Chapter 3

Research Plan

This chapter provides an outline of methodology to be used in the research, the conceptual frameworks used in our approach to define the constructs. The discussion initiates with explanation of exploratory, descriptive and causal research approaches which is further extended to qualitative and quantitative approaches and identify our study in the category. It further proceeds to selection of appropriate research strategy, discussion on data sampling, data collection and method of data analysis. It concludes with reliability, validity and triangulation of data.

3.1 Introduction

The purpose of this thesis is to identify success factors of government e-service delivery as perceived by citizens. A framework has been developed based on the extant literature and the guidelines, prepared by NIC, Department of electronics and Information Technology (DeITY) in compliance with World Wide Web Consortium (W3C) standards and adopted by Department of Administrative Reforms and Public Grievances (DARPG). A review of literature reveals that perceptions of success for information systems (IS), have been broadly investigated within two research aspects—the user-satisfaction literature and the technology acceptance literature. These success measures have been redefined extensively in the context of electronic medium typically for e-commerce web sites. Government portals were introduced in e-government following the success of e-commerce web sites or web portals. So, to develop the perceptual attributes, Technology Acceptance Model (TAM) given by Davis (1989) and the IS Success model of
DeLone and McLean (1992) have been considered as theoretical foundations. The conceptual flow of scale development was derived from E-S-Qual scale framework given by Parasuraman, Zeithaml and Malhotra (2005).

Research started with an online survey on usage of government portals involving transaction was conducted to understand the popularity of web sites and portals. Out of valid responses returned, 96% respondents voted for Indian Railways Catering and Tourism Corporation Ltd. (IRCTC), a Government of India Enterprise (www.irctc.co.in) and 33% voted for Income Tax portal (www.incometax.gov.in). Other transaction services like state tourism portals were not used regularly by citizens hence showed a negligible response percentage. IRCTC portal was found to be the busiest portal and hence was considered for devising a multidimensional scale to evaluate e-service quality for government portal. The scale was validated using statistical methods and checked for reliability. To verify whether the scale can be generalized for transaction based government portals the scale was further validated by income tax portal. Thus the second portal was primarily used for data triangulation.

### 3.2 Justification for using IS Models and e-SQ Framework

#### 3.2.1 Technology Acceptance Model

E-government is a paradigm shift from traditional ways of service offering. Hence it is imperative to understand the behavioral attitude of citizens in assessing e-service quality offered by government. In the last 25 years the TAM has become well established as a robust, parsimonious, and powerful model for predicting users’ acceptance of technology. In a meta analysis on TAM (Yousafzai, Foxall and Pallister, 2007), 145 studies based on varied technology adoption studies were identified. The pervasive popularity of the TAM is attributed to the following factors:
(1) Parsimonious model designed to explain and predict diverse user acceptance of vast range of IT-specific systems in a varying organization setup with different expertise level.

(2) Has a strong theoretical and conceptual foundation with a thoroughly researched inventory of psychometric measurements which were validated

(3) Accommodates modifications and has strong empirical support for its overall explanatory power. Researchers consider it to be operationally appealing and a pre-eminent model of users’ acceptance of technology (Chau, 1996; Hu, Chau, Liu Sheng and Tam, 1999; Mathieson, 1991; Szajna, 1996).

To use e-government services, citizens need to adopt internet as a service delivery channel. However, actual use of internet as an information and communication mode, depends on two criteria: the ease with which it can be used (perceived ease of use, PEOU) and its factual usefulness to the citizens and other stakeholders (perceived use, PU), thus justifying the theory of TAM.

3.2.2 DeLone and McLean IS Success model

D&M IS success model explains the process and causal relation between the success factors of information systems and their impact on individual level and organization level. It is a parsimonious model and can be used in different context.

... “no single variable is intrinsically better than another, so the choice of success variables is often a function of the objective of the study, the organizational context [emphasis added],..... etc. (DeLone & McLean 1992, p. 80).

The model provides the liberty to add different success factors depending on objective of study and nature of system. Hence we can apply this model in the context of e-government to have a better understanding of the success of online transaction based systems. Hu (2003) suggested that success and its measurement
may be different relative to the characteristics of the system and the organization so, the model should be modified according to the specific context.

As seen in literature review, e-government is different from e-commerce or other IS based organizations where users (citizens) use electronic system for relative advantage and convenience. Additional variables were incorporated based on previous studies (Gupta & Jana, 2003; Bertot et. al, 2008; Singh et. al (2008); Kanat & Ozkan, 2009), to extend this model so that citizen centric success variables can be considered. The purpose is to use the model in an e-government context and learn the new relationships that may have significant impact in the context.

3.2.3 E-S-Qual Scale

In the context of e-government, relative advantage of online presence and cost efficiency were initially considered as drivers for success, but as e-government in both developed countries and developing counterparts is inching towards transformational government, several issues regarding e-service quality are gradually surfacing out. Conventional service quality assessment procedures lack the distinct insights of people and technology interactions. Realizing the lacunae in the evaluation methods of e-service, Parasuraman et al. (2005) incorporated the intricacies of user perceived usefulness of technology, ease of use and other perceptual attributes which were quantified into measured dimensions and contributed in higher order abstraction like e-service quality or customer perceived satisfaction. They proposed a Means-End (Newell &Simon, 1963) framework for explaining the domain and consequences of e-service quality. Based on the framework they devised a multi item scale for assessing the e-service quality named as E-S-Qual. Since the essential purpose of e-government is to serve citizens in a better, transparent and efficient way by using internet extensively so, the same conceptual framework can be applied to e-government for achieving effective e-service quality. The perceptual attributes can be modified as per the context and dimension abstracted accordingly.
Figure 3.1 below gives the means-end framework workable at the backdrop of e-government.

**Figure 3.1:** Means-End Framework for domain and consequences of e-SQ [Source: Parasuraman, Zeithaml & Malhotra, 2005]

### 3.3 Research Issues

1. Lack of focus on e-Government services
2. Disparity between Websites/Portals design and E-government policy
3. Controlled accessibility to and use of government information.
4. Non-involvement of the decision-makers while designing government web portals
5. Poor citizen interface
6. Lack of service quality assessment and performance measurement;
7. Constraints – resources, skill, resistance, etc.
8. Resolution of issues like security, accountability and responsibility through proper interaction between government departments
9. Bridging gap between traditional and digital government services
3.4 Research questions

Research enquiry of this study probes into some key aspects of service quality of government portals in India involving transaction:

Q1. What are the factors that influence the service quality of government websites or portals?

Q2. To what extents are these factors interrelated?

Q3. Does service quality of an e-government portal significantly contribute to the overall satisfaction of usage?

3.5 Research Objectives

Based on the problem identified the following research objectives were set:

1. To study and identify the performance indicators of service rendered by government websites/web portals in India.

2. Classify the indicators and build a model based on them.


3.6 Scope of Study

E-government evolution takes place in multi stages. Successive gradation of these stages involves varied levels of technological sophistication, incorporates administrative integration, has unique levels of service maturity and induces citizen orientation (Holden et al., 2003; Moon, 2002; Gil-Garcia & Martinez-
Maturity phase of e-government evolution thus influence e-service quality of government portals making it a dynamic percept. It is observed that service quality of e-government may also vary with administrative levels of a country i.e. central, federal and local. Besides, e-government can be classified based on end user who the service is catered into government-to-citizen (G2C), government-to-employee (G2E), government-to-government (G2G), and government-to-business (G2B). Therefore, it becomes evidently difficult to include every aspect of government e-service in a single research. This study aims to identify success factors of government online service involving two way transactions. Since e-ticketing of Indian Railways Department and e-filing of income tax are two of the most highly ICT enabled G2C services provided by public agencies in India, we have limited our study to evaluating G2C e-service as a part of e-government domain. The study also restricts its evaluation of success through quality criteria of web sites /portals and citizen satisfaction associated with this e-service.

3.7 Research Model

3.7.1 Re-specification and Extension of IS models

A research model will be helpful in evaluating e-service quality of government portals which is based on theoretical support of extant literature. Hence to build a research model relative to the context, it becomes necessary to re-specify and extend D &M IS success model and TAM. As has been discussed before, the means-end framework suggested by Parasuraman et al. (2005) was used to understand the citizens’ perception of quality. To make the online convenience available to citizens the government must introduce policies for a robust infrastructure and network backbone so that all citizens have easy accessibility to the e-service. Government need to frame guidelines for proper web site structure and design so that uniformity is maintained among all websites and also adopt cost effective and efficient new
technologies to be at par with global standard. These service delivery prerequisites ascribe to the concrete cues (as shown in figure 3.1) in the context of e-government. The perceptual attributes for the model to be proposed were derived from the IS models specified earlier in the discussion.

