement system successfully. E-procurement CSFs research model is presented in Figure 24.

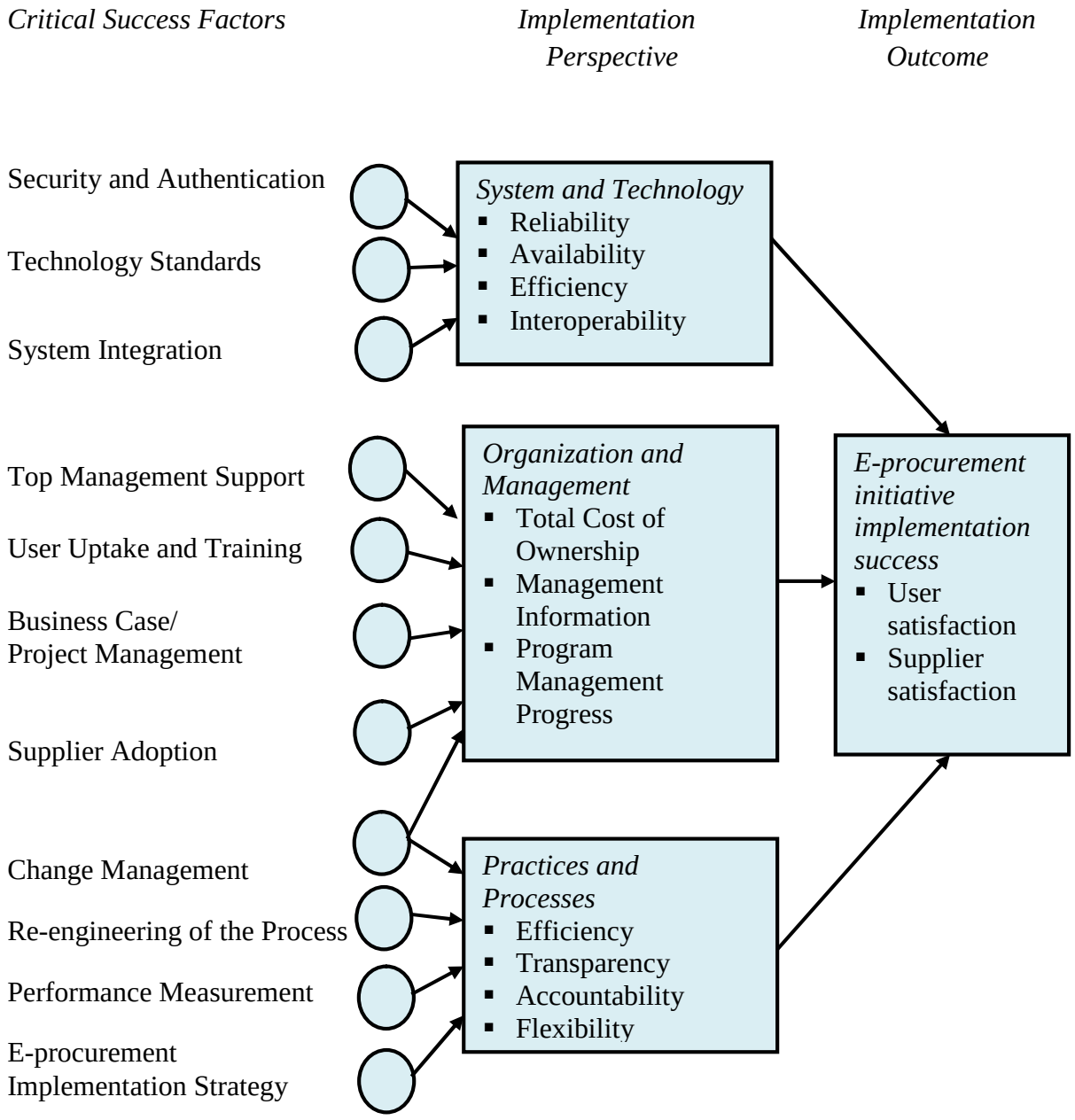

Figure 24: A Research Model of e-Procurement CSFs

They identified the relevant variables for each factor. From extensive literature review, they found that organization and management support are the most important factors for the success of e-procurement initiative. There is very less number of

literature available on e-procurement adoption in public sectors. Finding the critical success factors will influence the adoption of e-procurement system in public sector organizations. (Vaidya, et al., 2006), found eleven factors from e-procurement literature such as end-user uptake and training, supplier adoption, compliance with best practices for business case/project management, systems integration, security, and authentication, re-engineering the process, e-procurement implementation strategy, top management support change management, performance management, and technology standards.

Training to staff on e-procurement tools is critical to success of an e-procurement initiative (Vaidya, et al., 2006). The success of project depends on that it must be communicate to the users (Brick, Bond, & Radford, 2001). Once the end-user understands the operational functionalities of e-procurement system, they will optimum utilize the e-procurement system. Technology alone does not influence the adoption; the successful adoption of e-procurement system can only be possible when employees will use the e-procurement system.

The factor that influences the successful implement and utilization of e-procurement system is early adoption of e-procurement system by suppliers. It is important that before completely implementing the e-procurement system it should be demonstrate to the supplier and discuss the issues, changes related to system (Brick, et al., 2001).

E-Procurement provides opportunities to supplier that will help the public sectors to take feedback from the suppliers so that they can utilize this feedback to monitor and

improve the required area (OSD, 2001). Many suppliers are unwilling to conduct business with public sector organization because they are unclear about the benefits to be gained and they might think that public sector agencies using e-procurement system to force down the prices (ECOM, 2002).

The degree of e-procurement initiative success depends on the level of e-readiness of suppliers as well as appropriate communication with the suppliers (AOT, 2003). As suggested by (Brick, et al., 2001), e-procurement initiative require championing the project and senior management sponsorship, and business case should include understanding the starting point, identifying drivers, benefits, benefit realization, affordability, and risks. It is important to understand the level of integration required between the e-procurement system and existing information systems compatibility with new system (KPMG, 2001).

The confidentiality of Government data and the legal nature of orders and payments required the security and authentication to access the e-procurement system. The must have the mechanism to authenticate the user so that transaction should be safe (Vaidya, et al., 2006). The e-procurement implementation require that the existing procurement processes should be re-engineer to make procurement process more effective in terms of time, cost, and achieve value of money (ECOM, 2002; KPMG, 2001). It is important to determine the key performance indicators (KPIs) early in the process of project implementation, to successfully gain the benefit of distil and tracking the business case into measurable KPIs. These KPIs must be measure throughout the project (CGEC, 2002). The other critical factor that helps in successful

initialization of e-procurement system is top management support. The top management must involve the project managers, consultants, and agency staffs throughout the project to develop and implement strategy (ECOM, 2002).

The success of e-procurement mostly depends on change management programs, though it the least expensive aspect of e-procurement projects, a lack of inclusion leads to project failure (World Bank, 2003). Change management plan depends upon whether there is process improvement, process redesign or complete organizational transformation (Bajaj & Nag, 2008). It is very important to design a strategy for e-procurement initiative; e-procurement strategy is a key factor of successful initialization of e-procurement project (Vaidya, et al., 2006). E-procurement processes require exchange of electronic documents between the buyer and suppliers. They must have to rely on to use the same standards for electronic communication. There are many standards available for this purpose from Electronic Data Interchange to extensible markup language (XML). Traditional method of data interchange is EDI, but it is very expensive to implement EDI infrastructure setup, especially for SME organizations. XML provide an open environment, which allow e-procurement system of one organization to link with other organization e-procurement system, and facilitate with interoperability and upgrading of the system (World Bank, 2003).

There were many studies investigating the critical success factors (CSFs) in the implementation of e-procurement system initiative, which refers to commodities and services for organizations (Turban, et al., 2009). According to Aberdeen group, the

indirect procurement goods such as office supplies, stationery, and personal computer and other maintenance, repair, and operations (MRO) goods are not included in the production process purchasing (K C Laudon & Traver, 2004), usually comprise 30% to 60% of a firm's total expenditures (Orr, 2002). There are very few firms those who know and understand on which product they have spend, how much they have spend, and with which supplier (Bushell, 2004). From the literature of e-procurement initiative, Angeles & Nath, (2005) found twelve critical factors for successful implementation of e-procurement system in the firm such as

(i) Reduce the number of suppliers

(ii) Consolidate suppliers and contractors

(iii) Centralize control of contractors, product data, catalogs, and price updates for indirect procurement

(iv) Give individual and unit spending a lot of visibility

(v) Reengineer all affected business applications effectively

(vi) Enforce on-contract buying with preferred suppliers

(vii) Analyze purchasing behavior of end users

(viii) Understanding preferred supplier technology plans and their ability to support e-procurement initiatives

(ix) Implement and maintain computerized rules governing procurement

(x) Involve preferred and strategic suppliers in planning for e-procurement

(xi) Select e-procurement software and services following the development of a solid business case

(xii) Deploy a balanced catalog selection strategy.

A total 175 fully filled questionnaire received from the respondents, two types of firm included in the study manufacturing and service sector. All these twelve variables were loaded in four factors. First factor refers to rationalization of the firms' management of its supplier, second factor refers to redesigning of business processes and consequently, third factor refers to orchestrating e-procurement technology planning process by designing the software and mining the data produced, and the forth factor refers to actual selection of e-procurement solution and portfolio of planning sessions (Angeles & Nath, 2005).

Electronic procurement has significantly reduced the cost, by facilitating the sellers and buyer with wider choices, enables volume purchase, delivery improvement, reduced the administrative cost and paper work (Hsiao & Teo, 2005; Thomson & Singh, 2001). ISM/Forrester research Report (2001-2003), result represents that seven out of ten firms in the US market are engaged in web-based procurement for critical services and strategic services. Organizations, those who have adopted the e-procurement system, experienced between 11% - 12% business growth and 35% cost reduction (Wyld, 2004).

E-procurement system has three main models such as buyer side, seller side, and e-marketplace. E-marketplace is known by many terms such as exchanges, market-makers, e-hubs, and auction. It can be defines as inter-organizational systems,

meeting places, virtual infrastructure and locations (Luvsanbyamba & Chung, 2009). Archer & Wang (2003) described e-marketplace from three perspectives such as an electronic market, a centralized market and a value network. Unlike tradition marketplace, e-marketplace provides a virtual space in an electronic network, where buyer and sellers can use their inter-organizational information system to exchange the information about price, product catalog, and e-application.

There are a large number of studies on e-commerce adoption and it diffusion and many research models have been developed researchers (Bakos, 1991; Y. Bakos, 1998; Bartezzaghi & Ronchi, 2005; Croom, 2000; Ordanini, et al., 2004).

Researchers and practitioner are working enormously to develop different research model for different e-procurement model to maximize the acceptance of e-procurement technology by the buyer, sellers, and last but not the least adoption of e-procurement system by the employees of the organization. One such model for technological innovation is Technology, Organizational and Environment (TOE) model developed by (Tornatzky & Fleischer, 1990).

According to Thomson & Singh (2001), many studies have identified many adoption factors in information system research. Many studies has identified factors related to EDI adoption, in this research Technology-Organization-Environment framework was used by Thomson & Singh (2001), to determine the factors influencing the e-procurement system, and weather these factors are similar to the EDI adoption and other Information technology applications.

