CHAPTER 2
REVIEW OF LITERATURE

2.1 Introduction

In this chapter the available literature on the subject has been reviewed to know the dimensions of research issues and the research gaps. After defining IT, productivity, efficiency and performance, review of literature has been organized in two sections. First section deals with review of studies, which have used economic measures such as ratios analysis, econometric and linear programming methods to find the impact of information technology on the performance of banks. These studies have further been divided in two categories i.e. banking and non-banking. The second section deals with those studies which have used non-economic measures or surrogate measures to deal with subject. Models depicting link between IT and performance have also been reviewed.

2.2 IT, productivity, efficiency and performance

IT

IT has been defined differently by different authors in terms of its scope. Bosworth and Triplett (2000), Brynjolfsson and Hitt (2000) defined IT to include computer and telecommunication technologies for the collection, storage, retrieval, reproduction, processing, diffusion, and transmission of information. Shelly and Cashman (2004) defined IT to include hardware, software, databases, networks, and other related components which can be used to build information systems. William and Sawyar (2005) defined IT to include any technology that helps to produce, manipulate process, store,
communicate, and/or disseminate information. It thus encompasses hardware, software, and the skills of IT personnel.

The above definitions are generic in nature and have not been defined in context of banking sector. The researchers have taken a broader view of IT to include all IT products and infrastructure used by banks to provide banking services to customers and support the information needs of the staff responsible for banking operations. Thus computer hardware, core banking solutions, ATMs, internet banking, mobile banking, electronic payment systems, and CRM software forms part of IT in banks for the purpose of our study.

**Productivity**

Productivity is defined as a comprehensive measure of how efficiently and effectively banks achieve their major objectives. It is the relationship between outputs and inputs during a given period (Lawlor, 1985; Murdick, Render & Russell, 1990; Sumanth, 1984). It is construed as the ability and willingness of an economic unit to produce maximum possible output with given inputs and technology. Higher the output per unit of input, higher is the productivity. To calculate productivity, it is necessary to identify first which outputs and which inputs are to be used. In banking context the outputs of a bank are the products and services provided to customers. These can have monetary values, like revenues, profits, total deposits, and total loan. They can also have non-monetary values, like the total number of current and savings deposit accounts, loan accounts, and customers served. The inputs of a bank are the resources consumed in providing the products and services. Similar to the outputs, the inputs can have monetary values, like staff expenses, tangible asset
value, and operating costs. They can also have non-monetary values, like the total number of labor hours paid, IT employees, and the total floor area of business premises. The IT deployment is considered to be the input measure for bank productivity. Productivity is also categorized as partial or total. A business per employee would be a partial measurement of productivity because there are other measures also. An output per all inputs (staff, capital, purchased material and services) would be a measurement of total productivity. The inputs and outputs selected for the study have been given in chapter 3 i.e. research design.

Efficiency

Efficiency, on the other hand, measures performance of the bank in a normative sense by comparing it with the industry leaders within or across the borders. In general, it is expected that there would be a co-movement in productivity and efficiency; however the two may actually diverge. While a bank may improve in terms of productivity over a period, its efficiency score may decline if rise in its productivity is slower than that of the industry’s best performer. If efficiency of a decision making unit (DMU) is growing faster than of its competitors, its margin will rise. The technique used for measurement of efficiency for banks in the present study has been discussed in chapter 4.

Performance

The performance as stated by Wheelen and Hunger (2000) is an end result of an activity and an organizational performance is accumulated end result of all the organization’s work process and activities. When the performance of the organization is assessed, the past management decisions that shaped investment, operations and
financing are measured to know whether all resources were used effectively, whether the profitability of the business met or even exceeded expectations, and whether financing choices were made prudently. The most frequently used organizational performance measures include; organization’s efficiency (productivity), organizational effectiveness and industry ranking (Wetherbe, Turban & Mclean, 1999). For the purpose of this study we have used efficiency (productivity) as a measure of banks’ performance.

2.3 Impact of IT on performance of organizations

The important studies related with the measurement of impact of IT on performance of organizations have been discussed by categorizing them into those using economic and non-economic approaches. Further studies using economic approaches have been analyzed by categorizing organizations into banking and non-banking categories.

2.3.1 Economic approaches

This section reviewed the important studies used to measure performance by adopting economic approaches in banking and non-banking sectors.

2.3.1.1 Banking

A summary of important studies conducted in banking sector using economic approaches in terms of their focus, method(s) used, and their main findings, is presented in Table 2.1.
Table 2.1: Analysis of studies on impact of IT on banks