A government web portal is an information system (IS), consisting of digital information and collection of information delivery systems like browsers, portals, search engines, forms networking systems making internet a critical channel for delivering services for public agencies and government administrators. Acceptance of technology hence becomes a vital factor in successful implementation of the new system. Davis (1989) explained that people tend to use or disuse a system only when they believe that the system can help them to do the task in a better way which he defined as perceived usefulness (PU) and the acceptance of the new technology also depends on the effort that is needed by a person to use the system which he named as perceived ease of use (PEOU). Thus, TAM predicted that attitude of people to use a technology based system depend on two factors: perceived usefulness and perceived ease of use. Later the model proposed earlier was changed and a direct influence of PU on actual use of system was established (Davis, 1993, p. 481). It was decided to incorporate the insight of the study in this research and predict the constructs which can quantify PU and PEOU.

D&M IS Success Model was a comprehensive framework developed to conceptualize and operationalize IS success. In the model, system quality and information quality were identified as success criteria for using a system. E-government portals or web sites are generally used by citizens as a source of information so perceived usefulness of the online system lies in information quality. The information given in the sites or portals need to be citizen centric to keep pace with recent developments in e-government domain and cannot just be confined to web presence, so it needs to be more of citizen oriented information service. Along with perceived usefulness, citizens do look for the easy access of the information system in use. As the internet medium lack advantages of physical cues in traditional government systems, the effortlessness or comfort (PEOU) and trustworthiness of using the new system

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can encourage citizens to adopt e-government system (system quality). Therefore, our proposed model is adapted from both TAM and D&M IS Success Model.

### 3.7.2 Conceptual framework

Heeks and Bailur (2007) observed that most of the research studies concerning behavioral attitude of citizens to adopt e-government, lack clarity and also have poor treatment of generalization. The researchers recommended rigorous research methods to conduct such studies. Since e-government portals in India are designed and implemented solely by the IT department, these portals lack clear focus on citizens’ perspective and their requirements to accept the technology driven environment. While doing literature review on Indian e-government system, a dearth of empirical studies which can provide a comprehensive framework for service delivery assessment of government web portals was noted. Therefore a conceptual framework was proposed based on the theoretical perspectives and the studies discussed so far. The roles of the initial two phases of e-government evolution, such as information phase and interaction phase are primarily to convey information and communicate with users using ICT but the transaction stage of e-Government has an impact on implementing systems in their broader organizational context (Irani et al., 2006). The initial phases of e-government maturity models are static and involve less interaction with citizens, so, we considered the web elements of transaction phase to understand the user-experience with portals in depth. The framework proposed, incorporates concepts from earlier models and calls for testing in the area of e-government.

This study is exploratory in nature and is not based on any single previously proposed model; rather a new scale has been proposed which can evaluate e-service quality of government portals.

In this study, e-government success is defined through e-service quality which causes citizen satisfaction. E-service quality is proposed to be determined by e-government portals’ (a) System Quality which is represented by six factors: Citizen Convenience, Transaction Transparency, Communication, Citizen
Relation, Technical Adequacy and Security & Privacy (b) Information Quality represented by two factors: Comprehensive Information and Reliability. Table 3.1 gives a gist of existing literature for the contributing factors.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Implication</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizen Convenience</td>
<td>Citizen convenience parameter tries to encompass the facilities provided by an e-government portal so that a citizen can comfortably use the services.</td>
<td>Teicher, Hughes and Dow, (2002); Zhang and Prybutok (2005); Bouaziz and Fakhfakh (2007); Sarkar and Cybulski (2004); Gupta and Jana (2003); Sahu and Gupta (2007); Karunasena, Deng and Singh (2011).</td>
</tr>
<tr>
<td>Reliability</td>
<td>The content needs to be reliable and usable to build trust and confidence in citizens.</td>
<td>Parasuraman et al. (1988); Barnes and Vidgen(2000); Devaraj,Fan and Kohli (2002).Yang et al., (2005); Kim et al.,(2006); Kumar et al., (2007).</td>
</tr>
<tr>
<td>Technical Adequacy</td>
<td>Fast access, upload and download of information are important, especially for transaction sites.</td>
<td>Yang, Cai, Zhou and Zhou (2005); Aldwani and Palvia (2002); Liu and Arnett (2000).</td>
</tr>
<tr>
<td>Privacy and Security</td>
<td>The site should take complete responsibility of secured transaction ensuring privacy of data supplied by citizens.</td>
<td>Zeithaml et al., (2000); Yoo and Donthu (2001); Welch and Pandey (2005); Yang et al., (2005); Shareef et al., (2011); Karunasena et al., (2011).</td>
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<tr>
<td>Citizen relation</td>
<td>This dimension helps to build citizen relationship and be in regular contact with users.</td>
<td>Wolfinbarger and Gilly (2003); Pan, Tan &amp; Lim (2006); Reddick (2010); Wu (2011).</td>
</tr>
<tr>
<td>Transaction transparency</td>
<td>Transaction transparency may include cost effectiveness, communication for a cancelled or incomplete transaction and providing receipt or acknowledgement immediate to a transaction.</td>
<td>Welch and Hinnant (2003); Rocheleau and Wu (2005); Irani, et al., ( 2006).</td>
</tr>
<tr>
<td>Comprehensive Information</td>
<td>This factor ensures sufficient information for the existing users and comprehensive information for new users.</td>
<td>Kim and Stoel (2004); Zeithaml et al., (2000); Salahuddin and Rusli (2005).</td>
</tr>
<tr>
<td>Communication</td>
<td>Communication with users is very important as it gives confidence to a citizen to use the service.</td>
<td>Cox and Dale (2001); Liu and Arnett (2000); Chadwick and May (2003); Yang et al., (2005); Streib and Navarro, (2006).</td>
</tr>
<tr>
<td>Overall Satisfaction</td>
<td>Extent to which a citizen is satisfied with his or her overall experience with online service use and the e-service quality provided by government.</td>
<td>Parasuraman et al.,(2005), Oliver (1997) ; Cronin, Brady and Hult (2000) Szymanski and Hise (2000); DeLone and McLean, (1992, 2004); Seddon and Kiew, (1996);</td>
</tr>
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Table 3.1: Dimensions for the proposed model

Figure 3.2 gives a total framework supported by the existing conceptual studies in conjunction with different scales posited by researchers. The relative relation and the inter relation of the factors are depicted in detail in the figure. Our research was confined to identifying of the factors resulting in e-service quality. Information quality and system quality factors are for theoretical perspective only and have not been measured separately. ‘Overall satisfaction’ of citizens for a transaction oriented portal has been also proposed and relation between e-service quality and overall satisfaction was tested.
Figure 3.2: Conceptual Framework
3.7.3 Research Issues and relevant Hypotheses

A series of hypotheses were proposed from research questions and previous theoretical discussions. To answer the second research question the hypotheses were statistically tested.

Information Quality

Research studies say that system information output quality is critical for the growth of organization because good information quality lead to higher system usage (Lee, Strong, Kahn & Wang, 2002; Khalil & Elkordy, 2005). Studies also reveal that users expect high quality information from web-based system (Negash, Ryan & Igbaria, 2003). The information quality adds value to e-service as it provides updated, complete and authentic information to citizens. Availability of such information with a single link click option enhances citizen convenience. The relative advantage and convenience is important as user experience plays a decisive role in the diffusion of e-government, making citizen oriented functions an essential criterion for online government. Citizen centric services must protect the interest of citizens and provide easy access to online benefits. Information quality can be assessed by the completeness of content, comprehensiveness, relevance, updated and provided in the web portal. These measures are crucial to build trust and confidence in citizens as Shih & Fang (2004) explains that perception of information affects user acceptance of a system significantly. We identified two such measures: comprehensive information and reliability.

Comprehensive Information as a measure of e-service quality

Quality of content in a government web portal has a positive influence on e-service quality. Salahuddin and Rusli (2005), in their study mentioned that comprehensive and accurate information helps to support economic decisions and policy making at all levels of government. Besides, sufficient and appropriate information make citizens confident about a service. If the information is incomplete or impertinent, then
user might get confused and seek help from other sources which make online effort a failure. It is necessary that web content should ensure sufficient and comprehensive information both for the existing users and new users. Information accuracy and content relevance are widely-used measures for a successful information system (Mahmood, 1987; Miller & Doyle, 1987; Srinivasan, 1985). Information in web sites should be such that users need not go to other sources for verification or for further details.

So, we propose:

**H1**: Comprehensive Information (CI) is positively related to e-service quality.

**Reliability as a measure of e-service quality**

Reliability of e-government systems is determined by content parameters like updated information, well organized hyperlinks and detailed description of the service asked for (Parasuraman et al. 1988; Barnes & Vidgen, 2000, 2001; Devaraj et al., 2002) can create a perception of usability among citizens. The information provided is expected to be complete in all respect with elaborated explanation, well defined working links to build trust and confidence in citizens (Yang et al., 2005; Kim et al., 2006; Kumar, Mukherji & Persaud, 2007). Sang, Lee and Lee (2010) review the acceptance of e-government services and find that relative advantage over traditional method of service delivery by public organization in a government has a positive impact on citizens. Sometimes when the portal uses multilingual interface, there might remain some disparity in information which can make the portal less usable and can have a negative influence on adoption behaviour of citizens. Thus we propose:

**H2**: Reliability (REL) is positively related to e-service quality.
System Quality

System quality explains the efficacious output from system supporting information. Without a well-defined system, information fails to be conveyed appropriately. Thus it can also be defined as the citizen perceived ease of using an information system. It ensures the confidence and trust in online applications so that there is a repeat use. Dimensions which assure citizen centric system uses are identified as: citizen convenience, transaction transparency, citizen relation, communication, technical adequacy (Aladwani & Palvia, 2002) and security features (Chakravarti & Venugopal, 2008).