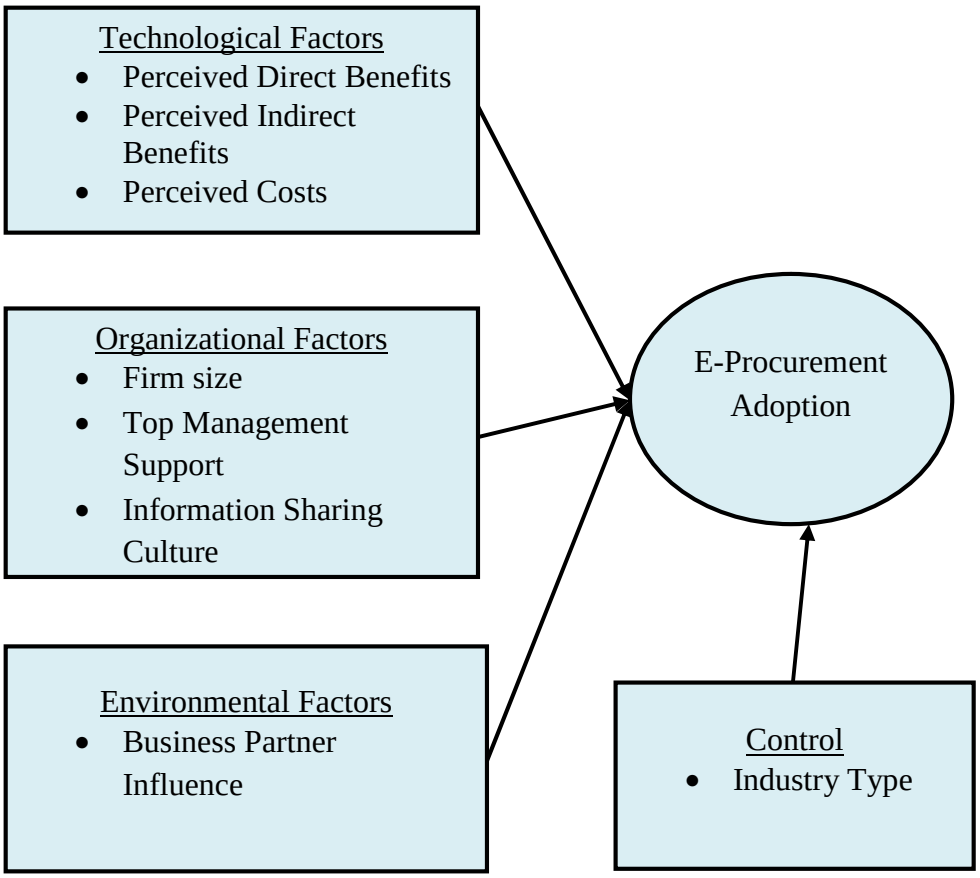

Figure 25: TOE Model

Source: (Thomson & Singh, 2001)

Technology-Organization-Environment framework was developed by (Tornatzky & Fleischer, 1990), which identifies three contextual aspects of an organization; these contextual aspects were used to determine the organizational decisions regarding technology innovation.

This model was further extended by (Luvsanbyamba & Chung, 2009), they included additional variable such as trust. The revised model was Technological, organizational, inter-organizational and marketplace (TOIM). This model was successfully tested with buyers and sellers of e-marketplace.

Inter-organizational factors, Trust relationship are a key factor of successful implementation of inter-organizational systems. Trust relationship improve sharing of information with their business partner and trusting organizations will more willing to invest in electronic data interchange (K. S. Soliman & Janz, 2004).

Technological factors, in technological factors researcher have included three critical factors such as complexity (simplicity), complexity of technology is usually negatively correlated with the adoption (Tornatzky & Fleischer, 1990). Thus, lower the complexity of infrastructural components; positively influence the performance of buyers and sellers (Luvsanbyamba & Chung, 2009). Information systems of participating organization must be compatible with each other in order to share information with each other. This compatibility is an issue, since the first day of EDI implementation. Therefore, higher compatibility leads to higher satisfaction of employees, partners, and the managers of information systems (Premkumar, Ramamurthy, & Nilakanta, 1994). Adopting immature technologies can be risky. Therefore, overall maturity of emerging technologies reduces the risk (Luvsanbyamba & Chung, 2009).

In the organizational factors Luvsanbyamba & Chung (2009) have included e-business readiness, which is somewhat related with technological factors. E-readiness not only includes the readiness of IT infrastructure but also the readiness of management and their knowledge about new technologies (Robertson, 2005). Top management support is another key factor under organizational factors, top

management support influence the adoption of new ideas and technologies in firms. Significant business implications with inter-organizational systems require top management support gaining commitment from the organization's business partners (Premkumar, et al., 1994; Robertson, 2005).

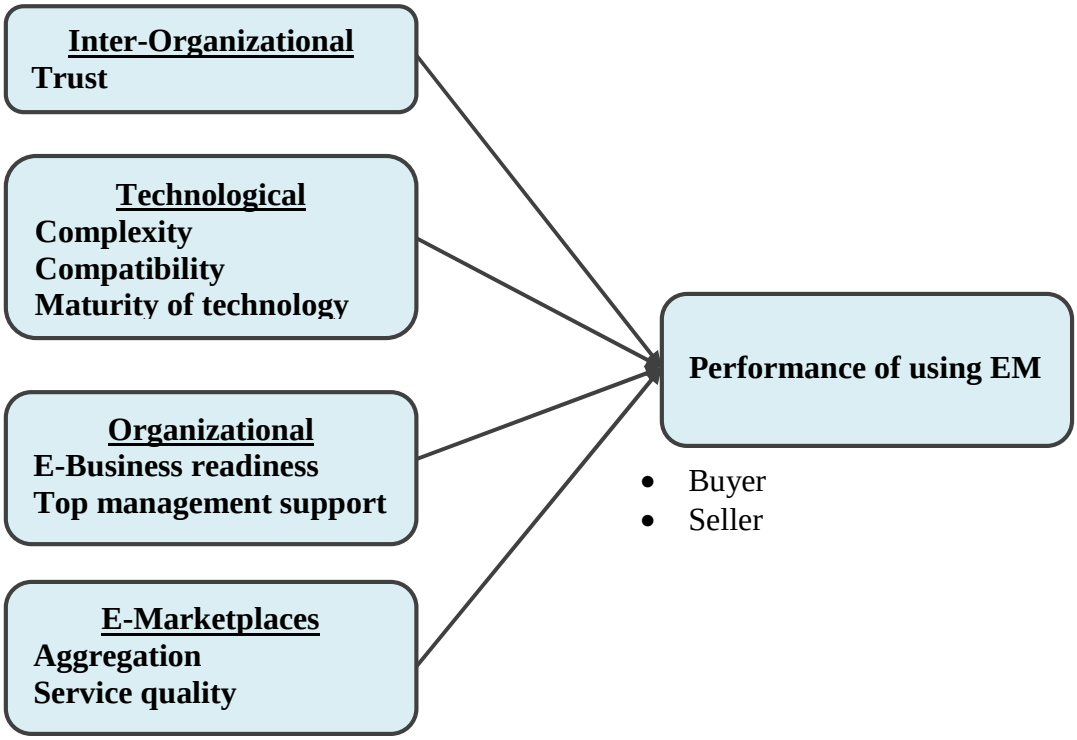

Figure 26: TOIM Model

Source: (Luvsanbyamba & Chung, 2009)

E-marketplace factors include Market aggregation and service quality. According to Luvsanbyamba & Chung (2009), Market aggregation provides buyers with more options and transparency in price; sellers with market access and overcome market fragmentation. Desired characteristics of e-commerce can measure by service quality (DeLone & McLean, 2004). Service quality of e-commerce can tested with

standardization of catalogs, ease of use, transparency of transaction, and accuracy of information.

Results obtained from the analysis of research model represent that trust play a key role under inter-organizational factors and have a positive significant effect in improving buyers' performance (Soliman, K., 2003). Technological factors such as complexity, compatibility, and maturity of technology, are not strongly affecting the buyers' and sellers' performance. From buyers' perspective, e-readiness was supported. From the buyers' and sellers' perspective top management support strongly influenced the adoption and usage of e-marketplace. Service quality factor is not an adoption factor, because it is a newly generated factor.

There is rich literature available which discussing about the critical success factors of adopting e-procurement system by the organization and their impact on organizational performance, but very few studies have discussed about the factors that influence the adoption and usage of e-procurement system by the employees working in organization. (Rahim, 2008) discussed in his qualitative case study research about the different factors that influence the acceptance usage of e-procurement system by the employees.

He found two set of factors from the literature comprising customized training, perceived usefulness, perceived ease of use, employee involvement, vendor support, reliability, and management support and their underlying relationship.

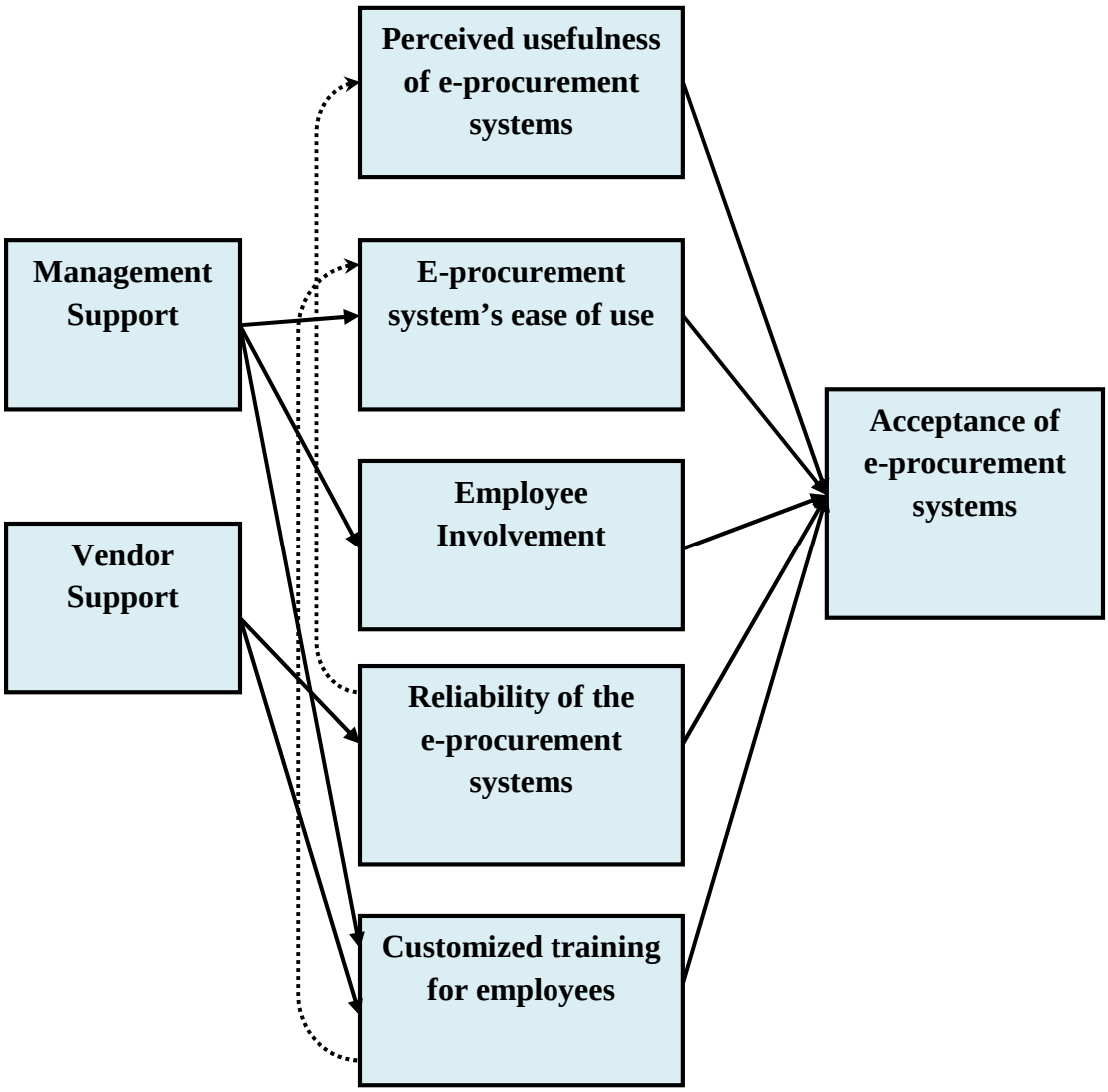

Figure 27: Factors Affecting Employee Acceptance of E-Procurement System

Source: (Rahim, 2008)

2.16 Barriers, Challenges & Legal issues of E-Procurement

There are many barriers, challenges & legal issues of e-procurement system implementation.

2.16.1 Barriers and Challenges

However, e-procurement system enhances the transparency of procurement processes and reduces the lead time. The implementation of online procurement is not so easy because there are many barriers created by the different hardware and software, different corporate culture and users' skills of interacting with Information Technology (Hsieh, Yang, & Lin, 2002). There are many instance of successfully implementation of e-procurement system, with reference to the public sector of India. The main challenge of Government of India at the moment are the maintenance of suppliers and buyers, procurement ambience, transformation from the legacy to the digital system of procurement, and security issues in dealing with the procurement information (Bulusu, 2004). Procurement ambience, technology issues, economic issues, and Legal issues are the main issues of implementing e-procurement in public sector departments (Bulusu, 2004). He suggested that implementing e-procurement using Public Private Partnership model is the best option for countries like Japan, Malaysia, and India. E-procurement system working on enterprise application, so government should use latest technologies in online procurement by using packages such as eXtensible Stylesheet Language (XSL), which is a core part of eXtensible Markup Language (XML). Technology committees should increase the liaison between them. Public sector must use quality broadband access, and have to emphasize on greater number of information kiosk points.

There were many categories of barriers, determined by many practitioners and researchers. (Obeidat & Abu-Shanab, 2010), determined six categories of barriers including strategic, technology, policy, organizational, legal, and human barriers.

