The study was conducted in the National Capital Region (NCR) in three phases: preliminary investigation, pilot study followed by a questionnaire survey. Two main sources of research data were primary and secondary data. Secondary data collection preceded primary data collection in order to gain insights into the research topic. The secondary data regarding various parameters of the e-readiness (specified in the e-readiness questionnaire) mentioned below was collected from various government offices, telephone operators and reports of NASSCOM and other offices.

Secondary data sought

- What is the network speed and quality?
- What percentage of voice calls are successful?
- What is the quality of the voice calls?
- How many problems are reported annually per 100 lines?
- What data services and speeds are available?
- What is the backbone network capacity?
- What are the most common dial-up modem transfer speeds?
- What technology choices are available for access to the network?
- What technology solutions have been implemented in the network?
- What broadband technology solutions have been deployed?
- Who are the service providers for voice, mobile, data and Internet and what are their territories?
- What is the average time for telephone mainline maintenance and installation?
- What is the quantity of and skill levels of software developers, programmers or computer technicians?
- What are the average maintenance costs for the various networks that have been deployed?
- What percentage of problems are power initiated?
- What are the bandwidth offerings and subscription ratio for residential customers, small, medium and large business customers, and Municipal, School, University and Hospital customers?
- How many ISPs offer local dial-up access?
- How many ISPs offer broadband access?
- What is the availability and type of higher bandwidth solutions?
- What are the service provider's plans to expand their service offerings and reach?
- What is the availability of off-the-shelf hardware and software solutions?
- Is Open-Source software readily available? How extensively is it being used?
- What is the degree of electrification?
- What specific locations have access to telecommunications infrastructure (voice, data, Internet, mobile, wireless and satellite)?
- What is the degree of teledensity?
- What is the degree of mobile wireless penetration?
- What is the degree of cable penetration?
- What are the prices charged for local voice, international voice, and data calls?
- What impact does competition in telecommunications market have on pricing?
- What are the costs per meter to deploy fiber, copper, broadband, and wireless technologies?
- What are the costs for satellite based services?
- What is the level of telecommunications competition?
- What is the status and impact of the telecommunications regulatory?
- What are the regulatory provisions with respect to telecommunications services?
- What are the regulatory provisions with respect to online privacy and security?
- What are the plans for telecommunications deregulation?
- Number of telephone subscribers / mobile phone subscribers/district?
- Number of PCs / household by district?
- Number of radios/televisions / household / district?
- Cost of Internet access / district?
- Number of public / community access facilities / district?
- Number of public / community access PCs / district?
- Number of public / community access facilities /inhabitant in urban vs. rural areas / district?
- Internet access type per public / community access facility / district?
- What is the level of ICT use by local and district government / district?
- What is the availability of online government services at a community level?
According to Malhotra (2004), examination of secondary data is a prerequisite to primary data collection. There were several sources of secondary data used in this study including books, journals, government publications, newspapers and databases. The comprehensive and extensive study of previous researchers’ works, government statistics, and different theories and models are good evidence of secondary data collection. Questionnaire was used in this study for collecting the primary data.

Preliminary interviews with the proprietors/managers of ten SMEs (as per defined criterion specified by Government of India - see Exhibit 1.5) in the region were conducted. This provided direction to the research effort and was supported by an extensive literature review. Given the lack of empirical research in the area of e-commerce in SMEs, an exploratory investigation was the most justifiable approach. A survey instrument with questions and multiple-item scales was than developed and pilot-tested to capture the information reflecting the perceptions and practice of SMEs adopting the e-commerce, specifically what internal or external environmental factors affected the adoption of e-commerce and the degree of influence.

Limited over the geographical area of NCR, questionnaires were personally distributed to the director or owner of the SMEs. Those interested/requested for e-mailing the survey instrument were provided the questionnaire after recording the e-mail addresses. In order to improve response rate, reminders were sent out to target respondents two weeks after the commencement of first and second-wave of mail-out.

The survey was conducted from September to December 2013. To be included in the survey, the organizations selected needed to have adopted at least one of the following forms of Internet usage: e-mail, Internet browsing, or a website for business purposes. The researcher asked the person responding to the survey to be holding a management position and who had been involved in any decision on the adoption of Internet technologies. This was to ensure that the attitudes reflected in the questionnaire were reflective of the person carrying out the relevant decision-making.