Citizen Convenience as a measure of e-service quality

To understand the effect of convenience on consumer behaviour researchers have conducted several empirical studies in e-commerce context and found that convenience can contribute to service quality and affect intention of use positively (Rust, Lemon, & Zeithaml, 2004; Seiders et al. 2005, 2007). Citizen convenience parameter tries to embody the minimum facilities provided by an e-government portal so that a citizen can comfortably use the services meant for him. However, it is quite often observed that online transaction services are not available round the clock. As e-government has a global perspective, availability of 24X7 is important (Teicher et al., 2002; Zhang & Prybutok, 2005). This is more applicable for citizens who are located in different time zones. West (2004), in his study, states that the specific characteristic of citizen centric online government is that it lets citizens seek public services at their own convenience and not just during working hours of government offices. This facility of accessibility to e-government operations beyond regular working hours, takes care of both resident and non residents. Grönlund (2005), in his study, identified the importance of serving civil society by delivering services to wide array of citizens while exploring the domain of e-government.

Another very important criterion for promoting citizen convenience is multiple language support. Yong (2004) while studying strategies and perspectives of citizen centric approaches to e-government
programmes in Asian economies remarked that only low cost access cannot entice citizens to use online services. Shareef et al. (2011) argue that virtual transactions lack physical cues, so this service requires extra facilities for individuals with different ethnic backgrounds. If a user can interact with website in his/her native language, then the cultural connection can help in the adoption of the site (Parasuraman et al., 2005; Kim et al., 2006). Multilingual option is especially required for a country that has multicultural and multilingual groups (Bouaziz & Fakhfakh, 2007). To encourage citizens to use these services; government agencies must develop content in local languages. In India, almost every state has its own language, so to make citizens familiar with online services, support of more than one language is badly required.

Sometimes citizens are not very comfortable with websites and instructions given in them; presence of online demos, trial Internet procedures and in some cases animation can influence the adoption of e-services (Sarkar & Cybulski, 2004; Grigoroudis, Litos, Moustakis, Politis & Tsironis, 2008).

A very important aspect of online application is performing complete task without any manual intervention. Often due to lack of complete integration between government departments partial job needs to be carried out with the help of government officials. Since a parallel system of traditional government service exists, citizens prefer to use the conventional method. Studies indicate that adoption of e-government service can be delayed till the expected benefits are clearly established (Gupta & Jana, 2003; Sahu & Gupta, 2007, Karunasena et al., 2011). Citizens continue using the service only if they enjoy the benefits of e-government services. Thus citizen centric approach needs to encompass the basic facilities provided by an e-government portal so that a citizen feels comfortable and confident while using online applications. So, this research proposes:

**H3:** Citizen Convenience (CCON) is positively related to e-service quality.
Transaction Transparency as a measure of e-service quality

Web portals advocating online transactions help citizens to pay bills, book tickets, pay taxes, renew visas or get a license. A two way interaction between users and specified government departments is established to complete the transaction electronically (Irani et. al, 2006). This mode of transaction is critical as high level of security has to be monitored for the complete procedure of payment till the receipt is acknowledged by the user. People who are not very conversant with web environment often have reservations against these online exchanges. As the online service lack the privilege of in-person or face to face interactions unlike traditional payment system, extra care should be taken to maintain transparency in these affairs. A transparent government is expected to disclose any performance information of public organizations on time. According to Welch and Hinnant (2003), the use of the online services is dependent on transparency and interactivity which might help to build public trust in government. Some common methods to enforce transparency in electronic transaction may include acknowledgement mail or printable receipt for a successful transaction, prompt communication for a cancelled transaction and intimation of refunds for incomplete transactions.

Holden et al., (2003), states that financially related transaction services to citizens should be provided 24 hours, seven days in a week. Allowing citizens and other stakeholders to conduct financially related e-transactions with government on a 24-hour, 7-day a week basis is a challenge for administrators since such services involve hidden costs. A convenience fee is generally charged for the service provided online. Rocheleau and Wu (2005), in their exploratory study found that convenience fees for online financial transaction have a negative effect on usage rates, because citizens and other people like businessmen develop an expectation that electronic exchanges is a mode of saving money. They posit web transaction as a service involving cost reduction and quick performance.

Transparency in virtual transaction should include measurements of cost effectiveness and transparency like communication about refunds, a cancelled transaction and receipt or acknowledgement immediately after a transaction.
Drawing conclusion that clear and transparent dealings enhance the service quality of a portal we propose:

**H4:** Transaction Transparency (TTR) is positively related to e-service quality.

**Communication as a measure of e-service quality**

Thomas and Streib (2003) conducted a research study on citizen interaction with e-government and found that citizen generally prefer to use e-government services for gathering information rather than using them for transaction services. Chadwick and May (2003) observed that most of national policy documents describing goals for e-government lack explanation for governance benefits of interaction/communication aspects. Reddick (2005) explored interaction of citizens with government through a survey of American adult users of government web sites and comprehended that citizens generally find their queries answered from government sites nevertheless they are eager to transcend from information phase to transaction phase. He suggested that government portal with good search facility can assure better e-citizen interaction.

As use of technology in government is a new experience for citizens, portals should provide effective interaction support. Contact details of the officials and support staffs should be provided at the site, so that any query can be answered with minimum response time (Kim & Stoel, 2004; Zeithaml et al., 2000). Communication can also be encouraged by using opinion poll system, message board and social media platform.

Studies emphasize that communication with users act as a positive trigger to imbibe trust and ensue willingness in a citizen to use the service (Cox & Dale, 2001; Liu & Arnett, 2000; Yang et al., 2005). Interaction or communication of government with users is very important as it gives confidence to citizens to use online services (Reddick, 2005; Streib & Navarro, 2006). Communication can be through
opinion poll, message board, email facility or personal contact which can be provided through detailed contact information. Since citizens visit portals to gather information, customized search option complimented with Frequently Asked Questions (FAQ) is of utmost importance. Interaction or communication of government with users is very important as it gives confidence to citizens to use online services (Reddick, 2005; Streib & Navarro, 2006). Communication can be through opinion poll, message board, email facility or personal contact which can be provided through detailed contact information. Since citizens visit portals to gather information, customized search option complimented with Frequently Asked Questions (FAQ) is of utmost importance.

To assist citizens further, advanced search options and well framed frequently asked questions (FAQs) can be provided. Depending on the previous arguments, this research proposes:

**H5**: Communication (COM) is positively related to e-service quality.

**Citizen Relation as a measure of e-service quality**

Users are keen to use online information if it proves to be useful to them. Relevant content, organized information and customized presentation are some of the efficient and useful system output criteria which citizens look for while performing an information search. Online information gives them the relative advantage of saving time and finding everything in a single window. Additionally users feel connected if there is a two way communication between the user and administrators. Valuable tips, suggestions in message boards, chat facility and regular follow up can help to establish a rapport with the citizens. Sahu and Gupta (2007) found that citizens are willing to adopt e-government services only if government clearly establishes the expected benefits from using such services. They proposed that well directed government promotional campaigns and proper interaction facility can play a significant role in establishing confidence. It is essential to understand citizen demands as it acts as a ‘barometer’ to assess how developed governments are with respect to internet (Reddick, 2005).
Poelmans, Thaens and Bogers (2004) proposed e-citizen’s charter as a quality instrument to understand citizens’ needs for better e-government practice. Countries like United Kingdom, Singapore, US and India have policy of documenting citizen charter to make citizens aware of services available for them and make government responsible towards quality services. Ho (2002), while reflecting on the elements of this charter emphasized on the need for local government systems to move from a production and cost efficiency model to one that is flexible in providing services and maintains a user satisfaction orientation. Some of the scholarly articles suggest that effectual citizen services and a good relationship with citizens can help to enhance trustworthiness retaining existing users and attracting new users (Wolfinbarger et al., 2003; Pan, Tan & Lim, 2006; Wu, 2011). Reddick (2010) emphasizes on citizen relationship management as one of the advanced e-government solutions to create citizen centric systems. Complying with the above discussion we propose citizen relationship as a factor contributing to e-service quality.