According to Isikdag, Underwood, Ezcan, & Arslan (2011), during their research study, they have categories the barriers into four main categories. These four categories are (Isikdag, Underwood, Ezcan, & Arslan, 2011):

(i) People and Process related barriers

(ii) Strategy related barriers

(iii) Technology related barriers

(iv) Market related barriers.

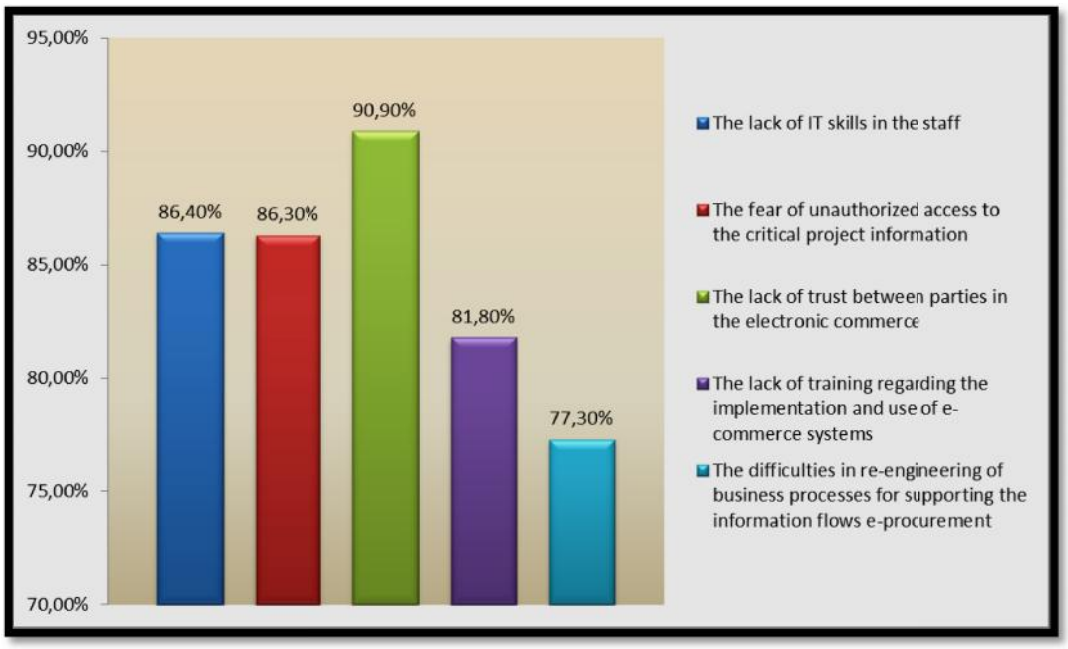

Figure 28: People and Process Related Key Barriers

2.16.1.1 People and Process Related Barriers

In people and process related barriers there are many barriers such as the difficulties in re-engineering of business process for supporting the information flows e-procurement, the resistance against the new way of working while moving towards electronic procurement, lack of IT skill staff, lack of training regarding use of electronic systems, lack of trust between parties using electronic commerce, fear about unauthorized access to critical project information, inadequacy of interaction in online environment during personal communication (Isikdag, et al., 2011). It was found during research study that the most critical barriers of e-procurement were, the lack of IT skills of staff, the fear of unauthorized access to critical project information, the lack of trust between the parties using electronic system, the lack of training provided to the user regarding implementation and use of electronic systems, the difficulties in re-engineering of business processes (Isikdag, et al., 2011). Change management is crucial in the process of adopting new technologies, it is important to impart training to staff (Matar, 2008).

2.16.1.2 Strategy Related Barriers

The lack of common goals, objectives, ownership, and authority are the main issue of e-procurement in public sector (Obeidat & Abu-Shanab, 2010). The lack of flexibility in policy and procedures, lack of top management support, lack of proper planning, difficulties in policy execution, bureaucratic procedure adopted are the barriers (Matar, 2008). Isikdag, et al. (2011), determined that there are many strategic barriers

to e-procurement such as lack of best practice studies and pilot projects, lack of bodies supporting the shift towards electronic commerce, organizations are disinclined to move from “brick” to “brick-and-clicks”, lack of knowledge about national or global taxation regime related to electronic commerce, inadequate legal infrastructure support, lack of organizational focus, lack of nation-wide standards for information exchange, lack of top management support.

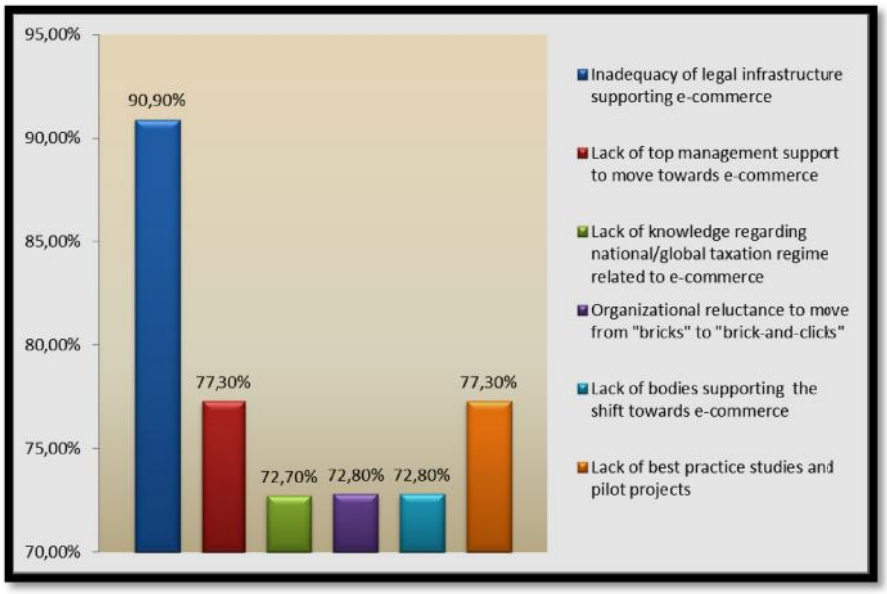

Figure 29: Strategy Related Key Barriers

Out of these eight barriers, inadequacy of legal infrastructure support, lack of top management support, knowledge about taxation regime, lack of best practice studies and pilot projects were the key barriers related to e-procurement (Isikdag, et al., 2011).

2.16.1.3 Technology Related Barriers

The barriers related to technology are lack of integration and capable infrastructure yields to different technological and policy problems (Obeidat & Abu-Shanab, 2010). There is lack of data standard formats, which is major technology barrier. The underutilization of technologies, lack of good application interface, and differences in framework are the key barriers to technology integration (Obeidat & Abu-Shanab, 2010).

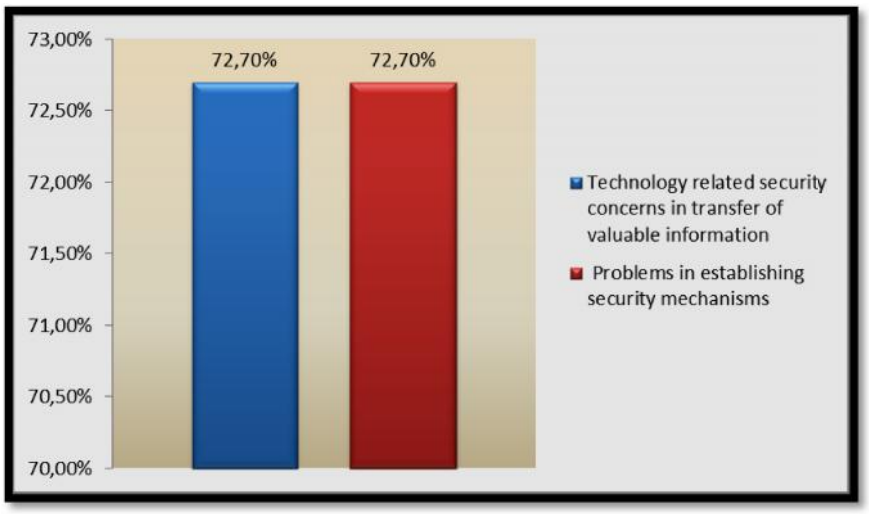

Figure 30: Technology Related Key Barriers

In technology related barriers, problems in integration of e-commerce environments with ERP Systems, slow shift towards digital signatures, difficulties in establishing the e-commerce environment, technology related security concerns in transfer of valuable information, problems related to internet infrastructure and bandwidth in implementing and running an e-commerce site, problems in establishing security mechanisms, problems in management of servers such as database/auction/ad/mail/

transaction processing), difficulties in hosting or outsourcing decision, lack of trust in the validity of electronic documents in dissemination or approval of physical products are the barriers related to technology. Out of these barriers, technology related security concerns in transfer of valuable information and problems in establishing security mechanisms are the key barriers of e-procurement (Isikdag, et al., 2011).

2.16.1.4 Market Related Barriers

The barriers related to market were the inefficiencies in making use of user-generated content for online marketing, traditional media being still much stronger than new media in marketing and public communication, the fear of price transparency in e-procurement, concerns related to the number of customers that can be targeted in the online environment, resistance of intermediaries against online commerce, lack of pioneering agents/firms.

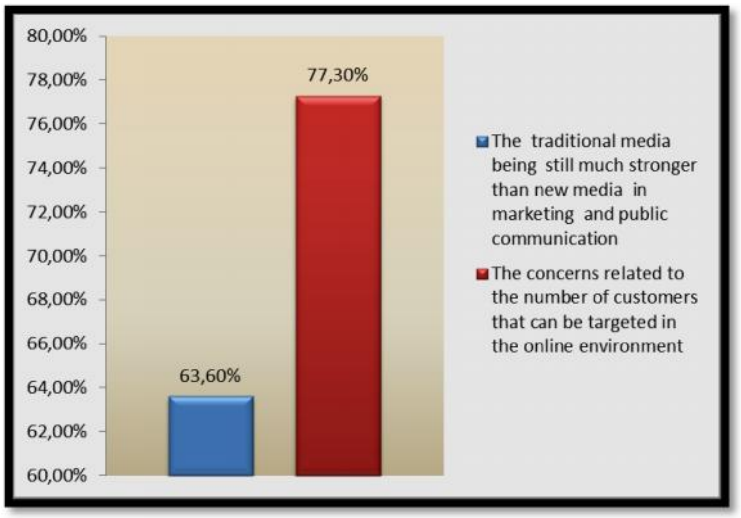

Figure 31: Marketing Related Key Barriers

Out these barriers, it was found in the study that concerns related to the number of customers that can be targeted in the online environment and traditional media being still much stronger than new media in marketing and public communication were the key barriers to e-procurement (Isikdag, et al., 2011).

2.16.2 Legal Issues

Literature of e-initiative barriers suggests that now the world is looking forward towards the legal side of the equation especially in the developing countries (Aboud, 2005; Baz, 2009; Hijazi, 2008).

Without using a proper legal framework governing electronic transactions, which regulates the domain and secure the rights of all parties, e-government projects can't get success. Employees require some special competency to work with e-governance applications especially the legal side of it. Employees in the e-government stage need training and special programs in change management through which they can facilitate management and control of the process without any legal contradictions. In the absence of needed legislations that regulate e-payments and its related issues, government is facing difficulties to implement and utilize the e-procurement (Abu-Shanab, Al-Rub, & Md, 2010).

Ian Mizza examined G2B e-services barriers from business point of view such as lack of trust on electronic payments, lack of resources, cross border legal issues, language issues, lack of payment vehicles (e.g. Paypal), IT literacy amongst decision makers,

shortage of skilled IT staff, intellectual property rights, channel conflict fare, fear to fraud, total cost of ownership, and fear of identity theft (Mizza).

Ting and Wong (January 11, 2012) have categories legal issues related to e-procurement as intellectual property rights, liability risks, global trading, security breaches and contract enforceability. The legal challenges faced by government agencies to implement e-procurement are legal liability, service dependency risks, lack of alignment in jurisdictions, and insecurity in e-transaction. Different countries using different jurisdictions and variations in their legacy systems, thus, each country use different approach to tackle with e-commerce legal issues and companies that are not familiar with foreign laws may face unexpected liabilities. Criminal penalties may also differ in different countries (Ting & Wong, January 11, 2012).

Figure 32: Potential Legal Issues of e-Commerce

Protecting your computer system in the past was much simpler than protecting your computer. However, web server, shared information, shared resources, and connecting with web makes your computer system, difficult to protect from theft, virus, worm attack, and denial of services. So, your computer network will become vulnerable to attack (Ting & Wong, January 11, 2012).