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Sample size</th>
<th>Technique(s) used</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turner, 1985</td>
<td>58 U.S. banks</td>
<td>Correlation analysis</td>
<td>No relation is found to exist between organizational performance and proportion of resources assigned for data processing.</td>
</tr>
<tr>
<td>Alpar and Poremski, 1989</td>
<td>30 German banks</td>
<td>DEA</td>
<td>Significant potential for cost savings from greater use of IT.</td>
</tr>
<tr>
<td>Alpar and Kim, 1990</td>
<td>175 U.S. banks</td>
<td>Translog function</td>
<td>IT contributed to reduction in demand deposits and increase in time deposits. It resulted in increase in other loans and decrease in installment loans. It is also found to be labor saving.</td>
</tr>
<tr>
<td>Parsons, Gotieb and Denny, 1993</td>
<td>5 Canadian banks</td>
<td>Translog function</td>
<td>An increase in productivity to the extent 17 to 23 percent by using computers. The returns were very modest compared to the levels of IT investment.</td>
</tr>
<tr>
<td>Wang et al., 1997</td>
<td>22 U.S banks</td>
<td>DEA</td>
<td>Inefficiency in IT-related value added activities always lead to overall inefficiency, while efficiency in IT related activities is found to increase overall efficiency in 64 percent of the cases.</td>
</tr>
<tr>
<td>Prasad and Harker, 1997</td>
<td>U.S banks</td>
<td>Cobb-Douglas production function</td>
<td>Additional investment in IT capital is found to yield no real benefits and may be more of strategic necessity to stay within the competition. However IT investment on staff is observed to give substantial returns.</td>
</tr>
<tr>
<td>Soteriou and Zenios, 1999</td>
<td>Bank branches of Cyprus</td>
<td>DEA</td>
<td>Micro-environment is found to be critical for efficiency gains and urban branches showed better efficiency than rural branches.</td>
</tr>
<tr>
<td>Off-site Monitoring and Survey Division, RBI, 2002</td>
<td>All scheduled commercial banks of India</td>
<td>Ratio analysis</td>
<td>Higher performance levels achieved without corresponding increase in the number of employees. Also operating expenses of the banking system declined during the study period, indicating the positive impact of computerization.</td>
</tr>
<tr>
<td>Researcher(s), Year</td>
<td>Banks Type</td>
<td>Method</td>
<td>Findings</td>
</tr>
<tr>
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</tr>
<tr>
<td>Takemura, 2003</td>
<td>Japanese banks</td>
<td>Cobb-Douglas production function</td>
<td>IT capital has either positive or no effect on productivity.</td>
</tr>
<tr>
<td>Rao et al., 2005</td>
<td>Indian banks</td>
<td>Cobb-Douglas production function</td>
<td>E-business capital and e-business as well as non e-business labor made positive contribution towards output. Non e-business capital has either insignificant or negative impact on productivity.</td>
</tr>
<tr>
<td>Swierczek and Shrestha, 2003</td>
<td>59 Japanese and 44 Asia-Pacific banks</td>
<td>Primary survey</td>
<td>IT usage has increased productivity in Asia-Pacific as well as Japanese banks. Japanese banks benefited less from IT usage as compared to Asia-Pacific banks with same level of IT investment.</td>
</tr>
<tr>
<td>Ehikhamenor, 2003</td>
<td>Nigerian banks</td>
<td>Primary survey</td>
<td>Benefits of investment in IT have not been realized in many banks.</td>
</tr>
<tr>
<td>Li, 2007</td>
<td>All Taiwan banks</td>
<td>DEA and SFA</td>
<td>Low operational efficiencies existed in the banking industry during the study period, 1996 to 2000. These inefficiencies were due to combination of both wasteful over use of information technology resources and inappropriate scale of information technology investment.</td>
</tr>
<tr>
<td>Beccalli, 2007</td>
<td>737 European banks</td>
<td>Ratios and SFA</td>
<td>Investment in IT services (consulting services, implementation services, training and education, support services) positively influenced the accounting profits and profit efficiency, while the acquisition of hardware and software reduced banks’ performance.</td>
</tr>
<tr>
<td>Chandrasekhar and Sonar, 2008</td>
<td>29 Indian banks</td>
<td>DEA and malmquist index</td>
<td>Private sector banks had a slight edge over their industry counterparts during the study period of 2001 to 2006. Further, on the technology front as well as in exercising managerial control, substantial scope existed for improvement across the sector.</td>
</tr>
</tbody>
</table>
IT has positive impact on all the organizations but the performance of banking sector outstripped the performance of manufacturing sector. In the banking sector local banks took the lead, while in manufacturing companies, multinationals took the lead.

2.3.1.2 Non-banking

Because of the lack of relevant empirical studies in the field of banking, most studies described in this section are thus related to other service organizations including hospital institutions and manufacturing firms. Most of the studies have applied financial ratio analysis, parametric and non-parametric approaches for performance measurement of these organizations. Some econometric-based studies have adopted SFA as the analytic tool and Cobb-Douglas function as the theoretical model, while nonparametric studies have used DEA technique. A summary of important studies conducted in non-banking sector using economic approaches in terms of their focus, method(s) used, and their main findings, is presented in Table 2.2.