**H6:** Citizen Relationship (CREL) is positively related to e-service quality.

*Technical Adequacy as a measure of e-service quality*

The convenience of using web portal as an information centre cannot be achieved without fast accessibility (Yang et al., 2005). Citizens while using online applications look for two aspects: availability and responsiveness. They expect quick log on, fast upload and download of forms, speedy search and prompt response from the service providers. Often due to inadequate technical infrastructure, there might be disruption in between web sessions leading to discontinuous web services. These failures act as constraints for citizens to avail online benefits. Users always appreciate uninterrupted and time efficient operations (Aladwani & Palvia, 2002; Liu & Arnett, 2000). Hence we propose technical adequacy as a contributing factor for evaluating e-service quality.

**H7:** Technical Adequacy (TAD) is positively related to e-service quality.
Security and Privacy as a measure of e-service quality

Web portals engaged in transactions sometimes need to collect sensible and personal data to identify citizens and serve them in a secured way. Culnan and Armstrong (1999) found that when organizations use procedures to protect individual privacy they gain business advantage through customer retention. Introna and Pouloudi (1999) stated that privacy concern is a subjective measure and is viewed differently by different people based on their sex and education. O’Niel (2001) studied that concern for privacy may vary with level of education, age, sex, race and level of income. Overall, all demographic groups prefer privacy protection to convenience. Since privacy and security of the data collected are a major concern, citizens need to be explained why the data are needed and how will the record be protected from third party invasion. Several research studies administered on e-service quality and adoption of e-governance reveal that uncertainty, security and privacy have prominent influence on citizens’ attitudinal aspect of adopting e-government services (Zeithaml et al., 2000; Yoo and Donthu, 2001; Welch et al., 2005; Yang et. al, 2005, Shareef et. al, 2011). As online government is virtual and different from traditional government in the mode of operation, so, policy makers associated with e-government transaction stages should be careful about developing application- based and institution-based trust in citizens (Kim, et al., 2005). If a service requires involvement of more than a single department, system quality should assure of well organized interoperability platform to establish synergy among the participating departments and the transaction site or portal should take complete responsibility of secured transaction. Karunasena et al., 2011 observe that public trust in e-government is reflected in citizens’ perceptions about the e-government services delivered. Ensuring privacy and security help to build trust in public agency and brings e-satisfaction resulting in enhanced usage of online services. Therefore we propose:

H8: Privacy and Security (SP) is positively related to e-service quality.
E-service quality has positive influence on e-satisfaction

Bitner (1990) argued that service quality and satisfaction are two different constructs. Zeithaml and Bitner (1996) established that superior service quality affects consumer behavioral intentions such as loyalty measured as positive word of mouth, willingness to spend more. According to Padhy and Swar (2009), confirmed standards lead to moderate customer satisfaction. There were several studies which attempted to explore that whether service quality influence levels of customer satisfaction (Oliver, 1989; Parasuraman et al., 1985, 1988; Srinivasan, Anderson & Ponnavolu, 2002; Padhy & Swar, 2009). Cronin and Taylor (1992) tested and found that a casual relationship exists between service quality and customer satisfaction. Spreng, Harrell and Mackoy (1996) in their study examined the relationship between service quality and satisfaction and indicated that perceived service quality is an antecedent to satisfaction. Szymanski and Hise (2000) found that consumer perceptions of online convenience, financial security, design impact online satisfaction assessments. Several other previous e-service quality(e-SQ) related studies (van Riel et al., 2001; Loiacono et al., 2002; Zeithaml et al., 2002; Montoya-Weiss, Voss & Grewal, 2003; Zhang & Prybutok, 2005) establish the positive relationship between e-SQ dimensions and e-satisfaction. Rajat Gera (2011) in his study of e-SQ in Indian context examines the influence of e-service quality on satisfaction of online users. So we proposed that:

**H9:** Overall satisfaction of users with portal depend positively on overall service quality

### 3.8 Overview of Research Methodology

A business research is classified on the basis of either technique or purpose. According to Chisnall (1997), three methods which are employed widely are 1) Exploratory, 2) Descriptive and, 3) Causal.

Exploratory research is conducted to clarify ambiguous situations or understand a problem but is not intended to provide conclusive evidence from which to determine a particular course of action. Usually
exploratory research is a first step, conducted with the expectation that additional research will be needed to provide more conclusive evidence. Exploratory research is often used to guide and refine subsequent research efforts (Zikmund, Babin, Carr and Griffin, 2010). Literature review, discussing with subject experts and conducting open ended interviews with focus groups are different ways used in exploratory research (Saunders, Lewis & Thornhill, 2009).

Objectives of descriptive studies are descriptions of the characteristics related with the particular population and determining the relations between the different variables. Unlike exploratory research, descriptive studies are conducted after the researcher has gained a considerable knowledge about the situation being studied. This understanding may be developed in part from exploratory research, directs the study toward specific research questions and prove hypotheses.

Causal research helps to identify ‘cause and effect’ relationships. Causal inferences are very powerful because explain the ultimate result and hence provide greater control (Zikmund et.al, 2010). The different types of research are building blocks for a complete outcome. Exploratory research builds the foundation for descriptive research, and that usually establishes the basis for causal research.

This research aims to find the success factors of e-service quality in government portals or websites involving transaction. A model was developed based on the extant literature and theories which helped to formulate eight hypotheses. Since most of the variables were selected from IS and marketing theories, specifically from e-commerce research areas, a preliminary exploratory study was conducted to check the applicability of the variables in context of e-government. As exploratory studies lay the foundation for descriptive study, to prove the hypotheses, descriptive research was employed. This research also studies the causal effect of e-service quality on citizen satisfaction. It is not practically feasible to examine all variables that contribute to e-service quality, so the model is open for extension including variables which exhibit high correlations.

Research approach can be either deductive or inductive. The deductive approach helps to develop a theory and hypothesis (or hypotheses) and design a research strategy to test the hypothesis while in the inductive
approach, data is collected and then theory is developed as a result of your data analysis (Saunders et al., 2009, p.124). Creswell (2003) explains that research design involves the intersection of philosophical worldview, strategies of inquiry and specific methods. The quantitative design approach imbibes the post-positivist research philosophy in which ‘causes’ determine ‘effects’ or ‘outcomes’. Thus, the problems studied by post-positivists reflect the need to identify and assess the causes that influence outcomes by reducing the ideas into a small, discrete set of ideas to test, such as the variables that comprise hypotheses and research questions. Robson (2002) gives five sequential stages through which deductive research typically progresses: 1) Deducing hypothesis / hypotheses from theory 2) expressing the concepts in measurable variables 3) testing the operational hypotheses 4) examining the outcome of inquiry which can confirm the theory or might indicate need for modification 5) modifying theory in the light of findings, if needed. Since the purpose of this study is to find the variables influencing e-service quality we adopted primarily quantitative approach based on deduction. Qualitative research approaches implement study of events from the natural settings and fall in constructivism or participatory world view of knowledge position. In this method researchers use case studies, personal experience, interviews, observational, historical, and visual text to collect a variety of empirical materials and interpret the phenomena in terms of the meanings people bring to them (Creswell, 1998). When researchers aim to get into the behavior of a phenomenon by exploring concepts, so that research ideas can be generated, then qualitative approach might prove to be valuable (Chisnall, 1997). So, to understand e-service quality in Indian e-government context, qualitative approach has been used partially.

3.8.1 Research Strategy

Research strategy is the roadmap guided by research objectives, research questions, the existing knowledge, time span, availability of other resources and researchers own philosophical underpinnings. It helps the researcher to specify the source of data collection, accessibility of data, time, location, cost involved and other ethical, social or political issues. According to Saunders et.al (2009), both deductive
and inductive approaches can be used in a research because these approaches are not mutually exclusive. The basic research strategies given by them are experiment, survey, case study, action research, grounded theory, ethnography, and archival analysis. Research based on survey provides a numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. It includes cross-sectional and longitudinal studies using questionnaires or structured interviews for data collection, with the intent of generalizing from a sample to a population (Babbie, 1990). Additionally, the data collected using a survey strategy can help to suggest possible reasons for particular relationships between variables and to produce models of these relationships. Since in this study we intend to find the contributing factors of e-service quality as perceived by citizens, and possible relationships shared among the factors, the survey method was decided to be the ideal method to serve the purpose.

A schematic representation of the research strategy is provided in figure 3.4.

As mentioned before the set of data collected for IRCTC portal will be used for confirming the factors proposed and then will be validated by data set collected for Income tax portal.
Figure 3.3: Research Strategy
3.8.2 Sampling

Sampling is a process of selecting units from a population and a way to represent the population. Since it is difficult to collect data from the entire population due to budget and time constraints, hence obtaining a sample is important. Sampling methods are classified as either probability or representative sampling and non-probability or judgmental sampling. In probability samples, each member of the population has an equal probability of being selected. Probability methods include random sampling, systematic sampling, and stratified sampling. Probability sampling is used more commonly where issues of generalizability and/or drawing statistical conclusions are involved (Hair, Babin, Money & Samouel, 2003, 2007). In non-probability sampling, members are selected from the population in some specified non-random manner. These include convenience sampling, judgment sampling, quota sampling, and snowball sampling. A sample may differ from the population which is manifested as sample error. In the probability sampling error can be calculated and the results are reported plus or minus the sampling error when referring to the population but in non-probability sampling, the sample error is difficult to find and remains unknown. Non-probability samples are generally chosen during the exploratory phases and during pretesting of survey questionnaires. Three principal guidelines that govern the sampling method are: 1) whether the research can be done through sampling 2) type of sampling to be used and 3) the size of the sample (Hair et al, 2003).