Figure 33: E-Commerce Legal Framework (Strategies and their Instruments)

Organizations have to conduct awareness program for their employees, so that they can understand the importance of security and observing security measures. Failure for law related to technology may encourage internet misuse. The other important aspect is to use mature and ready solutions like public key infrastructure that addresses all four key elements of security – authentication, integrity, confidentiality, and non-repudiation (Ting & Wong, January 11, 2012). To tackle with these legal

issues more efficiently one has to use various strategies such as self-regulation, legislation, technology, and information security management must be combined (Ting & Wong, January 11, 2012).

Chapter 3 : Research Design and Methodology

Research design describes the logical sequence which connects the empirical data to the study's initial research questions and, ultimately, to its conclusions (Yin, 2003). It deals with the overall purpose of a research study (Maxwell, 1996). This chapter details the design and methodology used for conducting this study.

3.1 Research Objectives

- To determine the determinants of e-procurement system acceptance and usage
- To find the impact of the independent variables like computer self-efficacy, infrastructure support and employee training on intention of employees to adopt and use e-procurement system mediated through perceived usefulness and perceived ease of use.

3.2 The Research Framework

The problem that was determined in this research study is that many employees in the organization are underutilization of information technology or not using information systems in the ways intended, result in failure of organization to achieve optimum productivity gain from Information Technology investment (Almutairi, 2007; Venkatesh & Davis, 1996). Failure of transferring Information into practice has been experienced by many organizations, and which seems to be worst in developing countries (Al-Gahtani & King, 1999). If Uttarakhands' public sector managers under that why technology innovation is accepted and rejected, they can proactively develop

some intervention programs to reduce the problem of underutilization of information technology. Flow of research process is presented in Figure 34.

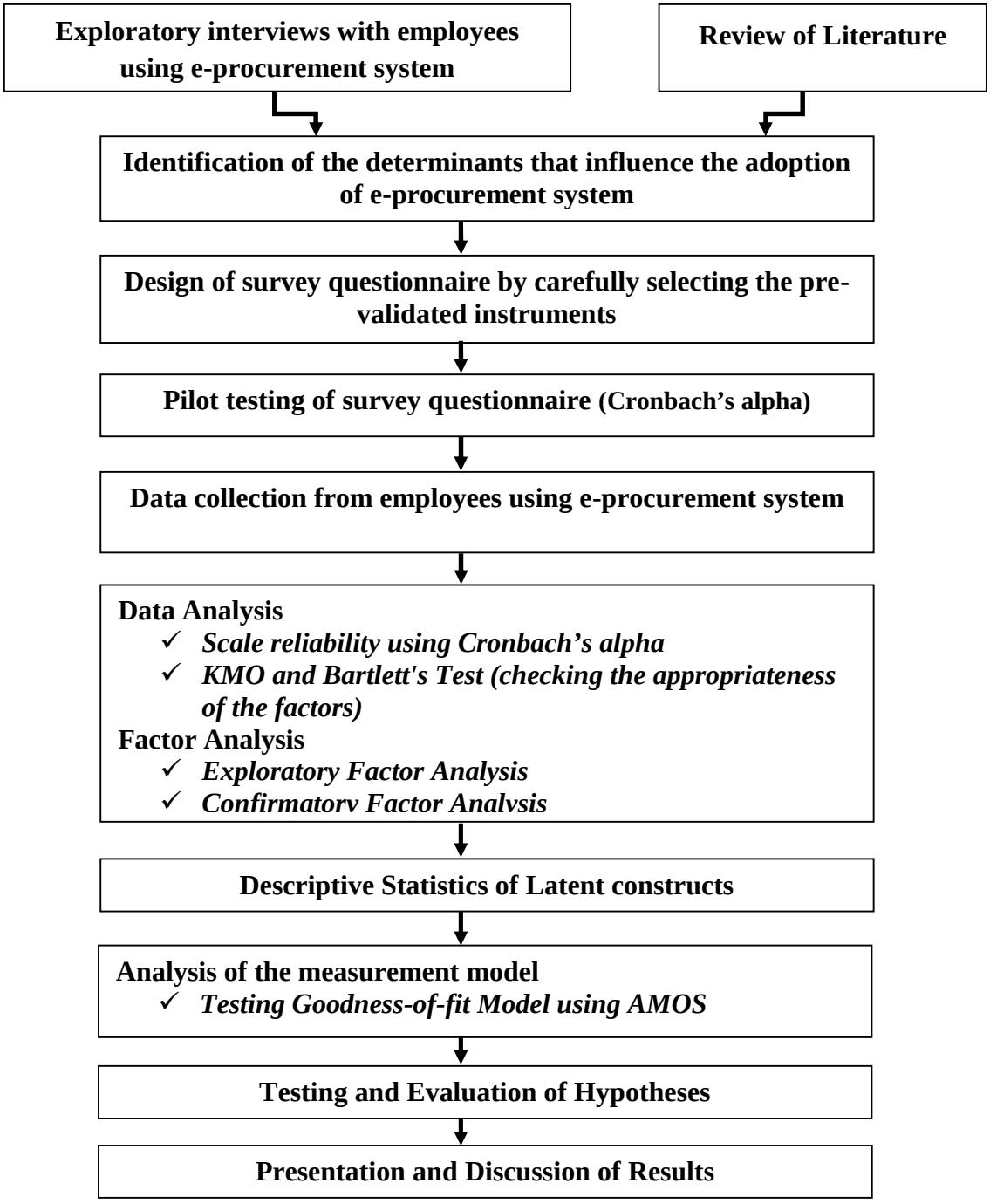

Figure 34: Research Process

To address the research problem, eleven research question and associated hypothesis were developed are present in this chapter. In this research study, six pre-validated instruments have been used and the reliability and validity of these instruments are then discussed.

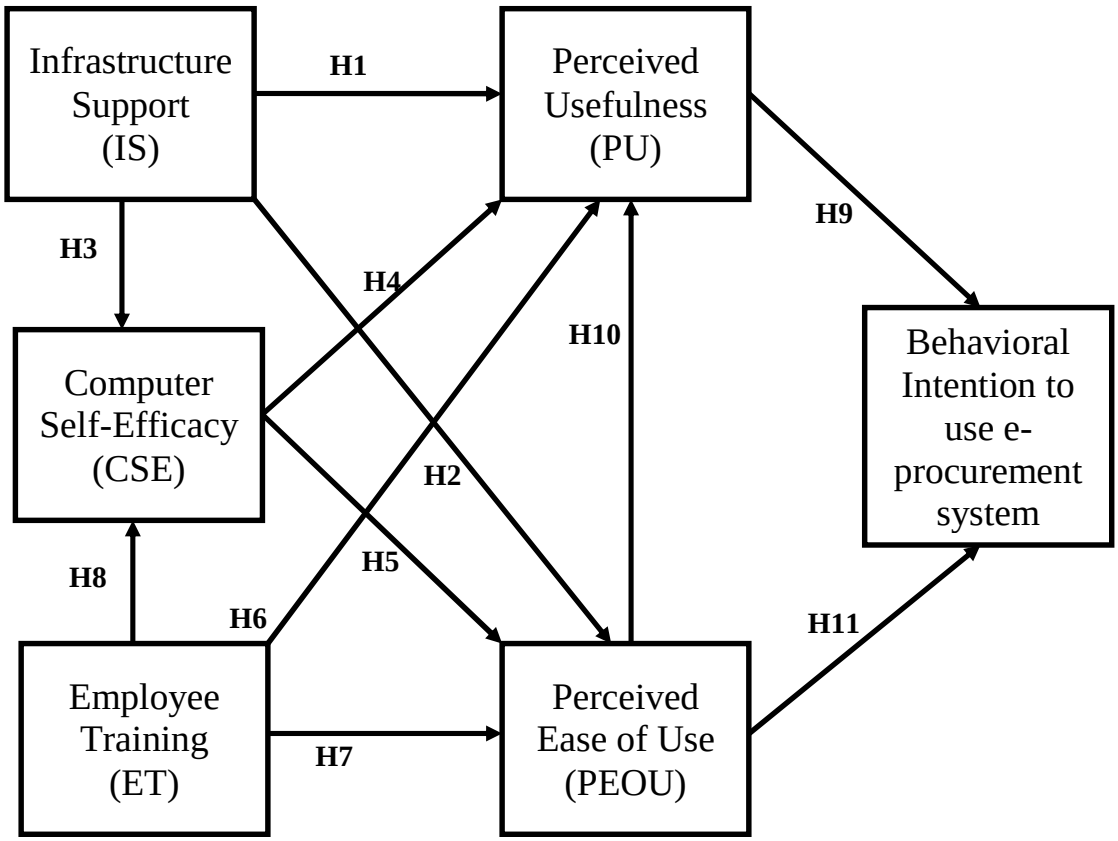

Figure 35: Research Model

3.3 Hypotheses & Research Questions

Extensive review of literature was done during research. In this research pre-validated instruments were used to find out the behavioral intention to use e-procurement system by the employees. Before moving to the hypothesis development section,

definition of constructs has been introduced first. The definition of constructs used in this study is given below:

The **Computer Self-Efficacy** was developed by (Compeau & Higgins, 1995) as a construct to assess the computer related competency of individuals. It is an individual's judgment about the capability to use a computer.

The **Infrastructure support** has been added in TAM as external variable that can be directly controlled by managers. Motivation to adopt and use IT increases if organizations provide the necessary resources to the employees (Bhattacherjee & Hikmet, 2008).

The **Employee Training**, if organizations provide adequate trainings to both middle and top management their level of acceptance to technology also increases (Nelson & Cheney, 1987).

Perceived Usefulness, defined as "the extent to which a person believes that using the system will enhance his or her job performance" (Davis, 1989).

Perceived Ease of Use, defined as "the extent to which a person believes that using the system will be free of effort" (Davis, 1989).

As research model developed and depicted in Figure 36, shows that the independent variables infrastructure support, employee training, and computer self-efficacy influence the adoption and usage of e-procurement system mediated through key determinants of TAM model, perceived usefulness and perceived ease of use to determined the extent of these independent variables influence the acceptance and usage of e-procurement system in Uttarakhands' public sector OGP organizations, the

following eleven questions and its associated null and alternate hypotheses were developed and tested as a part of this research study:

RQ1. What is the level of association between infrastructure support and perceived usefulness of e-procurement system?

$H1_0$: There is no significant relationship between infrastructure support and perceived usefulness of e-procurement system.

$H1_a$: There is a significant relationship between infrastructure support and perceived usefulness of e-procurement system.

RQ2. What is the level of association between infrastructure support and perceived ease of use of e-procurement system?

$H2_0$: There is no significant relationship between infrastructure support and perceived ease of use of e-procurement system.

$H2_a$: There is a significant relationship between infrastructure support and perceived ease of use of e-procurement system.

RQ3. What is the level of association between infrastructure support and computer self-efficacy?

$H3_0$: There is no significant relationship between infrastructure support and computer self-efficacy.

$H3_a$: There is a significant relationship between infrastructure support and computer self-efficacy.

RQ4. What is the level of association between computer self-efficacy and perceived usefulness of e-procurement system?

$H4_0$: There is no significant relationship between computer self-efficacy and perceived usefulness of e-procurement system.

$H4_a$: There is a significant relationship between computer self-efficacy and perceived usefulness of e-procurement system.

RQ5. What is the level of association between computer self-efficacy and perceived ease of use of e-procurement system?

$H5_0$: There is no significant relationship between computer self-efficacy and perceived ease of use of e-procurement system.

$H5_a$: There is a significant relationship between computer self-efficacy and perceived ease of use of e-procurement system.

RQ6. What is the level of association between employee training and perceived usefulness of e-procurement system?

$H6_0$: There is no significant relationship between employee training and perceived usefulness of e-procurement system.

$H6_a$: There is a significant relationship between employee training and perceived usefulness of e-procurement system.

RQ7. What is the level of association between employee training and perceived ease of use of e-procurement system?

$H7_0$: There is no significant relationship between employee training and perceived ease of use of e-procurement system.

$H7_a$: There is a significant relationship between employee training and perceived ease of use of e-procurement system.

RQ8. What is the level of association between employee training and computer self-efficacy?

$H8_0$: There is no significant relationship between employee training and computer self-efficacy.

$H8_a$: There is a significant relationship between employee training and computer self-efficacy.

RQ9. What is the level of association between perceived usefulness of e-procurement system and behavioral intention to use e-procurement system?

$H9_0$: There is no significant relationship between perceived usefulness of e- procurement system and behavioral intention to use e-procurement.

$H9_a$: There is a significant relationship between perceived usefulness of e-procurement system and behavioral intention to use e-procurement.

RQ10. What is the level of association between perceived ease of use of e-procurement system and perceived usefulness of e-procurement system?

$H10_0$: There is no significant relationship between perceived ease of use of e-procurement system and perceived usefulness of e-procurement system.