Table 2.2: Analysis of studies on impact of IT on non-banking firms

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Sample size</th>
<th>Technique(s) used</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cron and Sobol, 1983</td>
<td>138 medicine suppliers</td>
<td>Correlation analysis</td>
<td>Companies using computers extensively are found to have either very poor or very satisfactory financial results.</td>
</tr>
<tr>
<td>Bender, 1986</td>
<td>132 life insurance companies</td>
<td>Correlation analysis</td>
<td>Appropriate level of investment in IT positively affects total expenses. Further optimal level of IT investment is found to be achieved in the range between 20 to 25 percent of total operating expenses.</td>
</tr>
<tr>
<td>Author(s), Year</td>
<td>Sample Size</td>
<td>Methodology</td>
<td>Findings</td>
</tr>
<tr>
<td>----------------</td>
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</tr>
<tr>
<td>Strassman, 1990</td>
<td>38 service sector firms</td>
<td>Correlation analysis</td>
<td>No correlation is found to exist among spending on computers, profits and productivity.</td>
</tr>
<tr>
<td>Morrison and Berndt, 1990</td>
<td>Whole U.S. manufacturing sector</td>
<td>Cobb-Douglas production function</td>
<td>Estimated marginal benefits of investment in IT are observed to be less than the marginal cost, implying the problem of over investment. More specifically authors found that for each dollar spent on IT, the marginal increase in output is only 80 cents.</td>
</tr>
<tr>
<td>Weill, 1992</td>
<td>33 medium and small-scale valve manufacturing companies</td>
<td>Hierarchical regression</td>
<td>Although transactional IT investment is found to be strongly related to superior organizational performance, there is no evidence that strategic IT investment, on a long-term basis, would increase or decrease organizational performance.</td>
</tr>
<tr>
<td>Loveman, 1994</td>
<td>60 manufacturing firms</td>
<td>OSL regression</td>
<td>During the study period 1978 to 1984, the contribution of IT investment to the output of manufacturing firms is found to be nearly zero.</td>
</tr>
<tr>
<td>Lichtenberg, 1993</td>
<td>Firm level database</td>
<td>Cobb-Douglas production function</td>
<td>One information system (IS) employee is found to be equivalent to six non-IS employees in terms of marginal productivity.</td>
</tr>
<tr>
<td>Harris and Katz, 1989</td>
<td>40 insurance companies</td>
<td>Correlation analysis</td>
<td>Ratios of IT expense to premium income and the ratio of information technology expense to total operating expense are found to be related to organizational performance.</td>
</tr>
<tr>
<td>Brynjolfsson and Hitt, 1996</td>
<td>370 companies</td>
<td>Cobb-Douglas production function</td>
<td>Computer related capital investment contributed 81 percent to the marginal increase in output, where as non-IT capital contributed only 6 percent to the marginal output. Authors further observed that IS labor is more than twice as productive as non-IS labor.</td>
</tr>
<tr>
<td>Mitra and Chaya, 1996</td>
<td>448 large and medium-sized U.S. corporations</td>
<td>Primary survey</td>
<td>IT investment reduced average production cost, lowered average total cost, and increased average overhead cost in firms.</td>
</tr>
<tr>
<td>Authors</td>
<td>Sample Size</td>
<td>Methodology</td>
<td>Findings</td>
</tr>
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</tr>
<tr>
<td>Rai et al, 1997</td>
<td>497 firms</td>
<td>Cobb-Douglas production function</td>
<td>IT investment positively contributed to firms’ output and labor productivity but the same relationship is found to be non-existent in relation to administrative productivity.</td>
</tr>
<tr>
<td>Devaraj and Kohli, 2000</td>
<td>8 hospitals</td>
<td>Correlation analysis</td>
<td>Positive relationship exits between IT and performance with time lag.</td>
</tr>
<tr>
<td>Lee and Menon, 2000</td>
<td>83 hospitals</td>
<td>DEA and SFA</td>
<td>Hospitals having high technical efficiency used greater amount of IT capital than those exhibiting low technical efficiency. Further the authors observed that group of hospitals exhibiting high technical efficiency also exhibited low allocative efficiency.</td>
</tr>
<tr>
<td>Shafer and Byrd, 2000</td>
<td>208 organizations</td>
<td>DEA</td>
<td>Proposed a framework for measuring IT efficiency, which addresses issues like measurement errors, lag between investment and benefits, redistribution of profit, and mismanagement of IT resources.</td>
</tr>
<tr>
<td>Shao and Lin, 2002</td>
<td>370 firms from manufacturing and service sectors</td>
<td>DEA</td>
<td>During the study period of 1988 to 1992, IT is found to exert a significant favorable impact on technical efficiency which in turn, gives rise to the productivity growth.</td>
</tr>
<tr>
<td>Ham et al., 2005</td>
<td>21 hotels of Korea</td>
<td>Primary survey</td>
<td>Positive relationship is found to exist between IT usage and the performance of lodging operations. Furthermore, study found that front-office applications, restaurant and banquet management systems positively affect the performance of lodging operations; however, the effect of guest-related interface applications is found to be non-significant.</td>
</tr>
<tr>
<td>Andersen and Foss, 2005</td>
<td>88 organizations from computer industry</td>
<td>Hierarchical regression</td>
<td>Use of IT is found to have facilitated the communication among managers across functional and geographical boundaries. It also enhanced the coordination of activities in the development of strategies, which in turn resulted in superior performance.</td>
</tr>
</tbody>
</table>
2.3.1.3 Comparison of economic methods of performance measurement

In the past, performance management has drawn the attention of academia and the corporate. Literature survey reveals many approaches to measure the performance of organizations which broadly include; ratio analysis, econometric and linear programming approaches.

In ratio analysis financial ratios relating to liquidity, capital adequacy, earnings and liability are widely used measures of organizational performance. In the context of banking sector, ratios covering intermediation cost, interest spread, operating expenditure, cost to income ratio, return on assets, return on equity, business per employee, income per employee and business per branch are some of the commonly used ratios for assessing the efficiency and productivity of a banking unit.

Ratio analysis though appears to be simple to calculate, yet suffers from certain limitations. First, each single ratio needs to be compared with some benchmark ratio. Second, use of individual ratio is relatively easy but their aggregation is complicated and requires experienced judgment. Third, financial ratios do provide information on the overall financial performance of an organization, but provide little information about the amount by which performance could be improved or the area where the effort should be focused in order to improve performance. Fourth, ratio analysis also fails to consider the multiple input-output characteristics of business enterprises and cannot give an overall clear picture of organizational operations because firm’s performance may exhibit considerable variation, depending on the indicators selected. Recently, in view of these limitations of ratio analysis, frontier efficiency analysis covering econometric and linear
programming approaches have been applied for evaluating and improving banking efficiency.