As the basic goal of this research is to assess e-service quality of Indian government portals involving transaction so the sampling method should be chosen in such a way that it represent the population who use e-government transaction oriented portals. Indian Railways Catering and Ticketing Corporation (IRCTC) portal is a pioneer electronic G2C services in India and was considered an application area for this study to establish the service quality assessment model. To examine the replicability of the model it was later triangulated by collecting data from income tax e-filing portal users.
**IRCTC and Income Tax portal:**

IRCTC G2C service was initiated in 2002. 2002 saw booking of 27,000 tickets a day which increased 10 times in 2008 and in 2011, it reports a booking of 3, 50,000 tickets a day (e-Gov, July, 2011). This web portal has been awarded ‘National Award for E-Governance, 2007-08’ jointly by Department of IT, Government of India and Government of Haryana along with National award for ‘E-Governance Best Citizen Centric Application, 2007-2008. Besides facilitating citizens with booking of railways and airways tickets, the portal also provides information about hotels, tourist trains, holiday-packages and is connected to tourism sites of several states in India. A user needs to have a user id and password to login to the site for collecting information and booking tickets. Ticket status and booking status are accessed through individual account. Electronic payments are done through payment gateways of nationalized and private banks. 75% of online payments are reported to be successful by the portal (IRCTC portal, 2011).

Refund, in case of an incomplete transaction or cancellation takes place within 3-4 days of transaction in electronic mode. The user is updated of any status change through mails. The increasing trend of e-ticketing as reflected in the statistics is a clear indication of the popularity and increasing success of IRCTC. So, the users of this portal were chosen to be the target frame for determining the factors that influence the e-service quality of transaction based Indian government portals.

The income tax portal is an endeavour taken up by the Department of Revenue, Ministry of Finance, and Government of India. This portal provides several services like applying for Permanent Account Number (PAN), Tax Deduction Account Number (TAN), applying for annual income tax returns, finding refund status, knowing about jurisdiction governing income tax filing and knowing Income Tax Return receipt status in case it is a manual filing. As per the statistics of November, 2011 the portal has 1.68 registered users and there is a total growth of 82.87% of e-returns filing. The rate of e-filing is 5, 59,152/day at the peak month (Income tax portal, July, 2011). Since both the portals have large online footfall, it is not
possible to choose the census of the whole population for the study, so for obvious reasons a sample was chosen.

**Defining the target population and sample frame**

Hair, Money, Samouel and Page (2007) define target population as “the complete group of objects or elements relevant to the research project”. The sampling unit for the survey included citizens who use e-ticketing in case of IRCTC portal and citizens who are eligible to pay taxes and their experience with paying taxes online for income tax portal. Since the research is on Indian government portals, the residents should be Indians.

The target population for the current study is defined in table 3.2:

<table>
<thead>
<tr>
<th>Element</th>
<th>Individuals experienced in using</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>i) e-ticketing for railways/ airways</td>
</tr>
<tr>
<td></td>
<td>ii) using e-filing portal of income tax department of India</td>
</tr>
<tr>
<td>Sampling unit</td>
<td>i) Citizens using IRCTC</td>
</tr>
<tr>
<td></td>
<td>ii) Indian residents who are eligible to pay taxes</td>
</tr>
<tr>
<td>Extent</td>
<td>All of India and people living abroad but using the services</td>
</tr>
</tbody>
</table>

**Table 3.2**: Target population defined

Trochim (2006) defines sampling frame as “the listing of the accessible population from which you'll draw your sample”. Due to privacy constraints imposed by government authorities on the site developers to share information, the list of users of each of the portals under consideration could not be gathered. We approached the citizens through emails, used survey monkey tool ( surveymonkey.com ), social networking system and personally distributed the questionnaire to people. Around 1000 questionnaires were distributed for each of the two portals mentioned above.
A survey data is subjected to both sampling and non-sampling errors. Sampling errors can occur as a result of drawing a probability sample rather than conducting a census of the whole population. Non-sampling errors, on the other hand, are mainly associated to data collection and processing procedures. Sampling error can be checked by measuring the standard deviation of the sample to ensure that the variation of the sample from the population is within the limits. Common among the non-sampling errors are ineligibility error that is including elements that do not belong in the frame, duplication that is containing duplicate elements, non-response error that is the variation of views between non-respondents and respondents, time period bias that is data collection happens in an unrepresentative time period (National Statistical Service, Handbook: Chap 6). The first possibility was handled by requesting potential respondents those who have experience with the IRCTC web site and the Income Tax e-filing portal to proceed with the survey, thus targeting only the respective portal users and taxpayers. To tackle the duplication errors, email addresses were entered and each response was checked individually preventing the chance of repetition. To handle the time period bias a year’s time period was chosen to collect response as taxpayers pay taxes annually and if there is any change in the portal due to budget policy for e-ticketing that is reflected with a year’s time. Thus in this study significant attention was given to minimize the procedural flaws within the sample frame selected.

**Selecting Sample method**

The sampling method used in a research depends on: the nature of the study, the objectives of the study, and the constraints like time and budget (Hair et al., 2007).

Sampling method can be probabilistic and non-probabilistic as discussed earlier. The intent of probability sampling is to deploy a procedure that allows equal chance of selecting each element in a sample. Simple random sampling though is preferable because of least sampling error, has a constraint of time and budget and therefore was not considered for this study. The sample unit was defined based on users’ experience with government portal i.e. a single stratum and not on demographic differences. Since stratified random
sampling has an objective of dividing the population into non-overlapping groups (Trochim, 2006), we
could not stratify the target population and ruled out use stratified random sampling. Cluster and
multistage sampling were not opted for as because this study does not have any significant area based
characteristics within the target population that can focus the identification of clusters.

Hair et al. (2007) define convenience sampling which takes into account homogeneity of sample in
sample frame and where sample unit is selected based on their ready availability. It is a non-probabilistic
sample that is chosen based on convenience and help to perform a research in short time and within cost
budget. It is because of these advantages, we used convenient sampling for the primary data collection of
IRCTC. The main lacuna of this method is that it might not statistically represent the whole population.
To reduce this problem, email, virtual tool and social network communities were used to collect sample
elements online. Snowball sampling was also used to collect data from post graduate residential colleges,
cyber cafes and corporate organizations. Thus the initial sample frame for IRCTC is a mix of convenience
and snowball sampling.

E-filing of income tax is a facility provided to individuals but a mandatory process for firms in India. For
corporate house or firms, e-filing is generally done by income tax practitioners on a paid basis or by in-
house professionals. Since there are different rules for different sections for filing income tax, stratified
sampling method for Income tax portal was used. We wanted to include the experience of corporate tax
payers, so distributed questionnaire to firms as well. Profile analysis for the income tax portal was thus
different from the IRCTC where the service is used at individual level. So, the initial sample frame for
income tax portal was decided to be based on convenience followed by stratified sampling to achieve
further representativeness.

3.9 Questionnaire development

The measures used in this research were primarily adapted from different IS, marketing and e-commerce
literature, and were changed to fit into the context of service quality in e-government.
As the first step, domain of each construct was defined. Some were adapted directly from the extant literature, some were renamed and some were developed from the exploratory qualitative study that was conducted as a pilot study. The empirical study using exploratory factor analysis was done following the guidelines of scale development procedures proposed by Churchill (1979). The research is divided into three steps (i) Conceptualization (ii) Design and (iii) Normalization.

3.9.1 Qualitative interview

A qualitative pilot study was conducted with experts in e-government planning, portal designs and users to ascertain the pertinence of items selected in the specific research context and to have a fair judgment that all the aspects of e-service quality had been included. Changes were made in the scale items based on the experts’ opinion, with addition of a few new items, changing of wordings in some and deletion of repetitive and irrelevant items. The questionnaire was again reviewed for approval.

The interviews were conducted in two phases. The first phase interviews were conducted with seven experts of e-government portals or websites to understand the view of user and incorporate the variables pertaining to a citizens’ view. Two experts were government administrators, two were from the industries associated with e-government project, two were from research organization working on e-government department and one was from economics department of a University. This pilot study was necessary as most of the items were selected from researches done on e-commerce and were needed to be checked with the applicability of the items in the context of e-government. Thus the purpose of the initial phase can be summarized as:

- To ensure important aspects of e-service quality from citizens’ perspective were included in the model.
To determine that all variables included are relevant to the context of e-government as most of them are derived from existing scales given for measuring e-service quality of e-commerce and other IS studies.

To confirm that each question is properly framed without any positive or negative overtones and understandable by the respondents.

To ensure that there is no question which is repetitive or open ended and can create confusion among the respondents.

Additional variables pertain to the context of Indian e-government.