$H10_a$: There is a significant relationship between perceived ease of use of e-procurement system and perceived usefulness of e-procurement system.

RQ11. What is the level of association between perceived ease of use of e-procurement system and behavioral intention to use e-procurement system?

$H11_0$: There is no significant relationship between perceived ease of use of e-procurement system and behavioral intention to use e-procurement.

$H11_a$: There is a significant relationship between perceived ease of use of e-procurement system and behavioral intention to use e-procurement.

3.4 Instruments

The main aim of this research study is to identify the determinants of technology acceptance and usage in Uttarakhands' Oil, Gas and Power (OGP) public sector companies. The survey data obtained using personal contact with employees using e-procurement systems and web based service of kwik surveys (http://www.kwiksurveys.com). The survey questionnaire illustrated in Appendix A. participation in survey was voluntary. Participants are free to withdraw any time.

The questionnaire was developed to obtain the information from the participants that were necessary to analyze the eleven hypotheses. The survey consists of demographic questions as well as 22 adopted questions from the literature. These questions were used to measure six constructs of infrastructure support (Bhattacherjee & Hikmet, 2008), employee training (Nelson & Cheney, 1987), computer self-efficacy (P. Chau, 2001), perceived usefulness (Venkatesh & Davis, 2000), perceived ease of use (Venkatesh & Davis, 2000), and behavioral intention to use (P. Y. K. Chau, 1996). All variables were measured using a Likert-type ordinal scale drawn from the prior published research, and reworded to relate specifically to the context of using e-procurement system. Each item was assessed along a 5-point Likert-type ordinal scale anchored between "strongly disagree to strongly agree", where *Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5*.

Table 8: Source of Measurement Instrument and Description of Constructs

Variables	Variables Description	Source of Instrument
Infrastructure support	The adequacy of the deployment of Information Technology infrastructure such as servers, database and network in organization to enhance job performance and efficiency of employees	Three questions adapted from Bhattacherjee and Hikmet (2008)
Computer Self-efficacy	An individuals' perception about his or her ability to use a computer system to complete a job task.	Four survey questions adapted from Chau (2001)
Training	Training influence end user attitude, behavior, and performance directly or mediated through perceived usefulness and perceived ease of use.	Four questions adapted from Amoako-Gyampah & Salam (2004)
Perceived usefulness	The degree to which an individual believes that using a particular computer system improves his or her job performance.	Four questions adapted from V. Venkatesh and F.D. Davis (2000)
Perceived ease of use	The degree to which an individual believes that using a particular computer system is free of effort.	Four questions adapted from V. Venkatesh and F.D. Davis (2000)
Intention to Use	A measure of the strength of an individuals' intention to use a particular computer system.	Two survey questions adapted from Chau (2001)

3.5 Validity and Reliability Analysis

Validity is the degree to which the measurement instruments truly measure the constructs they intended to measure (Peter, 1979). Hence, in order to reduce threads to validity for this research study, an extensive literature review was done and used the concept mapping techniques to identify, describe, and operationalize theoretical concepts. The reliability of construct measured by Cronbach's alpha which is widely used to measure the reliability of constructs. Cronbach's alpha measure has been used to determine that how well a set of items measures an underlying construct. In social research, Cronbach's alpha value .70 or greater is acceptable (P. Chau, 2001; Thompson, Compeau, & Higgins, 2006).

Table 9: Cronbach's Alpha from Previous Studies

Construct	Cronbach's alpha (α)	Reference
Infrastructure support	.90	(Bhattacherjee & Hikmet, 2008)
Computer self-efficacy	.93	(P. Chau, 2001)
Employee Training	.88	(Amoako-Gyampah & Salam, 2004)
Perceived usefulness	.84	(Venkatesh & Davis, 2000)
Perceived ease of use	.89	(Venkatesh & Davis, 2000)
Intention to use IT	.81	(P. Y. K. Chau, 1996)

The two key construct of TAM model, perceived usefulness and perceived ease of use are valid and reliable with Cronbach's alpha coefficients exceeding .80 (Venkatesh & Davis, 2000). The validity and reliability of infrastructure support was tested by (Bhattacherjee & Hikmet, 2008), they reported factor loading greater than .60 for all the items in the construct.

The validity and reliability of computer self-efficacy was tested by (P. Chau, 2001), who reported factor loading greater than .70 for all the items in the construct. The reliability of intention to use IT construct was determined higher than .88 (P. Y. K. Chau, 1996). The employee training is also valid and reliable. Amoako-Gyampah & Salam (2004) adapted the instrument from (Venkatesh & Davis, 1996), who reported factor loadings greater than .70 for the entire item in the construct.

Table 10: Measurement Instrument Used by Other Sources

Measured construct	Measurement construct used by other studies
Perceived Usefulness	Amin (2007), Hasan (2007), Bhattacherjee and Hikmet (2008), Scott and Walczak (2009)
Perceived ease of Use	Ma and Liu (2005), Amin (2007), Hasan (2007), Bhattacherjee and Hikmet (2008), Scott and Walczak (2009)
Intention to Use Information Technology	Ma and Liu (2005), Amin (2007), Hasan (2007), Bhattacherjee and Hikmet (2008), Scott and Walczak (2009)
Computer Self-efficacy	Ma and Liu (2005), Amin (2007), Hasan (2007), Scott and Walczak (2009)

As, the pre-validated instruments were use in this study in a different culture, pre testing of the entire survey instruments were done using eleven persons selected randomly from the target population to verify that wordings are unambiguous. Feedback obtained from the respondents, incorporated in the survey questionnaire.

3.6 Sample Size Calculation, Data Collection, and Processing

$$N= (Zs/e)^2$$

N is the sample size of the research. Z= Represents the Z score from the standard normal distribution for the confidence level desired by the researcher. The Z value of 1.96, equivalent to 95% confidence level, was used for the research. "S" represents the population standard deviation for the variable which is to be measured from the study. The population standard deviation calculated from the preliminary research was 0.503. An error of 5% was considered as tolerable error for the study. Therefore, e= .05

Hence, the sample size of study, calculated as follows:

$$N = (Zs/e)^2$$

$$N=(1.96 \text{ X } 0.503/0.05)^2$$

$$N = 388.78$$

Further reducing the error margin, a sample of 400 respondents was targeted for the study.

The population for this research study was 1500 employees of Oil, Gas and Power (OGP) public sector companies in Uttarakhand, those who are using e-procurement system.

The minimum sample size required for SEM with six constructs is 150 (Hair, Black, Basin, & Anderson, 2010). Hair, et al. (2010) argued that large size is preferred since some SEM programs are not very reliable when small sample size used. Therefore, as calculated above, sample size of 400 is sufficient for this research study. Survey data was collected from the Oil& Gas and Power sector organization within Uttarakhand using online survey (http://kwicksurvey.com) as well as personally collect the filled questionnaire from the departments. Collected data was entered in SPSS version 18.0 software. The demographic information collected include the gender, age group, education qualification, whether IT professional or not, department name, level in the organization, number of year using computer, and work experience.

After collecting the survey data, incomplete questionnaires were removed. A total of 439 questionnaires were received personally and through online out of total distributed questionnaires. After removing the incomplete questionnaires, we obtained 416 completely filled questionnaires. Demographic data recoded using SPSS software and then exploratory factors analysis was done. Reliability check for the internal consistency alpha of the instruments scales using Cronbach's was also done. The reliability of the constructs achieved the threshold value. The SPSS software

used to perform descriptive statistics for demographic data, which includes arithmetic means and standard deviation.

The SEM statistical software Analysis of Movement of Structure (AMOS) version 18 was used the test the structural model. AMOS was used to assess the goodness-of-fit of the research model. The goodness of fit indices Normed Chi-Square (Chi-Square/ degree of freedom), goodness-of-fit index (GFI), adjusted goodness-of-fit-index (AGFI), Normed fit index (NFI), comparative fit index (CFI), and root mean square of approximation (RMSEA), were determined and compare with the threshold values used in the literature. The acceptable threshold values found in the literature are Normed Chi-Square ≤ 2.0, CFI ≥ .90, GFI ≥ .90, AGFI ≥ .80, NFI ≥ .90 and RMSEA ≤ .10 (Hoyle, 1995; Marcoulides & Schumacker, 1996).

3.7 Statistical Analysis

The Structural Equation Modeling (SEM) was used to test the models' validity, due to the complex nature of the research model (Hoyle, 1995). Using structural equation modeling, researcher can test the structure of an entire model for analyzing the set of association between the independent variables and dependent variables simultaneously. Each theoretical construct in the model was covered by a set of multiple items in the questionnaire. SEM was widely used by many researchers. Since, structure equation model having confirmatory factor analysis to test the validity of research model, thus, it is appropriate to use SEM for this research model.

The hypothesized structural equation model was tested using AMOS 18.0 for windows. Brief information about SEM is presented in the following section.

3.7.1 Structural Equation Modeling

Structural Equation Modeling (SEM) is a statistical methodology that takes a confirmatory approach such as hypothesis testing to do the multivariate analysis of a structural model bearing some phenomenon (Byrne, 2010). The term SEM do not refers to a single statistical technique, instead it refers to a group of relate procedures. Other terms such as moment of structure modeling, linear structural relations, covariance structure modeling, analysis of covariance structures, casual modeling with unobservable, latent variable structure modeling and covariance structure analysis are also used in the literature to classify these various techniques together under a single label of SEM (Kline, 2005). Structural equation modeling usually focuses on latent constructs rather than on the manifest variables used to measure these constructs. Latent constructs also refers to theoretical or unobserved constructs, whereas, manifest variables refers to empirical or observed variables, because these variables reflects the unobserved variables, thus also known as reflective indicators. Multiple measures can be possible with a single latent constructs. It is also not necessary to have latent variables in the model. Thus, a model, which contained only observed variables, certainly possible in SEM. The SEM was widely used as a confirmatory rather than an exploratory technique. The main purpose of using SEM to obtained the validity of a model.

There are two main reasons for the popularity of structural equation modeling (SEM). First reason is that in the behavioral sciences, researches are more interested in to study theoretical constructs, which cannot be observed directly. SEM directly deals with how well the measures reflect the intended constructs. SEM techniques also help in testing of complex path models that incorporate sophisticated thought patterns. Thus, structural equation modeling (SEM) techniques have more flexibility than other statistical techniques that based on multiple regression.

The second reason of its popularity is that structural equation modeling provides a unique analysis that simultaneously considers both, measurement and prediction. SEM allows Confirmatory Factor Analysis (CFA) and path analysis at the same time. SEM provides flexibility and power of assessing the quality of measurement as well as examining of predictive relationships among construct simultaneous, for the typical latent variables models.

3.7.2 Structure Equation Modeling Software

There are many computer software tools available which provides the functionality of structure equation modeling. There many SEM software available these days such as LISREL (Linear Structural Relationship), CALIS (Covariance Analysis and Linear Structural Equations), LISCOMP (Linear Structural Equations with a Comprehensive Measurement Model), SETPATH (SEM and Path Analysis), EQS (Equations), and RAMONA (Reticular Action Model or Near Approximations). For testing of research model, AMOS (version 18) software was used to assess the impact of infrastructure

support, computer self-efficacy, and employee training on behavioral intention to use e-procurement system.

3.7.3 Assessment of Model Fit

The purpose using AMOS software is to assess the degree of overall model fit, which allows us to determine that the whole model is consistent with the empirical data at hand. However, assessment with SEM is not straightforward as with the other multivariate techniques, such as conjoint analysis and multiple regression. There are wide ranges of goodness-of-fit indices, which mainly work in combination, for assessing the results from three perspectives: (1) Overall fit or absolute fit (2) comparative or incremental fit (3) model parsimony.

Absolute fit indices determine the degree to which the structural and measurement model predicts the observed covariance or correlation matrix. The most commonly used fit indices in absolute fit indices are the Chi-square (χ^2), the goodness-of-fit index (GFI), the Root Mean Square of Error Approximation (RMSEA). The goodness-of-fit index is a non-statistical indicator ranging value from zero (poor fit) to 1.0 (perfect fit). Higher values indicate the better fit; there is no establishment of absolute threshold value for acceptability.

Comparative or incremental fit indices, compare the proposed model with the null model, often refers to as baseline model. AMOS includes the Adjusted Goodness-of-fit Index (AGFI), the Normed Fit Index (NFI), and the Comparative Fit index (CFI). All these indices represent the comparison between the null model and the proposed

model. The values lie between zero (not fit at all) to 1.0 (perfect fit), the large value indicate high level of goodness-of-fit. The Comparative Fit Index (CFI) has more advantages than other fit indices because it can avoid the limitation of data fit due to small sample. The Adjusted Goodness-of-fit Index (AGFI) indices is an extended from of GFI.