Econometric approaches in the literature include (i) stochastic frontier approach (SFA), (ii) distribution-free approach (DFA) and (iii) thick frontier approach (TFA). The above three approaches are parametric in nature. The two commonly used linear programming approaches are (i) data envelopment analysis (DEA) and (ii) free disposal hull (FDH). These approaches are non-parametric in nature. Each of the approach has weaknesses, as well as strengths relative to the other. The literature has not yet come to a consensus about the preferred approach for determining the best-practice frontier against which relative efficiencies are measured. A key drawback of parametric approaches is that they usually specify a particular functional form that pre-supposes the shape of the frontier. If the functional form is mis-specified then measured efficiency may be confounded with the specification errors. In sharp contrast to parametric approaches, nonparametric approaches are inherently bounding techniques, and so they impose less structure on the frontier. They are deterministic and do not allow for random error owing to data problems or other measurement errors. If random errors do exist, measured efficiency may be confounded with these random deviations from the true efficiency frontier.

Most of studies on banking have used either SFA or DEA approach to calculate the efficiency. Both the DEA and SFA approaches have their individual strengths and weaknesses. The SFA approach has the advantage of allowing for random shocks and measurement errors. Further, SFA approach has the advantage that it is possible to analyze the structure and investigate the determinants of producer performance. Therefore, it has a more solid grounding in economic theory. On the other hand,
weaknesses with the whole family of econometric approaches to efficiency measurement (of which SFA is a part) are; (i) It is risky to impose a priori assumption on the production technology by choosing a functional form (e.g. Cobb–Douglas, translog, etc.), given that most of the distributional characteristics of the production technology are a priori unknown (ii) The precise specification of the error structure is difficult (sometimes even impossible) to ascertain. In addition, such specification is likely to introduce another potential source of error (iii) The continuity presumed in this approach may lead to approximation errors.

Compared with the stochastic parametric frontier approach, DEA has advantages in measuring the relative efficiency of banks. First, DEA is non-parametric frontier approach and does not require, rigid assumptions regarding production technology and specific statistical distribution of the error terms. Second, DEA is amenable for small sample studies. Third, as a non-parametric frontier technique, DEA identifies the inefficiency in a particular bank by comparing it to similar banks regarded as efficient. Other advantages of DEA are (Banker & Morey, 1986; Sengupta, 1988); identification of bad from good performers by generating an overall easy to interpret efficiency score; independent measurement units (giving great flexibility in selecting outputs/inputs); and manipulation of uncontrollable environmental factors, like competition. However, the DEA model does not allow for measurement error or random shocks. Instead, all these factors are attributed to efficiency or inefficiency, a characteristic that inevitably leads to potential estimation errors. Berger and Humphrey (1997) reported that DEA is a widely used approach in banking and the technique is found to be used in 69 studies amongst the studies he reviewed.
Based on the merits and demerits of each technique discussed above, the present study has selected DEA technique to compare IT efficiency of public sector banks in India. In the use of DEA technique the selection of right inputs and outputs are crucial. Based on the review of literature, the inputs and outputs used in the present study are discussed below.

### 2.3.1.4 Issues in specification of inputs and outputs for banking sector

In the banking literature, there is a considerable disagreement among researchers about what constitute inputs and outputs in banking industry (Casu, 2002; Sathye, 2003). There are two approaches namely intermediation and production to define inputs and outputs Sathye (2001). The intermediation approach views the banks as using deposits together with purchased inputs to produce various categories of bank assets. Outputs are measured in monetary values and total costs include all operating and interest expenses (Sealey & Lindley, 1977). In contrast, the production approach view banks as using purchased inputs to produce deposits and various categories of bank assets. Both loans and deposits are, therefore, treated as output and measured in terms of the number of accounts. Although both the approaches are commonly used in empirical studies, neither approach however is completely satisfactory, largely because the deposits have both input and output characteristics which can not be easily disaggregated. However, it should be noted that the definition and measurement of bank inputs and outputs has long been debated among researchers. There is no definite, commonly agreed choice of banking inputs and outputs (Sathye, 2001; Soteriou & Zenios, 1999). The present study adopted production approach in specification of inputs and outputs. Inputs and outputs,
based on production approach are also adopted in many other studies (Wang et al., 1997; Thanssoulis, 1999; Rao et al., 2003; Chen & Zhu, 2004).

2.3.1.5 The metrics measuring IT

One of the most difficult tasks involved in the determination of measurement of IT i.e. selection of input variables related to IT deployment and relating them to theory. In addition to the problems mentioned above, data collection is a difficult process as banks are either not tracking their IT investment data, or not willing to divulge it. In the literature different ratios have been used as measures of IT. IT budget and expenditure are the most frequently used metrics of computerization, as they are readily available and reasonably objective, but their reliability and validity are widely criticized, as they do not distinguish between different IT tools, capabilities and applications, which actually provide different results and benefits (Lucas, 1993; Strassman, 1990). IT budget neglect two important facets of IT, namely their deployment and their evolving capabilities and features and hence, they fail to illustrate how IT provide business value (Willcocks, Graeser & Lester, 1998). Bender (1986) and Harris and Katz (1989) used IT expenditure as a percentage of total operating expenditure to measure IT. IT expenditure as an input is also used by Alpar and Porembski (1989), Alpar and Kim (1990) in their studies. IT capital alone was used by Parsons et al. (1993), Prasad and Harker (1997), Rao et al. (2003) and Takemura (2003). IT in banks in India is characterized by increase in; ATMs, fully computerized and core banking branches over a period of time. Some studies in banking sector have also considered number of ATMs and computer terminals as the inputs. Athanassopoulos and Giokas (2000), Soterious and Zenios (1999) used number of computer terminals as a measure of IT. Thanassoulis (1999), Chandrasekhar and Sonar
(2008) used number of ATMs as an input variable to understand the impact of IT. All of these ratios have advantages and disadvantages. Measuring IT budget or expenditure gives researchers an idea as to "who the big spenders are, not the most successful users" (Sullivan, 1989). Computer world, in selecting its "Premier 100" list of most effective information system users, selected total IT spending compared to competitors, investment in IT as a percentage of revenue, staff and training investment, and total distribution of personal computers and terminals throughout the organization as the measures of IT investment (Sullivan, 1989). The first measure, annual IT budget as a percentage of revenue, indicates the amount spent annually by firms on IT vis-à-vis other organizations, providing means for comparing and differentiating firms. The second measure, IT investment as a percentage of revenue indicates a firm's total accumulated investment in IT assets relative to other organizations, thus providing another perspective of IT resources and means for comparing organizations. The third and fourth measures, the percentage of IT budget spent for staff and the percentage of IT budget spent on training represents the level of organizational spending on staff, to manage, and train IT personnel and end-users. The final measure, the number of PCs and terminals as a percentage of employees, indicates the extent to which IT is disseminated within an organization and, by implication, indicates the extent to which IT is used by organization’s personnel.