**OBJECTIVES OF THE STUDY**

The general objective of the research effort was to determine the utilization practices of electronic commerce among SMEs circumvent upon their e-readiness and perceived benefits/barriers to gauge the prospects of e-commerce. To get to the objective of this research, the proprietor's attitude, and perceived benefits, barriers of e-commerce, and infrastructure requirements which were considered instrumental to the e-commerce utilization amongst SMEs were dwelled upon. The research methodology moved through (a) identifying the factors that could affect e-commerce utilization and consequent success through a literature review, (b) test and validate the relationships between these factors and business utilization and performance, and (c) evaluate and determine the key factors that make a significant contribution to the business performance improvement among SMEs in e-commerce environment based on the outcomes of empirical testing.
The detailed set of objectives include:

1. To determine the level of awareness and utilization areas of e-commerce amongst SMEs and delineating the factors affecting awareness and increased utilization. Factors included perceived usefulness, perceived ease of use and application areas of IT tools such as computers, internet and e-commerce. How the IT tools influenced the growth and consequent adoption of e-commerce by the SMEs were thus extracted.

2. To identify and assess the perceived opportunities, benefits and barriers of e-commerce in the SMEs and thus determine the extent of adoption and the e-commerce adoption process amongst the SMEs. Interaction effects of demographic, geographic, institutional environment and other moderating variables (namely industry type, annual sales turnover and Internet experience) variables on e-commerce adoption were thus studied.

3. To identify the main critical success factors of e-commerce implementation amongst SMEs. How the organizational characteristics such as the size of the organization, location, period for which organization is in business, type of product category, market place – local vs. national and international, it skill levels, the gender of the proprietor and culture effected the utilization of e-commerce in the SMEs.

4. To assess the e-readiness of SMEs for the effective utilization of e-commerce.

5. To assess the e-commerce performance and its relationship with e-readiness.

**RESEARCH DESIGN**

**Data Collection**

The research used qualitative data collected in semi-structured interviews conducted separately with proprietor/s, Managing Director and/or Information Officers of the 10 SMEs operative in the select region. In total, 11 participants were interviewed. Interviews lasted between 30 to 80 minutes, with an average of 45 minutes. Topics covered in the interviews included background information on the SME, the history, the firm’s use of the Internet and other e-commerce technologies, and factors facilitating or inhibiting the adoption of these technologies. An interview included questions based on the issues arising from the literature review. Interview questions were designed to study SME’s e-commerce utilization process and to identify possible facilitators and inhibitors of the adoption of e-commerce.

The list of contacts were obtained from business directories and databases of Chamber of Commerce and Industries. Around 300 small business owners were contacted either by e-mail or the telephone numbers. Despite repeated reminders, only a limited response was obtained as detailed out at the beginning of the Chapter V. The low response rate could be due to the length of questionnaire and small business owner tendency not to give information about their business. The sample of the study consisted of a wide range of industries such as information technology, machinery, services, textile and food related industries. Organizational data was sought from a
single respondent (usually the owner/manager) of the SME which agreed to participate in the study. The details of the sample characteristics has been presented in Exhibit 5.1 in next chapter.

**Selection of Sample Size**
Some studies (Hair et. al., 1995; Hulland et. al., 1996; Kline, 1998) have stated that a sample size of 100 is considered small, between 100 and 200 is considered medium, and more than 200 is considered large. Roscoe (1975) has proposed rules of thumb to follow when determining sample size. One of the rules is sample size with number of participants larger than 30 and less than 500 are appropriate for most researches. Roscoe (1975) mentioned that in multivariate research like multiple regression analysis, the sample size should be at least preferably 10 times or more as large as the number of variables in the study. In this study, complete data could be obtained from 236 SMEs.

**Selection of Respondents**
In pilot study, convenience sampling method was used to select 10 SMEs. In primary data collection, systematic sampling method (Molla and Licker, 2004; Alampay, 2006; Jayabalan et. al., 2009) was used to select respondents from a list of SMEs. The list of SMEs was obtained from the website of Small and Medium Industries Development Corporation. The quantitative survey was targeted at, Proprietors, Chief Executive Officers, Managing Directors, General Managers, Sales/Marketing Managers and Export Managers in selected SMEs. In order to increase response rate, phone calls were made to SMEs to request their permission to participate. Upon receiving their consent, questionnaires were personally delivered the respondents. Some questionnaires were sent through e-mail upon the consent of the respondents. Reminder call was made whenever needed to request for questionnaire after two weeks. Based on one-questionnaire-one-SME method, owner or manager of SME was requested to answer questionnaire.