Parsimonious fit indices relate the goodness-of-fit of the model to the number of estimated coefficients required to achieve the level of fit. This method is similar to the adjustment of the R^2 in multiple regression.

Chapter 4 : Data Analysis & Findings

This chapter presents, explains, and discusses the outcomes of the various statistical analysis used in this study, to assess the impact of independent factors infrastructure support, computer self-efficacy, and employee training on dependant variable behavioral intension to use e-procurement system mediated through two key determinants of TAM model perceived usefulness of e-procurement system and perceived ease of use of e-procurement system.

The survey questionnaires were distributed to Uttarakhands' Oil, Gas and Power public sector organizations through online using http://www.kwiksurveys.com as well as personally visit to different departments. A total 1500 questionnaire were distributed, to different departments in different organizations. A total of 439 questionnaires were received personally and through online, out of total distributed questionnaires, representing the response rate of 29.26%. After removing the incomplete questionnaires, we obtained 416 completely filled questionnaires, which representing the effective response rate of 27.73%.

4.1 Results of Demographic Statistics

The demographics information about respondents' gender and age group are presented in Table 11. The result provides evidence that there is a good representation of male and female respondents. Although, there are much more males than there are females. The number of male respondents is 325 (78.1%) and the number of female

respondents is 91 (21.9%). The 40 (9.6%) of the respondents are in the age group of up to 25 years, 171 (41.1%) of the respondents are in the age group of 26 to 40 years, 174 (41.8%) of the respondents are in the age group of 41 to 55 years, 31 (7.5%) of the respondents are in the age group of above 56 years.

Table 11: Demographic Information: Gender and Age Group

Classification	Frequency	Percentage
Gender		
Male	*325*	*78.1*
Female	*91*	*21.9*
Age Group		
Up to 25 years	*40*	*9.6*
26 to 40 years	*171*	*41.1*
41 to 55 years	*174*	*41.8*
Above 56 years	*31*	*7.5*

The descriptive statistics for the education of the respondents, as well as, whether they are IT professional or not, are presented in Table 12. The result provides evidence that the respondents are well educated, and also representing the good combination of IT Professionals and non IT professionals. The 25 (6.0%) respondents' education qualification is up to 10+2, 169 (40.6%) respondents' education qualification is Graduate, 202 (48.6%) respondents' education qualification is Post Graduate, and 20 (4.8%) respondents' belongs to any other educational level. From the total number of respondents, 310 (74.5%) were non IT professionals, and the remaining 106 (25.5%) were IT professionals.

Table 12: Demographic Information: Education and IT Professional

Classification		Frequency	Percentage
Education			
	Upto 10+2	*25*	*6.0*
	Graduate	*169*	*40.6*
	Post Graduate	*202*	*48.6*
	Any Other	*20*	*4.8*
IT Professional			
	Yes	*106*	*25.5*
	No	*310*	*74.5*

The descriptive statistics of department and designation are presented in Table 13. The result provides evidence that there is good combination of technical, finance, HR,

Table 13: Demographic Information: Department and Designation

Classification		Frequency	Percentage
Department			
	Technical	*183*	*44.0*
	Finance	*96*	*23.1*
	HR	*64*	*15.4*
	Others	*73*	*17.5*
Designation			
	Supervisor	*65*	*15.6*
	Middle Management	*176*	*42.3*
	Executive Management	*120*	*28.8*
	Others	*55*	*13.3*

and other departments. 183 (44.0%) respondents belong to technical department, 96 (23.1%) respondents belong to finance department, 64 (15.4%) respondents belong to HR department, 73 (17.5) respondents belong to other departments. The results indicate that designation in the organization is well represented in the sample. There were 65 (15.6%) Supervisor, 176 (42.3%) Middle Management, 120 (28.8%) Executive Management, and 55 (13.3%) belongs to others.

The demographic statistics on the respondents' work experience and number of year using computer are shown in Table 14.

Table 14: Demographic Information: Work Experience and Number of Year Using Computer

Classification	Frequency	Percentage
Work Experience		
1 to 2 Years	*26*	*6.3*
3 to 5 Years	*75*	*18.0*
6 to 10 Years	*93*	*22.4*
More than 10 Years	*222*	*53.4*
Computer Experience		
1 to 2 Years	*12*	*2.9*
3 to 5 Years	*66*	*15.9*
6 to 10 Years	*127*	*30.5*
More than 10 Years	*211*	*50.7*

The results indicate that 26 (6.3%) respondents' work experience is 1 to 2 years, 75 (18.0%) respondents' work experience is 3 to 5 years, 93 (22.4%) respondents' work

experience is 6 to 10 years, and 222 (53.4%) respondents' work experience is more than 10 years.

The result also represents good computer experience of the respondents. 12 (2.9%) respondents' computer work experience is 1 to 2 years, 66 (15.9%) respondents' computer work experience is 3 to 5 years, 127 (30.5%) respondents' computer work experience is 6 to 10 years, and 211 (50.7%) respondents' computer work experience is more than 10 years.

4.2 Reliability and Validity of Constructs

The pictorial view of structural and measurement model present the latent factors and its associated measurement variables, and also present the relationship between six latent constructs.

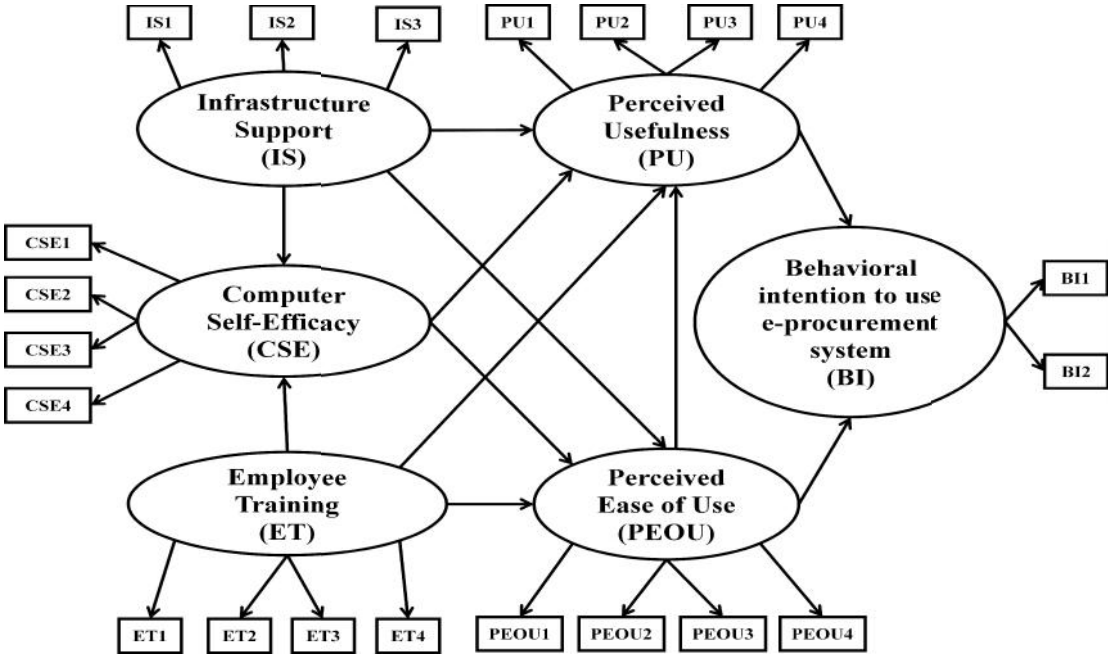

Figure 36: Structural and Measurement Model for the Research Work

Prior to find out the association (relationships) between the different pair of latent constructs, constructs reliability and validity was checked. A pictorial view of structural and measurement model is illustrated in Figure 36.

The reliability (Cronbach's α) of determinants was measured, based on the several questions asked to measure each determinant. The Cronbach's alpha .70 or above are acceptable in social research (Alshare, Freeze, & Kwun, 2009; Thompson, et al., 2006). The result obtain from analysis shows that the reliability of all the determinants were found exceeding the minimum threshold value of Cronbach's alpha .70 or above. Table 15 presents the construct reliability (Cronbach's α), obtained for the latent constructs assessed in this study.

Table 15: Reliability of Constructs

Constructs	Number of Questions	Cronbach's α
Perceived Usefulness (PU)	4	0.8367
Perceived Ease of Use (PEOU)	4	0.7959
Infrastructure Support (IS)	3	0.7669
Computer Self-Efficacy (CSE)	4	0.7224
Employee Training (ET)	4	0.7706
Behavioral Intention to Use e-procurement system (BI)	2	0.7526

For further proceeding with factor analysis, appropriateness of the factors must be checked. Adequacy of sampling was measured through Kaiser-Meyer-Olkin (KMO) statistic. The KMO value > .60 can be considered as adequate for applying factor

analysis (Kaiser & Rice, 1974). The results obtained from KMO and Bartlett's test are presented in Table 16.

Table 16: KMO and Bartlett's Test

Description		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.869
Bartlett's Test of Sphericity	Approx. Chi-Square	3203.941
	Df	210
	Sig.	.000

The values in Bartlett's test are significant and thus acceptable. For applying factor extraction, Principle Component Analysis with Varimax rotation and Kaiser Normalization were used.

Even though Structural Equation Modeling (SEM) was used in this study which includes Confirmatory Factor Analysis (CFA), an Exploratory Factor Analysis (EFA) was also done, because in this study one fairly new construct infrastructure support developed by (Bhattacherjee & Hikmet, 2008) was used, which have not been widely used. To confirm the component validity of this construct, exploratory factor analysis was done. The result obtain from exploratory factor analysis using principal component analysis with varimax rotation and Kaiser Normalization shows that all factor loading were found greater than .6. Most of the factors loading are greater than.7; suggest a well defined structure (Hair, et al., 2010; Thompson, et al., 2006). The good factorial validity of the measurement instruments have been found in the study because all the items were perfectly loaded on the correct construct.

Table 17: Cross Loading, Factor Loading and Reliability

	PU	PEOU	ET	CSE	IS	BI
Perceived Usefulness1	**.827**	.222	.047	-.004	.090	.028
Perceived Usefulness2	**.822**	.192	.124	.110	.056	.075
Perceived Usefulness3	**.704**	.032	.158	-.011	.080	.272
Perceived Usefulness4	**.715**	.160	.220	.020	.185	.040
Perceived Ease of Use1	.275	**.701**	.130	.089	.167	.115
Perceived Ease of Use2	.237	**.742**	.110	.084	.124	.204
Perceived Ease of Use3	-.004	**.698**	.113	.225	.115	.135
Perceived Ease of Use4	.196	**.741**	.178	.128	.135	.087
Infrastructure Support1	.296	.264	-.081	-.034	**.660**	.051
Infrastructure Support2	.095	.081	.193	.051	**.838**	.072
Infrastructure Support3	.042	.160	.184	.068	**.844**	.068
Behavioral Intention to use e-procurement System1	.161	.213	.128	.081	.062	**.823**
Behavioral Intention to use e-procurement System2	.173	.251	.205	.134	.118	**.774**
Employee Training1	.195	.172	**.661**	.168	.141	.008
Employee Training2	.254	.118	**.762**	.077	.058	.066
Employee Training3	-.001	.106	**.645**	.209	.029	.284
Employee Training4	.092	.104	**.801**	.110	.126	.089
Computer Self-Efficacy1	.000	.151	.038	**.763**	.023	.022
Computer Self-Efficacy2	.026	.086	.114	**.731**	.018	.037
Computer Self-Efficacy3	.089	-.015	.136	**.713**	.105	.230
Computer Self-Efficacy4	-.005	.210	.194	**.654**	-.042	-.031

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

The confirmatory factor analysis using AMOS was also done to further check the reliability of all these well defined constructs. The confirmatory factor loading with their significant values are shown in the Table 18. All factor loading are greater than .5 with most of the factor loading greater than .7. Additionally, the entire factor loading found to be statistically significant at ($p<.05$). Significant factor loading higher than .7 suggest high convergent validity (Hair, et al., 2010).