Based on the review of literature, researchers have selected following IT variables for the present study: number of ATMs, PC per employee, fully computerized branches to total branches, core banking branches to fully computerized branches and computerization expenditure to operating expenditure.
2.3.1.6 The metrics measuring performance

Various studies have been undertaken to measure the impact of IT on organizational performance (efficiency and effectiveness) using different performance indicators which are considered key factors for assessment. Researchers like Parthasarthy and Sethi (1993), Kelley (1994), Earl et al. (1996), O’Dell and Elliot (1999) etc. have investigated the impact of IT using quantitative performance variables i.e. income/profit of the companies. Woo and Willard (1983) found profitability measures such as return on investment, return on sales, and growth in revenues to be the important performance measures. Petersan and Waterman (1982) suggested the inclusion of financial market measures such as the market to book value ratio as a determinant of a firm's strategic performance. Chakravarthy (1986) argued, however, that profitability or financial market measures alone are incapable of measuring organizational strategic performance because they are concerned primarily with maximization of stockholders’ wealth; the interests of other stakeholders are ignored. Based on extensive research, he suggested the inclusion of an additional productivity measures such as sales revenue per employee, and additional variables that measure the effectiveness of an organization's management of slack resources, such as sales to total assets, which can capture a firm's potential future performance.

Commonly used performance ratios in banking sector are; businesses per employee, business per branch, return on assets and return on equity. One of the core benefits of computerization is the ability to generate high volume of business with low number of people. Business per employee is used to understand the trend in labor productivity devoid of the influence of various other aspects such as pricing of services rendered by
the bank. Business per branch ratio indicates expansion of new business, rationalization of branches by banks, and evolution of new business strategies like installation of ATMs so as to economize on cost and capitalize on technology. Return on Assets (ROA) gives an indication as to how much profit a business unit (bank in the instant case) is able to generate per unit of its assets. The Return on Equity (ROE) indicates the amount of profit a business unit is generating for its equity investors. On the other sides researchers like Franklin (1997), Olalla (2000), Schmidt et al. (2001), Zee and Han (2002) used different qualitative variables such as customer satisfaction, user satisfaction, company image, job interest of employees, stake holders confidence, and interoffice link in measuring the performance.

Based on the above review of literature the present study has selected the following output variables to be used for application of DEA technique: business per employee, business per branch and operating profit per employee.

2.3.2 Non-economic approaches of IT evaluation: measures, dimensions and models

Evaluating the information technology has been identified as one of the most critical issue in the field of IT management. Several conceptual and empirical studies have been conducted to explore this important issue. As IT investment grows, its evaluation poses challenges to IT managers and steering committees. The identification of causes of poor IT performance becomes important. Ives and Olson (1984) argue that the ideal measure and perhaps meaning of the concept of IT success is “the aggregate organizational benefit accruing from it (the computer based information system) when compared with alternative investment.” Such analysis would reveal the economic benefit of the system. Ives and Olson acknowledge, however, that such an economic analysis is difficult and
rarely possible and non-economic measures are much more frequently used as a surrogate for IT success. Subjective success evaluation and multi-item measuring scales have been advocated by many IT researchers (Bailey & Pearson, 1983; Ives et al, 1983; Miller, 1989). The scope of the success measures as well as the approaches for the measurement varies a lot in the IT literature. The studies that used surrogate measures and dimensions to evaluate the IT are discussed in this section.

**System quality**

In evaluating the contribution of information technology to the organizations, some researchers have treated the system quality as surrogate measure of IT success. In one of the early study, Swanson (1974) used several system quality items like reliability of the computer systems, on-line response time, and ease of terminal use to measure management information system (MIS) appreciation among managers of the firms. Kriebel and Raviv (1980, 1982) used resource and investment utilization as a performance measures and has created and tested a productivity model for computer systems. Bailey and pearson (1983) developed and tested the scale of 39 items, which included the system related dimensions i.e. convenience, flexibility, integration, response time along with other dimensions to measure the user satisfaction. Alloway (1980) used efficiency of hardware utilization as one of the system success criteria among 26 criteria developed for measuring the success of a data processing operation. Hamilton and Chervany (1981) proposed response time, turnaround time, data accuracy, reliability, completeness, system flexibility and ease of use among others as part of a formative evaluation scheme to measure system quality.
Rainer and Watson (1995) examined ease of use, as well as the presence of specific functions of the system as measures of system quality in their study of executive information system success. Rivard et al. (1997) developed and tested an instrument consisting of 40 items that measured eight system quality factors namely reliability, portability, user friendliness, understandability, effectiveness, maintainability, economy, and verifiability. Sedra et al. (2004) created a multidimensional instrument to measure information success. He identified the factors like ease of use, ease of learning, user requirements, system features, system accuracy, flexibility, sophistication, integration, customization as key characteristics of system quality.