**Statistical Tools**
The study utilized a combination of different analytical tools to accomplish the objectives. Statistical Package for Social Sciences (SPSS) software was used to present analyses on demographic data, e-commerce benefits, barriers, e-commerce perceived characteristics and e-commerce adoption based on research objectives and hypotheses. SMEs’ profiles were presented with frequency and percentage distribution. Parametric tests were adopted because primary data is normally distributed. t-test and ANOVA analyses were used to assess different demographic groupings on e-commerce benefits and barriers. Principle component analysis, varimax rotation and inter-item correlation have been used to perform reduction, purification and checking the reliability of collected data. Multiple linear regressions was used to analyse composite effect of e-commerce benefits and barriers on e-commerce adoption. Moreover, multiple linear regression analysis was used as well to assess correlation between independent variables and e-commerce adoption. Moderated multiple linear
regression with dummy variables was used to investigate interaction effects between moderators and independent variables on dependent variable.

**Significance the Study**

While the global volume of e-commerce in 2004 was estimated at approximately 6.7 trillion dollars (Forrester, 2005), it stood at 34.6 trillion dollars in the year 2013. The present volume of e-commerce seems minimal in terms of the total world economy, but the rapid and unpredictable growth of worldwide e-commerce and ongoing attempts to further its development by the developed economies in particular, demonstrate the necessity of rapid and sustained efforts in the developing world to do the same.

Statistics detailing the current state of information technology and communications in India, compared with the developed countries and even some neighboring countries, clearly reveal the critical infrastructural situation, poor legislation and poor awareness and utility in the country. Therefore, the identification of specific areas of e-commerce that may help promote greater development and the attempt to direct capital appropriately, is a subject that this study attempts to address. It is anticipated that this research will act as a roadmap for the Indian SMEs to evaluate their capabilities and competitiveness in the market regarding to e-commerce implementation.

**Organization of the Report**

The dissertation is presented in six chapters. Chapter I presents the background to the study. Chapter II presents a critical review of the relevant literature. Chapter III presents the framework of this research which is a compilation from different theories and adapted to meet research questions and objectives. From the research framework, a few hypotheses are generated to answer research objectives. All variables are carefully operationalized and a set of questionnaire was prepared. Chapter IV is on research methodology and discusses the research design and procedure undertaken in this research. Chapter V presents the results of the descriptive statistics. Chapter VI discusses the conclusions and recommendations. Also further suggestions for future research are provided in this chapter.

**RESEARCH INSTRUMENT**

The majority of the measures used in the study were taken from previously validated sources (e.g. Iacovou et al., 1995; Igbaria et al., 1997; Premkumar and Roberts, 1999; Grandon and Pearson, 2004; Chong and Pervan, 2007) and either adapted as such or were modified to suit to the requirements of this study. The measurement items were anchored on a seven-point or five-point Likert scale and the participants were asked to indicate an appropriate response. Following paras presents the constructs’ descriptive statistics. A full list of the measures used is provided in the Appendix.
The sets of respondents were targeted. Questionnaire marked A was meant for the owner/proprietor of the SME wherein some usage was being made of e-commerce tools. This questionnaire was also used for collecting data from the large sized firms (operative in the same industrial sector/s) and in the same region). Questionnaire marked B was used to collect data from the SMEs who were not using the e-commerce tools as yet. Questionnaire marked C was used for collecting data over various issues from the employees using as well as not using the e-commerce tools in their respective firms.

The control variables assessed were:
Type of ownership, Business Sector (viz. Automotive, Repair, Food, Handicraft/textile, Building/Construction, Engineering, Printing, Water filtering/supplies, Consulting, Education, Fitness Graphic Design, Healthcare, Marketing, Web Managing, Real Estate, Retail, Entertainment, Transport), Annual Sales Turnover, Number of Employees, Business Capital, Date of Establishment, Market Focus, Qualification of owner/Manager, and Gender of owner/manager.
Firm size was measured by two sub-items, i.e. annual sales revenue and workforce. Firm age was assessed by the length of time the SME had been in existence. Industry sector was delineated as manufacturing or services. The intensity of competition in the business was assessed on a Likert scale using “low”, “medium”, “high”, and “don’t know”. SMEs were asked to indicate the level of internet connectivity and whether the firm has a website or not was checked in.

The aim of the first section of was to collect background information about the business of the SME under sample. The questions in this section covered historical profile of the business, the nature of the products or services provided by the firm, the size of the business, and type of customer markets and trading partners. The questionnaire asked the SMEs to describe themselves in terms of target markets (domestic, exports), business classification, revenue, years of operation, and number of employees.

The questions in the following section focused specifically on the current use of e-commerce by the SMEs. For example, what were the drivers for e-commerce and how is e-commerce currently used? Questions were also asked about other e-commerce technologies that might be in place, for example a discussion of electronic banking facilities and electronic payment systems.