The second phase of the interviews was conducted with 10 users consisting 6 males and 4 females respondents with minimum graduation level of education. They were asked to review the initial list of items. As per their suggestions, items were added or eliminated. Some of the questions were rephrased to make them interesting and understandable for respondents. The aim of this phase interview is summarized as:

- To confirm that item scales are understandable within the context of e-service quality expected from government portal.
- To ensure the items actually represent the main variable in this context.

Initial questionnaire had thirty-four items which were selected from previous studies which were grouped seven logically coherent sections. After the qualitative interview with the users and the experts in e-government, ten items were deleted and two items were added.

3.9.2 Summary of Interview

The interviews were for qualitative study and were unstructured. All interviewees were experienced internet users and had exposures with IRCTC and Income Tax e-filing portals. They unanimously agreed that these online applications of government provide them with facility of hassle free activities without
going to agents or respective government offices and are quite easy to use. They prefer to perform the activities online as e-services consume less time and money. Though the services need improvement yet they are quite satisfied with the web presence of the services.

However, it was found that citizens who book tickets online or collect information regarding trains available for a particular destination or visit the portal for some other tourism related purposes usually use the IRCTC web site frequently, while the citizens who pay tax through the e-filing facility of online government portal usually use the income tax e-filing portal annually to either file their annual tax returns or for downloading required forms or collecting information pertaining to tax payment. So, the visits in this portal are less by an individual compared to the IRCTC portal.

It was observed that the users are concerned about the 24X7 availability of the transaction facility. They are concerned about an interface which can guide to fill up requisite information for both the IRCTC and Income tax portals as senior citizens have reservations against using online payment options. So, citizen convenience was considered as a contributory factor for e-service quality. Timeliness, updated information and accurate information are the next significant points which were raised by the users. So reliability of information was considered as a factor for determining e-service quality. Another concern that was voiced by the users was citizen relationship management through proper communication, notification of any urgent information through message board or any other means. So citizen relation was a new factor that was considered in the research. It was also noted that accessibility of the portals or web sites especially to the senior citizens and people of lesser education formed an integral part of the reliability of the portals. The inclusions of other variables in the model were checked with the users in the interviews, and were tested further in the quantitative study.

3.9.3 Pre-testing questionnaire

Once the measurement items were developed, the questionnaire was assessed by five people at Department of Management Studies, IIT Delhi and University School of Management studies, GGSIP
University. The respondents were two Professors and a research scholar from the e-government research group, one Assistant professor from Marketing department and one Professor from the Information System department.

To ensure representation of a ‘real world environment the pre-testing process helped us to consider the opinions of the respondents on the following points:

- Clarity of questions in the questionnaire.
- Average time needed by a respondent to complete the questionnaire (the questionnaire should not be long).
- To check if any variable is repeated or unnecessary.
- To check if the questions are asked in an understandable manner without any ambiguity.

Based on the respondents’ suggestion some questions were reframed and small changes in the order of the questions were made (Ref: Appendix I).

3.9.4 Pilot test

Pilot test is an important component of data collection process as it “... a small-scale trial run of all the procedures planned for use in the main study” (Monette, Sullivan and DeJong 2002, pg. 9). Pilot testing of the instrument being used (i.e. questionnaire) for research purposes has obvious benefits like: providing scope to test hypotheses; checking statistical and analytical procedures and chance to reduce problems and mistakes in the study. Thus a pilot test was conducted before proceeding for the final model to confirm the relevance and completeness of each item in the instrument (i.e. questionnaire).

Sample chosen for the pilot test is a small subset of respondents and may range from 20 to 100 (Monette et al., 2002, pg: 98; Cooper & Schindler, 2003). Thirty questionnaires were distributed among employees
of Centre for Management Studies. After a week 30 respondents were collected. All respondents were familiar with the web portals.

SPSS 16 was used to do factor analysis using principal axis factoring method on the data collected which yielded nine factors. The ninth factor did not show high loading (> 0.4) for the items and those items were dropped. Reliability of the scale was verified by calculating the Cronbach’s alpha value which was found to be 0.813. Based on the poor factor score and comments received from respondents in the pilot test, three items were removed. The final scale had twenty three items grouped under eight factors (Ref: Appendix II) as explained below:

**Items to measure Citizen Convenience**

Five items were selected to measure citizen convenience, which delineated the services that provide convenience for citizens to use e-government applications. These items were selected from the previous studies done by Zhang and Prybutok (2005); Bouaziz and Fakhfakh (2007); Sarkar and Cybulski (2004); Gupta and Jana (2003); Sahu and Gupta (2007); Karunasena et al., (2011).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Explanation</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCON_item1</td>
<td>24/7 availability</td>
<td>Zhang and Prybutok (2005); Bouaziz and Fakhfakh (2007); Sarkar and Cybulski (2004); Gupta and Jana (2003); Sahu and Gupta (2007); Karunasena et al., (2011).</td>
</tr>
<tr>
<td>CCON_item2</td>
<td>Guided tour availability</td>
<td></td>
</tr>
<tr>
<td>CCON_item3</td>
<td>Voice guide with or without animation provided</td>
<td></td>
</tr>
<tr>
<td>CCON_item4</td>
<td>Multilingual interface</td>
<td></td>
</tr>
<tr>
<td>CCON_item5</td>
<td>Complete service provided independent of manual intervention</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.3: Items for Citizen Convenience**
**Items to measure Reliability**

Three items were decided based on the previous literature and the term was used as is from ServQual scale (Parasuraman et al, 1988). The measures were adapted and changed as per the context from previous studies done by Yang et al., (2005); Kim et al., (2006); Kumar, Mukherji, Butt and Persaud (2007).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Explanation</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>REL_item1</td>
<td>Up-to-date information</td>
<td>Parasuraman et al.,1988; Barnes &amp; Vidgen,2000; Devaraj et al.,2002; Yang et al., (2005); Kim et al., (2006); Kumar et al.,(2007).</td>
</tr>
<tr>
<td>REL_item2</td>
<td>Complete service description</td>
<td></td>
</tr>
<tr>
<td>REL_item3</td>
<td>Organized hyperlinks</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.4:** Items for Reliability

**Items to measure Technical Adequacy**

Two items were selected to measure technical adequacy of e-government portals from the existing studies done by Yang, Cai, Zhou and Zhou (2005); Aldwani and Palvia (2002); Liu and Arnett (2000).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Explanation</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAD_item1</td>
<td>High speed page loading</td>
<td>Yang et al., (2005); Aldwani and Palvia (2002); Liu and Arnett (2000).</td>
</tr>
<tr>
<td>TAD_item2</td>
<td>Fast accessibility to site</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.5:** Items for Technical adequacy

**Items to measure Privacy and Security**

Two items were decided to measure privacy and security for transaction oriented government portal. They were decided on from studies done by Zeithaml et al.,(2000); Yoo and Donthu (2001); Welch et al. (2005); Yang et al.,(2005); Shareef et al.,(2011); Karunasena et al.,(2011).
### Table 3.6: Items for Privacy and security

<table>
<thead>
<tr>
<th>Variables</th>
<th>Explanation</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP_item1</td>
<td>Confidentiality of customer information.</td>
<td>Zeithaml, Parasuraman and Malhotra (2000); Yoo and Donthu (2001); Welch et al. (2005); Yang et al., (2005); Shareef, et al., (2011); Karunasena et al., (2011).</td>
</tr>
<tr>
<td>SP_item2</td>
<td>Availability of adequate security features.</td>
<td></td>
</tr>
</tbody>
</table>

**Items to measure Citizen Relation**

Three items were decided based on the previous literature. The relevant studies were done by Wolfinbarger and Gilly (2003); Pan, Tan & Lim (2006); Reddick (2010); Wu (2011).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Explanation</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREL_item1</td>
<td>Customized information presentation</td>
<td>Wolfinbarger and Gilly (2003); Pan et al. (2006); Reddick (2010); Wu (2011)</td>
</tr>
<tr>
<td>CREL_item2</td>
<td>Valuable tips to users about the service</td>
<td></td>
</tr>
<tr>
<td>CREL_item3</td>
<td>Regular follow up provisions with users or citizens.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.7: Items for Citizen Relation**

**Items to measure Transaction Transparency**

Three items were decided based on the previous literature and the term was used as is from Servqual scale (Parasuraman et al., 1988). The measures were adapted and changed as per the context from previous studies done by Welch and Hinnant (2003); Rocheleau and Wu (2005); Irani, Al-Sebie and Elliman, 2006).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Explanation</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTR_item1</td>
<td>Process is cost effective.</td>
<td>Welch and Hinnant (2003); Rocheleau and Wu (2005); Irani et al., 2006.</td>
</tr>
<tr>
<td>TTR_item2</td>
<td>Refund or communication received from site against cancellation of action.</td>
<td></td>
</tr>
<tr>
<td>TTR_item3</td>
<td>Process is transparent.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.8: Items for Transaction Transparency**
**Items to measure Comprehensive Information**