**Information quality**

Some researches have focused on the quality of output produced by information systems mainly in the form of reports, rather than measuring the quality of system performance. Information quality is often taken as a key dimension of instruments used to measure end-user satisfaction (Ives et al., 1983; Baroudi & Orlikowski, 1988; Doll & Torkzadeh, 1994). As a result, information quality is often not distinguished as a unique construct but is measured as a component of user satisfaction. Baroudi and Orlikowski (1988) created a multidimensional instrument to measure user satisfaction with IT and identified reliability, relevance, accuracy, precision and completeness of output information as a key characteristics of information quality dimension. Ahituv (1980) incorporated five information characteristics into a multi-attribute utility measure of information value, which are accuracy, timeliness, relevance, aggregation and formatting. Gallagher (1974) in order to measure the value of group of IT reports, developed semantic differential instrument, which included the measures such as relevance, informativeness, usefulness,
and importance. Zmud (1978) in his work included report format as an information quality measure in his work. Olson and Lucas (1982) proposed report appearance and accuracy as measures of information quality in office automation information systems. King and Barry (1983) proposed multiple information attributes to yield composite measure of information value. The proposed information attributes included; sufficiency, understandability, freedom from biasness, reliability, decision relevance, comparability and quantitativeness. Miller and Doyle (1987) in their study of 21 financial firms incorporated completeness, relevance, accuracy and timeliness as measures of information quality. Saaksjarvi and Talvinen (1993) used content, availability, and accuracy as measures of information quality in their study of two specific marketing information systems. Rainer and Watson (1995) in their study of the keys to executive information system success used accuracy, timeliness, conciseness, convenience, and relevance of the information as measures of information quality. Sedra et al. (2004) created a multidimensional instrument to measure information success and identified availability, usability, understandability, relevance, format conciseness as key characteristics of information quality dimension. Fraser and Salter (1995) developed a generic scale of information quality, and others based on the type of information systems developed their own scales using the literature to measure the information quality (Coombs et al., 2001; Wixom and Watson, 2001; Gable et al., 2003).

Service quality

In the last decade, role of IT department has been expanded from product developers to service providers. Users expect the IT department to assist them in variety of tasks such as problem resolution, hardware and software selection, identification of outsourced...
services, IT systems installation and systems training. IT department is not just provider of products but also of services. The quality of IT department’s services, as perceived by its users, is a key indicator of IT success (Moad, 1989; Rockart, 1982; Roses et. al., 2009). Service quality is the most researched area of service marketing (Fisk et al., 1993). High quality services generate more customer satisfaction, customer retention, profit, cost reduction, and a good image of the enterprise (Buttle, 1996; Jiang et. al., 2003). Parasuraman et al. (1985) investigated the concept by conducting series of extensive focused group interviews and concluded that service quality is nothing but comparison between what the customer feels should be offered and what is being provided. Other marketing researchers (Gronroos, 1982; Sasser et al., 1978) also supported the fact that service quality is the gap between customers’ perception and expectation. Conrath and Mignen (1990) reported that the second most important component of user satisfaction, after general quality of service, is the match between users’ expectations and actual IT services being delivered. On the basis of data obtained from four independent samples (banking service, credit cards processing service, repair and maintenance service, and long distance telephone service), Parasuraman, Zeithaml, and Berry (1988) developed the SERVQUAL instrument to measure the gap between customer expectations and services received. The scale was designed to be applied to a broad spectrum of services. The model evaluated service quality using two instruments. Each contains 22 items, distributed into five dimensions (constructs), according to the definitions in Table 2.3.
Table 2.3: Five dimensions of service quality

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Definition</th>
<th>Number of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangibles</td>
<td>The appearance of physical facilities, equipments, personnel, and communication materials.</td>
<td>4</td>
</tr>
<tr>
<td>Reliability</td>
<td>The ability to perform the promised service dependably and accurately.</td>
<td>5</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>The willingness to help customers and to provide prompt service.</td>
<td>4</td>
</tr>
<tr>
<td>Assurance</td>
<td>The knowledge and courtesy of employees and their ability to convey trust and confidence.</td>
<td>4</td>
</tr>
<tr>
<td>Empathy</td>
<td>The firm provides care and individualized attention to its customers.</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Adopted from Parasuraman, Zeithaml, and Berry (1988)

The first instrument, SERVEXP, assessed clients and supplier’s expectations related to the service, whereas the second instrument, SERVPERF, assessed clients and supplier’s perception of performance regarding the service provided. Parasuraman et al. (1988) suggested, “SERVQUAL provides a basic skeleton through its expectations/perceptions format encompassing statements for each of the five service quality dimensions. The skeleton, when necessary, can be adapted or supplemented to fit characteristics of specific research needs of a particular organization”.