Questions were posed to explore the impact of e-commerce activities on business operations. These questions sought to determine the importance of e-commerce and the Internet, and to assess any changes to business processes internally and externally to the business as a result of incorporating e-commerce. Questions also concerned problems that may have been encountered during the implementation and use of e-commerce. The questionnaire also aimed at identifying the actual gains as a result of the Internet and e-commerce. The gains were classified according to benefits the literature had previously identified such as, increase in the range of customers, increase in sales, improvement in communication with clients, increase in the number of suppliers and faster and more accurate processing capabilities. Cost savings were also identified individually, for example, savings in advertising and promotion, intermediation savings and cost savings in procurement.
The researcher operationalized e-commerce usage by SME by measuring whether or not the SMEs had a website “through which you conduct business”. Accordingly the enterprises have been grouped into two main categories: adopters and non-adopters. The questionnaire also asked whether or not they planned to use the web to conduct business in the future. Responses were also obtained on a separate questionnaire from the SMEs not using the e-commerce tools. The questionnaire was the constraining form of major questionnaire used for proprietors/managers with only relevant questions. The pilot questionnaires was first applied to a group of respondents before finalizing the structure of the survey.

MEASUREMENT OF VARIABLES
Over and above the control variables following variables were measured.

Areas of current and planned internet usage by the firm
Based on the literature survey, 27 areas where internet can be used by the firms were presented to the owners/proprietors of the SMEs.

Reasons for establishing website of the firm
Starting with question “whether the websites are common in your industrial sector,” respondents were asked to reason out the basis of establishing first the internet connection in the firm and secondly to spell out the reasons of maintaining the website of the firm.

Application areas of e-commerce in SMEs
Respondent were asked to indicate over the applications and their extent of agreement using a five point Likert scale (with 5 = Always used to 1 = Never used). For these questions the Cronbach’s Alpha coefficient of 0.85 has been calculated.
As it was assumed that ICT usage lead to e-commerce usage, questions on five point scale followed application areas of e-commerce which extracted the importance of usage of ICTs in SMEs in marketing, manufacturing and in management. Barriers to deploying ICTs in these areas were also cornered herein this part.
Respondents were also required to specify the usage of email, www, extranet and EDI to know the usage areas of e-commerce.

Reasons for adoption of e-commerce
Respondents were asked to state the reasons for adopting e-Commerce, based on literature survey using a rating scale of 1-5, with 1 denoting Strongly disagree, 2 Disagree, 3 Neutral, 4 Agree and 5 Strongly Agree.
Non-adopters were asked to give answers to the list of statements identified according their perception of e-Commerce and why they have not adopted it, using a rating scale of 1-5, with 1 denoting Strongly disagree, 2 Disagree, 3 Neutral, 4 Agree and 5 Strongly Agree.
Perceived Benefits of Electronic Commerce
Respondents were asked to pinpoint their opinion on a five point Likert Scale ranging from Strongly agree to Strongly disagree over a set of 30 benefits that may accrue to a firm as were available in literature.

Perceived Barriers to Electronic Commerce
Following the perceived benefits of using the e-commerce by the SMEs, a list of barriers that hinder the e-commerce usage was provided to the respondents for citing opinion on each of the statement on a scale of 5=Extreme barrier to 1=No Barrier. Most commonly occurring barriers to e-commerce adoption were identified from the literature. During the interviews it was checked whether the barriers were applicable and complete and were finally included in the questionnaire. Respondents who had not adopted e-commerce were also asked to rate the importance of each barrier to their decision not to adopt e-commerce using a standard 5 point Likert scale. Problems such as cost increases, reductions in flexibility, security, and operational efficiencies as encountered after implementing use of the Internet as a business tool were asked for.

Reasons of e-commerce adoption
The researcher here drew the clues to adoption of e-commerce from Technology-Organization-Environment (TOE) (Tornatzky and Fleischer, 1990) framework which posits that the adoption of innovations depend on organizational, environmental, and technological factors supplementing with factors as considered in other researches. Essentially, the TOE model is an integrative schema, widely discussed in literature, incorporating characteristics of the technology, contingent organizational factors, and elements from the macro-environment (Tornatzky and Fleischer, 1990; Tornatzky and Klein, 1982; Li et al., 2010). Other studies have used the TOE and one or some of the variables such as perceived benefits, top management commitment/support, organizational IT competence (akin to organizational readiness in other information systems (IT) studies), external pressure, IT vendor support, and financial resources availability. Importantly, the acceptance of e-commerce by SMEs can also be viewed from the perspective of almost all the aforementioned factors as has been done by many researcher (e.g. Gatignon and Robertson, 1989; Iacovou et al., 1995; Thong et al., 1996; Premkumar and Roberts, 1999; Chwelos et al., 2001; Lawson et al., 2003; Scupola, 2003; Pearson and Grandon, 2004; Al-Qirim, 2007). In the TOE framework used over time, the dependent variable has been either adoption/acceptance, receptivity, business performance, business value, or a combination of other relevant variables (Kendall et al., 2001; Love and Irani, 2004; Wade et al., 2004; Van der Deen, 2005; Davis and Vladica, 2006). In this study, under the context of SMEs, the researcher partially replicated the study with dependent variable as acceptance of e-commerce by the SMEs taking cognizance of technological, organizational and environmental factors which were operationalized with the measures as proposed by Princely Ifinedo (2011).
Questions were also presented to extract opinion of the respondents regarding comparisons with large sized firms, effect of educational qualifications of employees and effect of growing size of an SME on e-commerce adoption.