Table 18: Confirmatory Factor Loading

Constructs	***Variables***	***Factor Loading***	***P-Value***
Perceived Usefulness			
	PU1	.787	***
	PU2	.829	***
	PU3	.661	***
	PU4	.705	***
Perceived Ease of Use			
	PEOU1	.737	***
	PEOU2	.772	***
	PEOU3	.608	***
	PEOU4	.731	***
Behavioral Intention			
	BI1	.720	***
	BI2	.841	***
Infrastructure Support			
	IS1	.574	***
	IS2	.787	***

	IS3	.827	***
Computer Self-Efficacy			
	CSE1	.645	***
	CSE2	.624	***
	CSE3	.644	***
	CSE4	.605	***
Employee Training			
	ET1	.679	***
	ET2	.737	***
	ET3	.558	***
	ET4	.697	***

The descriptive statistics of latent constructs are shown in Table 19. Results shows that on average respondents perceived that perceived usefulness is higher than average (M=4.2392, SD=.59734). Results shows that on average respondents perceived that infrastructure support is higher than average (M=4.1514, SD=.59022). Results shows that on average respondents perceived that perceived ease of use, behavioral intention to use e-procurement system and employee training is higher than average (M=4.0685, SD=.61516), (M=4.0805, SD=.65040), (M=4.0691, SD=.58382) respectively. Result show that computer self-efficacy is slightly higher than average (M=3.9231, SD=.57621).

Table 19: Descriptive Statistics of Latent Constructs

Constructs	Mean [a]	Standard Deviation
Perceived Usefulness (PU)	4.2392	.59734
Perceived Ease of Use (PEOU)	4.0685	.61516
Infrastructure Support (IS)	4.1514	.59022
Behavioral Intension to use EPS (BI)	4.0805	.65040
Employee Training (ET)	4.0691	.58382
Computer Self-Efficacy (CSE)	3.9231	.57621

[a] Likert-Type scale ranging from 1 to 5 where 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree.

4.3 Analysis of the Measurement Model

The measurement model for the six latent construct was assessed. The values obtained from the measured model presented in the Table 20.

The results obtained from the analysis are Chi-square/degrees of freedom (χ^2 / df) = 1.856, Comparative Fit Index (CFI) = .951, Goodness-of-Fit Index (GFI) = .928, Adjusted Goodness-of-Fit index (AGFI) = .904, Normed Fit Index (NFI) = .901, and Root Mean Square Error of Approximation (RMSEA) = .045. All the values obtained are achieving the required threshold values for model fit (Hoyle, 1995; Marcoulides & Schumacker, 1996).

Table 20: Analysis of Goodness-of-Fit

Goodness-of-Fit Index	Threshold Values [a]	Result Obtained
χ^2 / **df** (324.738/175)	≤ 2.00	1.856
CFI	≥ .90	.951
GFI	≥ .90	.928
AGFI	≥ .80	.904
NFI	≥ .90	.901
RMSEA	≤ .10	.045

[a] Recommended threshold values for goodness of fit (Hoyle, 1995; Marcoulides & Schumacker, 1996).

4.4 Evaluation of Findings

In the consecutive sections we have discussed about hypothesis testing (path estimates and significance level), and evaluation of hypothesis.

4.4.1 Hypothesis Testing

The SEM analysis was done on the sample sizes of 416 to determine the Pearson's correlation r (standardized path estimates) and their significance level (P-value). SEM analysis shows that hypothesis H1 and H3 were not supported as their significance level is >.05. For H1 r (416) = .062 and p = .505, and for H3 r (416) = -.007 and p = .938. Hypothesis H2, H4, H5, H6, H7, H8, H9, H10, H11 were supported as their significance level is <.05. The results for H2, r (416) = .44 and p < .001, for H4, r (416) = -.189 and p = .013, for H5, r (416) = .252 and p < .001, for H6, r (416) = .362

and p < .001, for H7, r (416) = .317 and p < .001, for H8, r (416) = .539 and p < .001, for H9, r (416) = .134 and p =.038, for H10, r (416) = .503 and p < .001, for H11, r (416) = .548 and p <.001.

Table 21: Path Estimates and Significance Level

Relationship	*Pearson's r*	*P-Value*	*Hypothesis*
IS→PU	.062	.505	*H1*
IS→ PEOU	.436**	***	*H2*
IS→ CSE	-.007	.938	*H3*
CSE→ PU	-.189*	.013	*H4*
CSE→ PEOU	.252**	***	*H5*
ET→ PU	.362**	***	*H6*
ET→ PEOU	.317**	***	*H7*
ET→ CSE	.539**	***	*H8*
PU→ BI	.134*	.038	*H9*
PEOU→ PU	.503**	***	*H10*
PEOU→ BI	.548**	***	*H11*

*** Significant at < .001 level, * Significant at < .05 level*

4.4.2 Evaluation of Hypothesis

Total eleven hypotheses were developed to assess the association between different latent constructs. Hypothesis 1 was used to assess the relationship between infrastructure support and perceived usefulness of e-procurement system. The results [r (416) = .06, p = .505] obtained from the analysis shows that the calculated significance value is greater than the critical threshold value of (p <.05). So, no such evidence was found to reject the null hypothesis $H1_0$, therefore, there is no significant

relationship between Infrastructure support and perceived usefulness of e-procurement system. Hypothesis 2 was used to assess the relationship between infrastructure support and perceived ease of use of e-procurement system. The results [r (416) = .44, p < .001] obtained from the analysis shows that the calculated significance value is less than the critical threshold value of (p <.05). So, enough evidence was found to reject the null hypothesis and accept the alternate hypothesis $H2_a$, therefore, there is a significant relationship between infrastructure support and perceived ease of use of e-procurement system. Hypothesis 3 was used to assess the relationship between infrastructure support and computer self-efficacy. The results [r (416) = -.01, p = .938] obtained from the analysis shows that the calculated significance value is greater than the critical threshold value of (p <.05). So, no such evidence was found to reject the null hypothesis $H3_0$, therefore, there is no significant relationship between infrastructure support and computer self-efficacy.

Hypothesis 4 was used to assess the relationship between computer self-efficacy and perceived usefulness of e-procurement system. The results [r (416) = -.19, p = .013] obtained from the analysis shows that the calculated significance value is less than the critical threshold value of (p <.05). So, enough evidence was found to reject the null hypothesis and accept the alternate hypothesis $H4_a$, therefore, there is a significant negative relationship between Computer self-efficacy and perceived usefulness of e-procurement system. Hypothesis 5 was used to assess the relationship between computer self-efficacy and perceived ease of use of e-procurement system. The results [r (416) = .25, p < .001] obtained from the analysis shows that the calculated

significance value is less than the critical threshold value of ($p < .05$). So, enough evidence was found to reject the null hypothesis and accept the alternate hypothesis $H5_a$, therefore, there is a significant relationship between computer self-efficacy and perceived ease of use of e-procurement system.

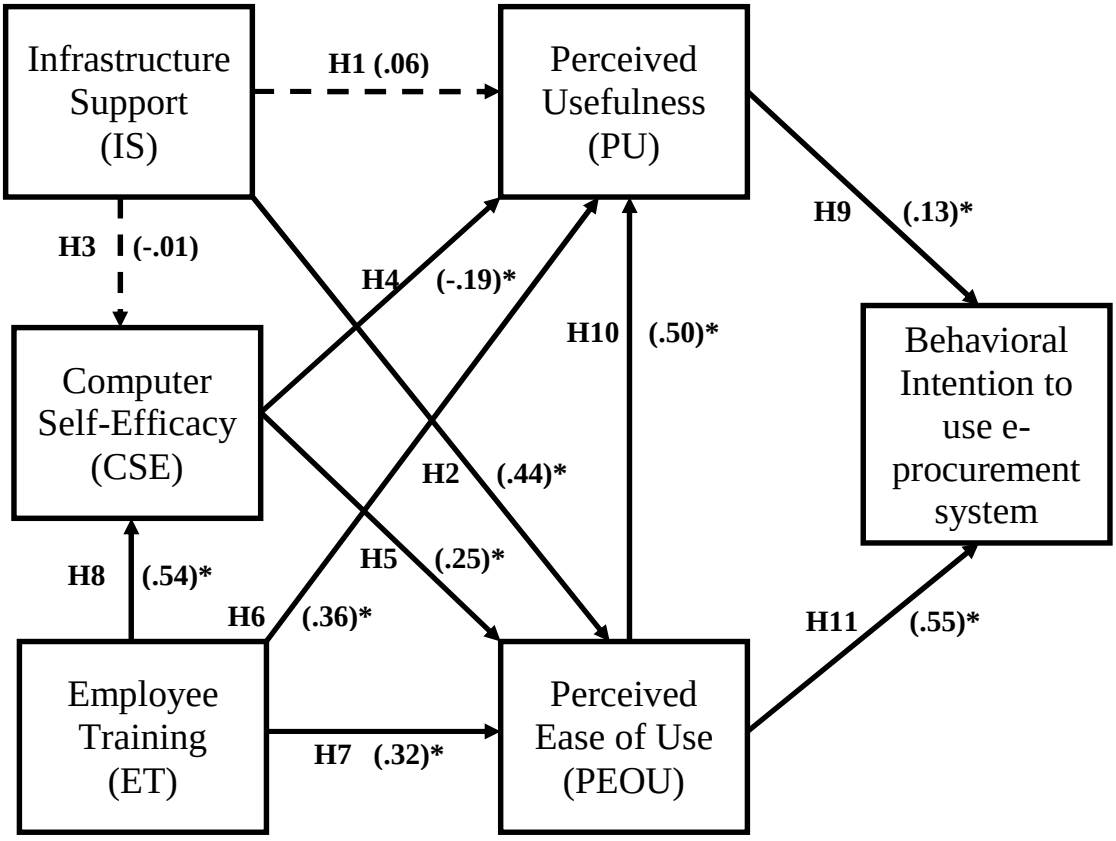

Figure 37: Structural Model with Hypotheses Results

Hypothesis 6 was used to assess the relationship between employee training and perceived usefulness of e-procurement system. The results [$r(416) = .36$, $p < .001$] obtained from the analysis shows that the calculated significance value is less than the critical threshold value of ($p < .05$). So, enough evidence was found to reject the null

hypothesis and accept the alternate hypothesis $H6_a$, therefore, there is a significant relationship between employee training and perceived usefulness of e-procurement system. Hypothesis 7 was used to assess the relationship between employee training and perceived ease of use of e-procurement system. The results [r (416) = .32, p < .001] obtained from the analysis shows that the calculated significance value is less than the critical threshold value of (p <.05). So, enough evidence was found to reject the null hypothesis and accept the alternate hypothesis $H7_a$, therefore, there is a significant relationship between employee training and perceived ease of use of e-procurement system. Hypothesis 8 was used to assess the relationship between employee training and computer self-efficacy. The results [r (416) = .54, p < .001] obtained from the analysis shows that the calculated significance value is less than the critical threshold value of (p <.05). So, enough evidence was found to reject the null hypothesis and accept the alternate hypothesis $H8_a$, therefore, there is a significant relationship between employee training and computer self-efficacy.

Hypothesis 9 was used to assess the relationship between perceived usefulness of e-procurement system and behavioral intention to use e-procurement system. The results [r (416) = .13, p = .038] obtained from the analysis shows that the calculated significance value is less than the critical threshold value of (p <.05). So, enough evidence was found to reject the null hypothesis and accept the alternate hypothesis $H9_a$, therefore, there is significant relationship between perceived usefulness of e-procurement system and behavioral intention to use e-procurement system. Hypothesis 10 was used to assess the relationship between perceived ease of use of e-

procurement system and perceived usefulness of e-procurement system. The results [r (416) = .50, p < .001] obtained from the analysis shows that the calculated significance value is less than the critical threshold value of (p <.05). So, enough evidence was found to reject the null hypothesis and accept the alternate hypothesis $H10_a$, therefore, there is a significant relationship between perceived ease of use of e-procurement system and perceived usefulness of e-procurement. Hypothesis 11 was used to assess the relationship between perceived ease of use of e-procurement system and behavioral intention to use e-procurement system. The results [r (416) = .55, p < .001] obtained from the analysis shows that the calculated significance value is less than the critical threshold value of (p <.05). So, enough evidence was found to reject the null hypothesis and accept the alternate hypothesis $H11_a$, therefore, there is a significant relationship between perceived ease of use of e-procurement system and behavioral intention to use e-procurement system.

4.5 Comparisons with other studies

The Table 22 represents that the structural and measurement model is well fitted with the variables used in this study and the values of CFI, GFI, AGFI, and NFI are (.951, .928, .904, .901) achieved respectively, which is higher than the minimum threshold value (≥ .90). The value of χ^2/df is 1.856 and the value of RMSEA is .045, obtained from the analysis, which is not exceeding the maximum range. Table 22 represents the comparison of Goodness-of-Fit Index of this study with other studies.