SERVQUAL is the most frequently used measure of service quality in IT. It has also received some criticism like; (i) the poor predictive and convergent validities of SERVQUAL as a service quality measure (Pitt et al., 1995; Kettinger & Lee, 1997; Van et al., 1997); (ii) the operationalization of perceived service quality as a gap score (Cronin & Taylor, 1992); (iii) the ambiguity of the expectation instrument (Teas, 1993); and (iv) the use of a single generic measurement to measure service quality in different types of industry (Babakus & Boller, 1992). However, using confirmatory factor
analysis, Jiang et al. (2002) found that SERVQUAL is indeed a satisfactory instrument for measuring IT service quality. Pitt et al. (1995) assessed the suitability of SERVQUAL in three different types of organizations in three countries. After examination of content validity, reliability, convergent validity, nomological validity, and discriminant validity, the SERVQUAL is found to be an appropriate instrument for researchers seeking to measure the IT service quality. Van et al. (1997) reported that the performance perception assessment instrument is more adequate than the expectation assessment instrument, since the latter does not have better psychometric properties than the former. Cronin and Taylor (1992), and Teas (1993), also recommended that expectation ratings be eliminated altogether to overcome the problems of SERVQUAL instrument. In addition, Bolton and Drew (1991) stated that assessment of overall service quality is affected only by perception of performance levels. They suggested that direct measures of disconfirmation are more important than expectations. Boulding et al. (1993) also suggested that perceptions of performance alone influence overall service quality.

SERVQUAL has been adapted and supplemented to fit characteristics of specific research needs of a particular organization. Yoon and Guimaraes (1995) in assessing the expert system impact on users’ job, used the measures like skill, experience, and capabilities of the support staff in addition to the measures of SERVQUAL. Outsourcing for systems development and support, service quality often involves an external provider as in the case of banks. The responsiveness of the vendor affects the perception of users, how ‘cooperative’ that vendor will be (Gefen, 2000).
Babbar (1992) extended the service quality model to include system hardware and networking requirements and the dynamics of system operation and control. Nath (1992) used the work of Parasuraman et al. (1985) to develop a framework to improve service quality. His framework involved the examination of the interface between the customer, the employee, and the existing IS applications to detect where applications of information technology require alteration in the interfaces in a positive way either for the customer or for the organization. He proposed that the effect of the change on the customer should be evaluated in terms of how it influences the ten determinants of service quality i.e. reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding the customer and tangibles. Funston (1992) developed the service quality model and depicted gaps in service quality, communication, delivery, and design where measurement and improvement are possible. Roses et al. (2009) evaluated the perception gaps of service quality between IT service providers and their clients using SERVPERF of the SERVQUAL model. In a study of large Brazilian retail bank, they found that improvement is possible in all the five dimensions of SERVPERF i.e. tangibility, reliability, responsiveness, assurance and empathy.

In our study we have used SERVPERF instrument of the SERVQUAL model to measure service quality.

**System use**

A rationale for the application of system use as an IT success measure is the idea that it does not contribute to performance if it is not used. Several researchers (Hamilton & Chervany, 1981; Iivari, 2005) have proposed system usage as a measure of IT success.
Some researchers have argued that system use is not a valid measure when a system usage is mandatory. The actual use as a measure of IT success only makes sense for voluntary users as opposed to captive users (Lucas, 1978; Welke & Konseynski, 1980). Taking the clue, Maish (1979) chose voluntary use of computer terminals and voluntary requests for additional reports as measures of IT success. Seddon and Kiew (1994) recommended replacing use with usefulness, stating that use only affects satisfaction when use is voluntary. Seddon and Kiew (1996) found that, in a mandatory context, use measured by system importance, was not related to user satisfaction. Seddon (1997) recommended the removal of system use as a success measure because it was deemed more a characteristics of user behavior than a measure of system success. Others have suggested the need to examine use from a multi level perspective across the individual and organizational levels to enable a better understanding of this construct (Burton-Jones & Gallivan, 2007). Markus and Keil (1994) suggested that organizations should approach system development as business process reengineering and ensure that implementation ability, or use, is built in, rather than develop an IT system to solve organizational problems and mandate its use. Further they argue that system use is inevitable when the interests of developers and users are aligned, and system use is encouraged through rewards and incentives.

In our study, we have not considered system use as a measure of IT success, since in PSBs the use of IT systems is mandatory.

**User satisfaction**

User information satisfaction has been defined as a “multidimensional attitude towards various aspects of the IT such as output quality, man-machine interface, Electronic Data
Processing (EDP) staff and services, and various user constructs such as feeling of participation and understanding” (Raymond, 1985). The measurement of how satisfied a user is with his or her information system (User Information Satisfaction or UIS) has become a pervasive measure of the success or effectiveness of an information system. Ives and Olson (1984), for example, reviewed the IT user involvement research literature and found thirteen studies which utilized UIS as the dependent variable or indicator of success. The user information satisfaction (UIS) instrument, a standard measure of user satisfaction has been developed as a measure of system success and is found to be widely adopted (Bailey & Pearson, 1983; Baroudi & Orlikowski, 1988; Ives et al, 1983; Doll & Torkzadeh, 1994). Bailey and Pearson (1983) defined user satisfaction as “the sum of one's positive and negative reactions to a set of factors affecting the success of an information system”. They constructed an instrument, consisting of 39 items and several adjective pairs for each item. Ives et al. (1983) refined and abbreviated Bailey and Pearson’s instrument into a short, 13 items questionnaire. They also modified the definition of UIS to the extent of the users' belief in the efficacy of the information system available to them in meeting their information requirements. Factor analysis identified three factors of UIS; the information system product (quality of output), support (quality and service of the IT function), and involvement (knowledge of the systems or involvement in the development of the systems).