Two items were decided based on the previous literature Kim and Stoel (2004); Zeithaml, Parasuraman and Malhotra (2000); Salahuddin and Rusli (2005).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Explanation</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI_item1</td>
<td>Relatively comprehensive information compared to other portals</td>
<td>Kim and Stoel (2004); Zeithaml et al., (2000); Salahuddin and Rusli (2005).</td>
</tr>
<tr>
<td>CI_item2</td>
<td>Sufficient information for existing and potential customers</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.9: Items for Comprehensive Information**

**Items to measure Communication**

Three items were selected based on earlier studies done by Cox and Dale (2001); Liu and Arnett (2000); Yang, Cai, Zhou and Zhou (2005) to understand the need for interaction.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Explanation</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM_item1</td>
<td>Customized search options.</td>
<td>Cox and Dale (2001); Liu and Arnett (2000); Chadwick and May (2003); Yang, et al., (2005); Streib and Navarro, 2006</td>
</tr>
<tr>
<td>COM_item2</td>
<td>Detailed contact information.</td>
<td></td>
</tr>
<tr>
<td>COM_item3</td>
<td>Message board or forums for government to customers.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.10: Items for Communication**

Likert scale (Likert, 1932) is the most widely used method of because it is easy to construct and is more reliable than other scales with the same number of items (Tittle and Hill, 1967). Five point Likert scale is the popularly used scale in survey methods as it can deal with neutrality or indecisive opinion of a respondent (Garland, 1991)
Questions in the questionnaire were designed to evaluate each item on a five-point Likert-type scale. The grading was done with 1 denoting “strongly agree” ending up to 5 denoting “strongly disagree”. We avoided using seven point Likert scale as increasing the number of scale points can result in non-response bias and respondent fatigue besides increase the cost of administration. Lehmann and Hulbert (1972) opinionate that for individual scale analysis and a long questionnaire, using a 5 pointscale is sufficient to obtain an accurate measurement.

3.10 Data collection

Online survey allows the collection of descriptive cross-sectional data and is becoming popular (Money et al., 2003; p. 141). Online surveys are easy to administer, low in cost, has global reach, and exhibit the ability to capture and analyze data quickly but have disadvantages of complex design, include loss of anonymity and are limited to computer users (Hair et al., 2007). Careful selection of items can help to collect information on users’ preference, behaviour, and attitudes, as well as their intentions and expectations relative to certain questions based on the variables. There are several methods for collecting data online. The two most common are e-mail surveys and web-based surveys (Granello & Wheaton, 2004).

An online survey was administered on the sample by using survey monkey tool and emails. The questionnaire was also distributed through emails to known contacts and snowball sampling was used to reach out to maximum people. Additionally hard copies of questionnaire were also distributed in cyber cafes and to known contacts. The respondents were given liberty to maintain their anonymity. 1250 emails were sent for each of the two portals, so that necessary number of responses could be obtained.

The survey was open for four months. During this time, 286 valid responses were received for IRCTC and 200 responses were received for income tax portal. The response rate was 22.88 % for IRCTC and
16% for the Income Tax e-filing portal. No reminder or follow up emails were sent to non respondents primarily because the completed responses collected were sufficient for testing the model.

3.11 Data examination

3.11.1 Missing data handling process

In surveys, researchers might not receive answers to all of the questions, which create a missing data issue (Janssens, Wijnen, De Pelsmacker, and Van Kenhove, 2008). It is important for the researcher to find any missing data in the data set since it can affect the results of the analysis. Before solving this problem, the researcher must determine the extent of the missing data problem. If the problems not widespread, it is easy to solve by simply eliminating the respondents and/or questions with missing data. But if the problem is extensive, then researcher must deal address the situation.

In the present case, the online survey was conducted to collect data. The software used for the survey was configured so that all necessary item questions were mandatory, so that if any respondent omitted any question by mistake, he or she was informed that a particular response was not completed. Thus, the responses received were complete, and missing values did not pose a problem as is common with offline questionnaires.

3.11.2 Testing the assumptions of multivariate analysis

To meet the requirements of multivariate techniques, it is necessary to assess some assumptions, such as normality, homoscedasticity or homogeneity in variance, and linearity. In this study, a graphical analysis of normality and statistical tests of normality were conducted to assess this requirement. Histogram, skewness, and kurtosis tests were conducted, and in the analysis chapter, the results are explained in
According to Hair et al., 2007, the acceptable range of skewness is -1 to 1. The acceptable kurtosis range is -1.5 to 1.5.

### 3.12 Data analysis

Different statistical methods can be used to make sense of collected data sets. According to Hair et al. (2007), two steps are involved in quantitative data analyses: 1) descriptive statistics to obtain a descriptive overview of data in hand, and 2) using statistical tests for hypothesis testing. For this study, we have conducted the following statistical analysis to make sense of the data.

#### 3.12.1 Descriptive statistics

In order to get a descriptive overview of the data, descriptive statistics is used, and this statistical analysis summarizes the large set of data through a limited number of meaningful statistical indicators. Each variable is studied separately to compare average scores of variables among the different groups of respondents (Janssens et al., 2008). Usually, descriptive statistics contain three types of indicators: frequency distribution, central tendency measures, and dispersion measures.

The use of frequency distribution indicates how the scores of individual respondents are distributed for each of the variables, and it examines the data one variable at a time (Janssens et al., 2008). “Typically, a frequency distribution shows the variable name and description, frequency counts for each value of the variable, and cumulative percentages for each value associated with a variable” (Hair et al., 2007, p. 308).

The measure of central tendency helps a researcher summarize the characteristics of a variable in one statistical indicator to obtain a better understanding. The measures of central tendency are: mean, median, and mode.

Mean—the average—is the most commonly used central tendency measure, the median is the middle value in the distribution, and mode identifies where the most value occurs in the distribution (Hair et al.,
In the present study, all these descriptive statistics—frequency distribution, central tendency, and dispersion—were conducted, and the applicable details are included in the analysis portion.

### 3.12.2 Confirmatory factor analysis and structural equation modeling

Structural equation modeling was chosen as a major analysis technique for this study, and the AMOS (Analysis of Moment Structures), version 7 (software package was used to accomplish structural equation modeling. In structural equation model, it is important to test multiple interrelated dependence relationships in a single model. Here, interrelated means that the dependent variable in one equation can be the independent variable in another equation (Hair, Anderson, Tatham & Black, 1998). Structural equation modeling (SEM) has become an increasingly popular tool for researchers to assess and modify theoretical models (Gefen et al., 2000). It has the ability to estimate simultaneously several multiple regressions that may be interdependent (Blaikie, 2003). Thus, it is a tool to address a network of interrelated predictor variables.

Applying SEM is a two-step process: the structural equation model involves both the measurement model and the structural model, which provides a better way of examining empirically the theoretical model (Hair, Black, Babin, Anderson & Tatham, 2006).

### 3.12.3 Confirming the Measurement Model (CFA)

Confirmatory factor analysis is a technique to confirm a pre-specified relationship of observed measures. This helps a researcher find out the degree to which different assumed variables correctly measure a certain factor. Confirmatory factor analysis is used to validate an instrument (Janssens et al., 2008). How well the measured variables represent a construct is determined by conducting a confirmatory factor
analysis. The researcher can get a better understanding of the quality of the measures when the CFA and the construct validity tests are combined (Hair et al., 2007). The purpose of confirmatory factor analysis is to identify a small number of factors that can explain each of the variables. Each item or factor is explained by the variable, in part by its path loading. In the present, study based on good theoretical background, factor structure was specified, and confirmatory factor analysis was used to determine factor structure with empirical support. After conducting the confirmatory factor analysis for each construct, the full measurement model was developed with all constructs to estimate the relationship between latent variables. The measurement model draws covariance between all variables and estimates how well the scale items contribute together towards a relationship between the variables.

**Overall model fit:**

During evaluation of both measurement and structural models, the researcher must assess overall fits for the model in order to judge whether the model sufficiently represents the set of causal relationships. This is done through assessing goodness of fit measures. Three types of goodness of fit measures are used (Hair et al., 1998):

<table>
<thead>
<tr>
<th>Type of measure</th>
<th>Level of acceptable fit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absolute fit measures:</strong></td>
<td></td>
</tr>
<tr>
<td>Goodness-of-fit index (GFI)</td>
<td>&gt;0.90</td>
</tr>
</tbody>
</table>
| Root mean square error of approximation (RMSEA) | Marginal fit <0.090  
                                         | Acceptable <0.080,  
                                         | Good fit <0.050, |
| **Incremental fit measures:**         |                                              |
| Tucker –Lewis index (TLI)             | > 0.90                                       |
| Adjusted goodness-of-fit index (AGFI) | > 0.80                                       |
| Comparative fit index (CFI)           | >0.90                                        |
| Incremental fit index (IFI)           | >0.90                                        |
**Parsimonious fit measures:**

| Normed chi-square (CMIN/DF) | Lower limit: 1.0  
|                           | upper limit 2.0/3.0 or 5.0 |

**Table 3.11:** Goodness of fit measures for structural equation modeling

**Measurement model fit:**

Once the overall model has been accepted, each of the constructs can be evaluated separately by

1) examining the indicator loadings for statistical significance, and

2) estimating the reliability coefficients (composite reliability) of the measures.