**Critical Success Factors**

There are three independent variables that stand out in the literature as critical to success in e-commerce. Organizational Readiness (OR) or e-readiness is the state of preparation within the organization to adopt an e-commerce strategy (Levy, Powell, & Worrall, 2004; Beckinsale & Levy, 2004). Perception of usefulness (PB) (Perceived Benefits by decision-maker) specifies the decision-maker’s belief that adoption of e-commerce technologies and strategies will provide profitable benefits to the organization (Levy et al., 2004; Beckinsale & Levy, 2004).

External Pressure (EP) (relationship to business partners and pressure) is the pressure that SBs receive from business partners to adopt e-commerce technologies (Levy et al., 2004; Beckinsale & Levy, 2004).

These factors were tested, through regression analysis, to determine how they work together to achieve success in e-commerce defined as the sustained successful completion of business transactions using computer network and Internet technologies (Turban et al., 2004).

**E-readiness Measurement**

E-readiness measures included judgment first at the macro level wherein the answers to the following questions were sought from various sources.

**Access to Telecommunications**

What is the network speed and quality?
What percentage of voice calls are successful?
What is the quality of the voice calls?
How many problems are reported annually per 100 lines?
What data services and speeds are available?
What is the backbone network capacity?
What are the most common dial-up modem transfer speeds?
What technology choices are available for access to the network?
What technology solutions have been implemented in the network?
What broadband technology solutions have been deployed?

**Service & Support**

Who are the service providers for voice, mobile, data and Internet and what are their territories?
What is the average time for telephone mainline maintenance and installation?
What is the quantity of and skill levels of software developers, programmers or computer technicians?
What are the average maintenance costs for the various networks that have been deployed?
What percentage of problems are power initiated?
What are the bandwidth offerings and subscription ratio for residential customers, small, medium and large business customers, and Municipal, School, University and Hospital customers?

**Internet Availability**

How many ISPs offer local dial-up access?
How many ISPs offer broadband access?
What is the availability and type of higher bandwidth solutions?
What are the service provider’s plans to expand their service offerings and reach?
**Hardware & Software**
What is the availability of off-the-shelf hardware and software solutions?
Is Open-Source software readily available? How extensively is it being used?

**Information Infrastructure**
What is the extent of electrification?
What specific locations have access to telecommunications infrastructure (voice, data, Internet, mobile, wireless and satellite)?
What is the degree of tele-density?
What is the degree of mobile wireless penetration?
What is the degree of cable penetration?

**Internet Affordability**
What are the prices charged for local voice, international voice, and data calls?
What impact does competition in telecommunications market have on pricing?
What are the costs per meter to deploy fiber, copper, broadband, and wireless technologies?
What are the costs for satellite based services?
What are the number of small, medium and large businesses in all the communities?
What are the take-up rates for Residential customers, small, medium and large Business customers, and Municipal, School, University and Hospital) customers?

**Policy**
What is the level of telecommunications competition?
What is the status and impact of the telecommunications regulatory?
What are the regulatory provisions with respect to telecommunications services?
What are the regulatory provisions with respect to online privacy and security?
What are the plans for telecommunications deregulation?

**Community Access**
Number of telephone subscribers / district?
Number of mobile phone subscribers / district?
Number of PCs / household by district?
Number of televisions / household / district?
Number of radios / household / district?
Cost of Internet access / district?

**Access to broadband by district**
Number of public / community access facilities / district?
Number of public / community access PCs / district?
Number of public / community access facilities /inhabitant in urban vs. rural areas / district?
Internet access type per public / community access facility / district?
What is the level of ICT use by local and district government / district?
What is the availability of online government services at a community level?

Second part included a set of questions regarding e-readiness specifically for a firm wherein the opinion of the SMEs was obtained on a five point scale Very high to very low (see Questionnaire A).