Table 22: Comparison of Goodness-of-Fit Index

Index	Threshold value	This study	Other studies	Other studies sources
χ^2/df	≤ 2.0	1.856	3.314 2.588	Bhattacherjee and Hikmet (2008) Reid & Levy (2008)
CFI	≥ .90	.951	.940 .948	Bhattacherjee and Hikmet (2008) Reid & Levy (2008)
GFI	≥ .90	.928	.860 .898	Bhattacherjee and Hikmet (2008) Reid & Levy (2008)
AGFI	≥ .80	.904	.820 .866	Bhattacherjee and Hikmet (2008) Reid & Levy (2008)
NFI	≥ .90	.901	.910 .918	Bhattacherjee and Hikmet (2008) Reid & Levy (2008)
RMSEA	≤ .10	.045	.084 .065	Bhattacherjee and Hikmet (2008) Reid & Levy (2008)

The summary of hypothesis results is presented in Table 23.

Table 23: Summary of Hypothesis Results

	Hypothesis	***Result***
$H1_a$	*There is a significant relationship between infrastructure support and perceived usefulness of e-procurement system.*	*Not Supported*
$H2_a$	*There is a significant relationship between infrastructure support and perceived ease of use of e-procurement system.*	*Supported*
$H3_a$	*There is a significant relationship between infrastructure support and computer self-efficacy.*	*Not Supported*
$H4_a$	*There is a significant relationship between computer self-efficacy and perceived usefulness of e-procurement system.*	*Supported**
$H5_a$	*There is a significant relationship between computer self-efficacy and perceived ease of use of e-procurement system.*	*Supported*
$H6_a$	*There is a significant relationship between employee training and perceived usefulness of e-procurement system.*	*Supported*
$H7_a$	*There is a significant relationship between employee training and perceived ease of use of e-procurement system.*	*Supported*
$H8_a$	*There is a significant relationship between employee training and computer self-efficacy.*	*Supported*
$H9_a$	*There is a significant relationship between perceived usefulness of e-procurement system and behavioral intention to use e-procurement.*	*Supported*
$H10_a$	*There is a significant relationship between perceived ease of use of e-procurement system and perceived usefulness of e-procurement system.*	*Supported*
$H11_a$	*There is a significant relationship between perceived ease of use of e-procurement system and behavioral intention to use e-procurement.*	*Supported*

** Negative relationship between computer self-efficacy and perceived usefulness of e-procurement system.*

Chapter 5 : Discussions, Recommendations and Conclusions

In this chapter, we start our discussion on results obtained from the hypothesis testing. After the discussion section, recommendations and conclusions of the research are presented in the consecutive sections.

5.1 Discussions

The potential productivity gains from investment in Information Technology can be determined by its acceptance and optimum utilization by the employee (Agarwal & Prasad, 1997). If, Uttarakhands' public sector organizations (Oil, Gas and Power) managers understand that why a particular technology is accepted or rejected, they can proactively organize some intervention programs to improve the acceptance and usage of technology, and reduce the underutilization of Information Technology. Based on the research findings from this study, several theoretical and managerial discussions are presented in this section.

RQ1. What is the level of association between infrastructure support and perceived usefulness of e-procurement system?

Finding obtained from testing of hypothesis 1, represents that there is no statistical evidence was found [r (416), =.06, p=.505] to suggest that infrastructure support significantly relates with perceived usefulness of e-procurement system. The results represent that a persons' perception about using a particular technology enhance his

or her job performance, would not influence by investments in IT infrastructure to support job performance. Investment in IT infrastructure does not influence intention to use e-procurement system. However, investment in Information Technology enhance the productivity of an organization by automating the processes, investing enormous amount in IT does not influence the employees that implemented systems is useful. So, organizations have to invest in the complementary assets also such as new business models, organization reengineering, interaction with suppliers and customers, and user training (Brynjolfsson & Hitt, 2000).

RQ2. What is the level of association between infrastructure support and perceived ease of use of e-procurement system?

Finding obtained from testing of hypothesis 2, represents that statistical evidence was found [r (416), =.44, p<.001] to suggest that infrastructure support significantly relates with perceived usefulness of e-procurement system. The results represent that a persons' perception that particular technology is free of effort, would influence by investing in additional IT infrastructure support, products and services. Today, almost all the software has the inbuilt manual facility for the end users. Therefore, it is easy for the employees to read the manuals before using a particular technology. In addition, there are many new features in the latest software, using a single click you can do the processes as well as troubleshoot the problem. Other requirement of enterprise application is high-speed networks. Manager has to hire technical support staff to provide services to employees. The more an employee will utilize the latest

technology, the more he or she will feel that the technology is free of effort. The more the organization would provide additional IT products and services the more it improves the quality of employee work.

RQ3. What is the level of association between infrastructure support and computer self-efficacy?

Finding obtained from testing of hypothesis 3, represents that there is no statistical evidence was found [r (416), = -.01, p=.938] to suggest that infrastructure support significantly relates with computer self-efficacy. The results represent that a persons' perception about his or her job ability to use computer system to accomplish the target job task, would not influence by investments in IT infrastructure to support job performance. However, investment in Information Technology enhance the productivity of an organization by automating the processes, investing enormous amount in IT does not motivate the employees' belief in their ability to use a computer system.

RQ4. What is the level of association between computer self-efficacy and perceived usefulness of e-procurement system?

Finding obtained from testing of hypothesis 4, represents that statistical evidence was found [r (416), = -.19, p= .013] to suggest that computer self-efficacy significantly relates with perceived usefulness of e-procurement system. The results represents that, the individuals' perception of his or her ability to use a computer system to

accomplish a job task have a negative significant impact on a persons' perception that using a particular technology would enhance his or her job performance.

RQ5. What is the level of association between computer self-efficacy and perceived ease of use of e-procurement system?

Finding obtained from testing of hypothesis 5, represents that there is enough statistical evidence [r (416), =.25, p<.001] to suggest that computer self-efficacy significantly relates with perceived ease of use of e-procurement system. The results represent that a persons' perception that using a particular technology is free of effort, would influence by individuals' perception about his or her ability to use a computer system to accomplish the specified job task. The positive significant relationship between computer self-efficacy and perceived ease of use of e-procurement system suggest that in order to increase the perception about ease of use of e-procurement system and optimum utilization of existing IT , managers have to develop the intervention programs to increase the level of computer self-efficacy of their staff.

RQ6. What is the level of association between employee training and perceived usefulness of e-procurement system?

Finding obtained from testing of hypothesis 6, represents that there is enough statistical evidence [r (416), =.36, p<.001] to suggest that employee training significantly relates with perceived usefulness of e-procurement system. The result represents that the degree to which an individual's believes that using a specific

computer system would enhance his or her job performance, would influence by going through a training programs. Hence, managers have to organize more training programs to increase the job performance of employees.

RQ7. What is the level of association between employee training and perceived ease of use of e-procurement system?

Finding obtained from testing of hypothesis 7, represents that there is enough statistical evidence [r (416), =.32, p<.001] to suggest that employee training significantly relates with perceived ease of use of e-procurement system. The result implies that the degree to which an individual's believes that using a specific computer system may free of effort would influence by attending the training programs. Attending more training programs before the system is implemented, would increase the individuals' perception that using a particular technology is free of effort. Senior managers have to take decision, to involve the employees during system design and its implementation process. Training provides the hand-on experience that allows employees to explore the e-procurement system from technical and functional standpoint.

RQ8. What is the level of association between employee training and computer self-efficacy?

Finding obtained from testing of hypothesis 8, represents that there is enough statistical evidence [r (416), =.54, p<.001] to suggest that employee training

significantly relates with computer self-efficacy. The result represents that a persons' perception about his or her ability to use specific computer system to accomplish a job task would influence by attending the training programs. Training facilitates the employees to explore the ease of use of the e-procurement system and influence the computer self-efficacy of employees.

RQ9. What is the level of association between perceived usefulness of e-procurement system and behavioral intention to use e-procurement system?

Finding obtained from testing of hypothesis 9, represents that there is enough statistical evidence [r (416), =.13, p= .038] to suggest that perceived usefulness of e-procurement system significantly relates with behavioral intention to use e-procurement system. The result implies that the strength of a persons' intention to use a specified computer system, would influence by the degree to which the individual believes that using a particular computer system would enhance his or her job performance. Hence, to increase the adoption and usage of Information technology in the organization, managers have to seek computer systems that employees believe would enhance their job performance.

RQ10. What is the level of association between perceived ease of use of e-procurement system and perceived usefulness of e-procurement system?

Finding obtained from testing of hypothesis 10, represents that there is enough statistical evidence [r (416), =.50, p<.001] to suggest that perceived ease of use of e-procurement system significantly relates with perceived usefulness of e-procurement system. The result implies that the degree to which an individual believes that using a specified computer system enhance his or her job performance, would influence by the degree to which an individual believes that using a specified computer system is free of effort. In order to increase the level of employees' perception about the usefulness of the computer system, managers have to seek the computer systems that are user friendly and easy to use interface.

RQ11. What is the level of association between perceived ease of use of e-procurement system and behavioral intention to use e-procurement system?

Finding obtained from testing of hypothesis 11, represents that there is enough statistical evidence [r (416), =.55, p<.001] to suggest that perceived ease of use of e-procurement system significantly relates with behavioral intention to use e-procurement system. The result implies that the strength of a persons' intention to use a particular computer system is influenced by the degree to which an individual believes that using a specific computer system may free of effort. In order to increase the adoption and usage of computer system in the organization, managers have to seek the computer systems that are user friendly and easy to use.

5.2 Recommendations

There is no statistical evidence was found that infrastructure support influence perceived usefulness of e-procurement system and computer self-efficacy. The result obtained for this factor is quite useful. Investing in IT infrastructure is important to automate the processes and improve the organization productivity, but investing enormous amount in IT infrastructure does not influence the employees to believe that the implemented system is useful. The result obtained support the other studies that suggest in order achieving potential gain from IT investment, it is required to invest in complementary assets such as develop new business models, business process redesign, organizational learning, develop strategies for IT investment, interaction with suppliers and customers, and employees training (Brynjolfsson, 2003, Brynjolfsson & Hitt, 2000).

Finding from the statistical analysis provide evidence that in this study employee training play a critical role to influence the intention to use e-procurement system mediated through perceived usefulness of e-procurement system and perceived ease of use of e-procurement system. Training provides the hand-on experience that allows employees to explore the e-procurement system from technical and functional standpoint. Training also facilitates the employees to explore the ease of use of the e-procurement system and influence the computer self-efficacy of employees. Thus, managers have to develop intervention programs to provide effective training to their employees on e-procurement system. Further studies also required to find out the additional determinants of employee training.

Though there are many studies that find computer self-efficacy to influence both perceived usefulness and perceived ease of use Admin (2007), Hasan (2007), Scott and Walczak (2009) the finding in this study support the other studies such as Chau (2001) and Reid and Levy (2008) who also find that computer self-efficacy has no impact on perceived usefulness.

There are several external factors that influence the technology acceptance and usage. In this study we have considered on individual and organizational factors that impact on IT usage behavior. Though the organizational factor, employee training plays a critical role in influencing the technology usage by employees, there are several other organization factors also that were not studied in this research work. Future research can also be done to assess the other organizational support factors that may influence the usage of IT.

5.3 Conclusions

In this quantitative correlation study, the extended TAM was developed and used to assess the impact of individual factor (computer self-efficacy), organizational factors (infrastructure support and employee training) on intention to adopt and use e-procurement system mediated through perceived usefulness and perceived ease of use. Total 416 completely filled questionnaires were received from respondents out of 1500 questionnaires distributed personally and using online survey. This survey data was used to assess eleven hypotheses. It was found that no such statistical evidence suggest that infrastructure support influence perceived usefulness of e-procurement

system or computer self-efficacy is quite useful. Though investment in IT is important for the organization to implement computerized system to improve productivity and efficiency of the employees, investment itself does not influence the employees in believing that the implemented system is useful. Computer self-efficacy influences the perceived ease of use of e-procurement system, but has a negative impact on perceived usefulness. In order to achieve higher technology usage towards improving productivity, public sector managers have to more emphasize on organizing training programs. In this study employee training plays a critical role in technology acceptance and usage.

5.4 Limitations of the Study

This study focused on Public Sector Oil, Gas and Power (OGP) companies only. The researcher wanted to study the adoption of e-procurement in government organizations / departments as well. In Uttarakhand state, none of the government department has yet introduced e-procurement systems. The findings and recommendations are primarily based on the data collected from public sector Oil, Gas and Power (OGP) companies, Private sector companies have not been included in the study. The geographical reach is also limited to companies based in Uttarakhand.

5.5 Suggestions for Future Work

There are several external factors that influence the technology acceptance and usage. In this study we have considered individual and organizational factors that impact on

IT usage behavior. Though the organizational factors like employees training plays a critical role in influencing the technology usage by employees, there are several other organization factors also that were not studied in this research work. Future research can also be done to assess the other organizational support factors that may influence the usage of IT.

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Appendix A: Survey Questionnaire