This provides an examination of the convergent and discriminant validity of the research instruments (Hair et al., 1998).

**Structural model/path model**

“A structural model represents the theory with a set of structural equations and is usually depicted with a visual diagram” (Hair et al., 2006, p.845). When a measurement model is specified, it is possible to build a path/structural model in order to evaluate hypothesized relationships. Using SEM to test the theoretical model, the researcher must consider two issues:

- The overall and relative model fit
- The size, direction of the relationship, and significance of the relation as estimated in the model

In the present study, following the assessment of the measurement model, the structural model is developed to test the hypotheses that consist of all the factors tested in the measurement model.

**3.12.4 Reliability analyses**

“Reliability is an assessment of the degree of consistency between multiple measurements of a variable”, (Hair et al., 1998, p. 117). Reliability indicates the consistency of the research findings. Hair et al. (2007)
state that a survey instrument can be considered reliable if repeatedly applying the instrument results in consistent scores. Testing and retesting with the same individual at two points in time is one way of judging consistency. If the responses do not vary significantly across the different time periods, then the measurement can be considered reliable. The second and most widely used measure of reliability is internal consistency of the entire scale, which is obtained by calculating the coefficient alpha, also known as Cronbach’s alpha. The lowest acceptable limit for Cronbach’s alpha is .70, but in some cases, 60 may also be acceptable (Hair et al., 1998). When one intends to assess the instrument’s quality, Cronbach’s alpha absolutely should be the first measure (Churchill, 1979).

Another test of reliability can be determined on the basis of composite reliability. For every latent variable, composite reliability (CR) must be calculated manually. For composite reliability, the guideline is that the value should be higher than 0.70 (Janssens et al., 2008). The formula for composite reliability is as follows:

\[
\text{Composite reliability} = \frac{(\text{standardized loadings})^2}{(\text{standardized loadings})^2 + \text{sum of indicator measurement errors}}
\]

To assess scale reliability in this present research, Cronbach’s alpha and the calculation of composite reliability were used.

### 3.12.5 Validity analyses

“Validity is the extent to which a construct measures what it is supposed to measure” (Hair et al., 2007).

The following approaches can be used to assess measurement validity:

**Content validity**

The content or face validity of a scale asks whether the scale items are truly measuring what they are supposed to measure. While it is a systematic assessment of such, nevertheless by definition it is a subjective assessment (Hair et al, 2007).
In order to ensure content validity all the items that measured each construct were mainly adapted from previous research works. Five experienced users of e-tax filing system and five experienced researchers reviewed the items and operational definitions of the constructs. Based on their opinion, several items were added to and omitted from the scale, and corrections were made in the operational definitions.

**Convergent validity**

“Convergent validity indicates the degree to which two different indicators of a latent variable confirm one another”, (Janssens et al., 2008, p. 306). Several ways are available to measure convergent validity. According to them, the first (weak) condition to assess convergent validity is factor loading, which relates each indicator to the constructs that are all significant, meaning all the critical ratios should be more 1.96 (P< 0.05). According to Hair et al. (2006), another way of measuring convergent validity is through calculation of average variance extracted (AVE). This measure reflects how much of the latent construct is responsible for overall variance within the measurement items. Thus, the higher the variance extracted, the more the items actually represent the latent construct. The guideline for the value of AVE is that it should exceed 0.50.

**Construct validity**

Researchers define ‘construct’ as a conceptual term which is used to describe, organize and assign meaning to a phenomenon of theoretical significance and relevant to domain of research (Cronbach & Meehl, 1955; Edwards & Bagozzi, 2000; Messick, 1981; Nunnally, 1978; Schwab, 1980).

Construct validity is concerned with measurement accuracy, and this addresses the extent to which the items used to measure the theory-based latent variable actually reflect such a variable. Establishing construct validity (through statistical measures) of the item measures used within samples can strengthen the representativeness of the actual true scores existing in the population (Hair et al., 2006). Convergent validity and discriminant validity tests need to be performed for assessment of construct validity (Hair et al., 2007).
**Discriminant validity**

Discriminant validity procedure was developed by Fornell and Larcker (1981). To calculate Discriminant validity, they compared the squared correlation between two constructs with the variance extracted between those two constructs.

The square of the correlation between the two constructs should be smaller than their corresponding AVE.

**Criterion related validity**

According to Trochim (2006), criteria-related validity helps to check the performance of an operationalization against some criterion. In this validity test we usually make a prediction about how the operationalization will execute based on our theory of the construct. Depending on the criteria used as the standard for judgment criterion related validity is differentiated into (a) predictive validity and (b) concurrent validity.

Assessing predictive validity helps to establish that the adopted measurement procedure make accurate predictions about the construct(s) it represents. A high correlation provide evidence for predictive validity showing that the measure actually can correctly predict a variable or a construct that it is theoretically believed to be able to predict. Concurrent validity is the procedure when two different measurement procedures are carried out at the same time. This can also be measured by using correlation.

**Nomological validity**

The nomological network is a concept that was developed by Cronbach and Meehl (1955) to establish construct validity in a network of variables. Nomological Validity substantiates that the structural relationships hypothesized among variables or constructs are conformable with existing validated studies and tested against a variety of persons, times and methods.
3.12.6 Addressing possible common method bias in the current research

In the current research work, common method bias can arise due to the use of a single respondent to address all the variables in the model. As a result, using it for measuring both predictive and criterion variables may result in a method effect produced by the common source. Another possible source of common method bias in this research is the “consistency motif,” or respondents’ answering while looking for similarities and trying to maintain consistency. Other sources of common method bias, such as the items of social desirability or characteristic effects, are deemed not applicable in the context of this research. According to Podsakoff, MacKenzie, Lee & Podsakoff (2003), several ways have been suggested to counter possible common method bias in behavioral research. We can achieve this by using several procedural remedies.

**Temporal, proximal, psychological, or methodological separation of measurement:**

Another option is to introduce a temporal, proximal, or psychological separation between the measurements. This is aimed at reducing any contextual cues that may have been present in one instance. Also, temporal separation can help remove answers from short term memory. A locational separation is aimed at the elimination of locational retrieval cues.

Due to resource and time constraints within the research, it is not possible to collect data from different periods. It is also difficult to find the same respondent group to answer the question a second time. Thus, reducing common method bias through temporal separation is not feasible. However, since the survey is conducted online, it already has eliminated locational cues from the respondents’ environments; therefore, a locational separation is in effect here.

Also, since the questionnaire is answered online rather than in a predetermined room or laboratory setting, any contextual cues are also either absent or present in any respondent situation, since it is only the computer environment. Thus, contextual cues are also removed by using an online questionnaire that reduces common method bias.
Protecting respondent anonymity and reducing evaluation apprehension:

Finally, protecting respondent anonymity and reducing evaluation apprehension are cited as procedures that can be used to reduce common method bias. The survey is designed accordingly. Statements are highlighted at the beginning of the survey noting that responses are completely anonymous, and that the data given cannot be identified with any respondent. Furthermore, providing demographic data is optional, and the fact is highlighted within the questionnaire. These steps reduce evaluation apprehension and thus reduce the common method bias.

3.12.7 Data Triangulation

Triangulation is an attempt to map out, or explain more fully, the richness and complexity of human behavior by studying it from more than one standpoint - Cohen and Manion

Thus triangulation refers to the use of different data collection techniques within one study in order to ensure that the data are telling you what you think they are telling you. For example, qualitative data collected using semi-structured group interviews may be a valuable way of triangulating quantitative data collected by other means such as a questionnaire (Saunders et al., 2009). Yin (2003) distinguishes between four case study strategies based upon two discrete dimensions: single case and multiple cases. One of the reasons for using mixed method is to use triangulation. Triangulation is use of two or more independent sources of data or data collection methods to corroborate research findings within a study. Denzin (1978) identified four basic types of triangulation:

- **Data triangulation**: involves time, space, and persons.
- **Investigator triangulation**: involves multiple researchers in an investigation.
- **Theory triangulation**: involves using more than one theoretical scheme in the interpretation of the phenomenon.
- **Methodological triangulation**: involves using more than one method to gather data, such as interviews, observations, questionnaires, and documents.

MacKenzie, Podsakoff and Jarvis (2005) proposed a design map for devising an instrument. The design map has been adopted in this study to establish a reliable measurement instrument for e-service quality of transaction based Indian government portals. The map is given elaborately depicted in Figure 3.4.
Figure 3.4: Research Plan for Triangulation
3.14 Concluding Remarks

The research work was thoroughly designed and data tabulated in SPSS 16. The next chapter deals with the data and analysis for IRCTC portal. A model was validated and then triangulated by the data collected from Income tax portal. This triangulation was necessary to prove the generalizability of the model for transaction oriented portal in Indian e-government.