Baroudi and Orlikowski (1988) evaluated the psychometric properties of the short-form UIS instrument and found it to be reasonably valid and reliable. This short-form UIS instrument has seen wide use, but also has been criticized. Doll and Torkzadeh (1994) produced a 12-item instrument for measuring end-user computing satisfaction (EUCS). The instrument identifies and measures five components of end-user satisfaction which are; content of systems, accuracy of systems, format of reports, ease of use of systems
and timeliness of systems. In a comparison between Doll and Torkzadeh’s (1994) EUCS and Ives’ et al. (1983) UIS, Seddon and Yip (1992) found that EUCS instrument outperformed the UIS instrument in the context of accounting information system. However, both the EUCS and UIS instruments contain items related to system quality, information quality, and service quality, rather than only measuring overall user satisfaction with the system. Because of this, some researchers have chosen to phase out the various quality dimensions from these instruments and either use a single item to measure overall satisfaction with an information system (Rai et al., 2002) or use a semantic differential scale (Seddon & Yip, 1992). Others have used scales for attitude that are compatible with the concept of user satisfaction (Coombs et al., 2001).

Kettinger and Lee (1994) compared the SERVQUAL instrument with the UIS instrument and found them generally mutually exclusive and complementary. So, both service quality and user satisfaction should be measured. But the reliable measurement of user satisfaction requires further study.

The development of UIS has been a very important and promising step towards better measures for the IS success. However, some researchers have also pointed out the problems associated with UIS. Melone (1990) questioned its use, since the UIS construct had not been integrated with user attitude theory. Galletta and Lederer (1989) found that the short-form UIS instrument proposed by Ives et al. (1983) did not exhibit test/retest reliability, but four summary questions of overall satisfaction did behave reliably. Conrath and Mignen (1990) found that even though the literature widely supports the measurement of user satisfaction, very few are actually measuring it. Only 26 percent of their sample of large Canadian firms has any formal mechanism in place to measure customer satisfaction.
**Individual impact**

This dimension, measures the contribution of information technology towards the performance of users. Improvement in user performance indicates the positive impact of IT and is usually considered important dimension of IT success. Delone and Mclean (1992) characterized individual impact as “an indication that an information system has given user a better understanding of the decision context, improved his or her decision making productivity, produced a change in user’s activity, or changed the decision maker’s perception of the importance or usefulness of the information system”. Seddon (1997) interpreted individual impact as “benefits accruing to individuals from system use”. Many studies have suggested that IT has effects on nature of office work, job satisfaction and quality of social and work life of the office workers. Coates (1988) as well as, Kaye and Sutton (1985) found that computerization has affected office work productivity, as well quality of work life of those involved in office work. Bikson et al. (1985) found that majority of users felt that their work performance has improved with the help of IT. Rivard and Huff (1984) included user’s productivity as one of the measure in their measures of IT success. DeBrabander and Thiers (1984) used efficiency of task accomplishment as the dependent variable in their study. Rainer and Watson (1995) measured impact of IT on executive work using the variables such as efficiency, higher-quality decisions, communication, and operational control. Igbaria and Tan (1997) measured the perceived performance impact using the variables such as decision making quality, performance, productivity and effectiveness of the job. They used questionnaire data provided by 371 employees of large organizations located in Singapore and found a significant, positive influence of user satisfaction on both usage and individual impact. Sedra et al. (2004)
created a multidimensional instrument to measure information success, which included the measures of individual impact i.e. learning, awareness/recall, and decision effectiveness.

**Organizational impact**

This dimension, measures the contribution of information technology towards performance of organizations. Improvement in organization performance indicates the positive impact of IT and usually considered important dimension of IT effectiveness or success. The study conducted by Branchau and Wetherbe (1987), in the survey of IT professionals found that measurement of IT systems effectiveness is the ninth most important issue for them. Measures of individual performance and to a greater extent of organizational performance are of considerable importance to IT professionals. Several researchers have suggested that the success of the IT department is reflected in the extent to which the computer is applied to major problem areas of the organization (Rockart, 1979; Senn & Gibson, 1981). Cerullo (1980) ranked IT success on the basis of a firm’s ability to computerize complex applications. Rivard and Huff (1984) interviewed the data processing executives of large companies and asked them to assess the cost reductions and organization’s profits realized from specific user-developed application programs. Brynjolfsson and Hitt (1995) in their study of, objectives of IT investment by the companies, found that some focused on cost savings and improved management control while others have a customer orientation, quality, flexibility, and speed. They further found that the customer-oriented companies have higher profits and productivity. Sedra et al. (2004) created a multidimensional instrument to measure information success, which included the measures of organizational impact i.e. staff reduction, cost reduction, overall productivity, improved output, increased capacity, e-Government and
business process change. Gupta et al. (2007) in their study of government organizations identified measures of IT effectiveness, which included; communication, decision-making, effectiveness and organizational responsiveness.

**IT success models**

Using various interrelated dimensions, researchers have derived a number of models to explain what makes IT successful. Davis’s (1989) technology acceptance model (TAM) used the theory of reasoned action and theory of planned behavior as proposed by Fishbein and Ajzen (1975). According to the theory of reasoned action, beliefs influence attitude, which in turn lead to intention, which then, generate certain behaviors. TAM explains why some IT systems are more readily accepted by users than others. Acceptance, however, is not equivalent to success, although acceptance of an information system is a necessary precondition to success. TAM specifies the causal relationships between system design features, perceived usefulness, perceived ease of use, attitude toward using and actual usage behavior. It is mainly used to explain the impact of system characteristics and end user behavior on the actual system use. Figure 2.1 outlines the major elements and relationships according to this model.

**Figure 2.1: Davis’s technology acceptance model**

```
Perceived usefulness

Perceived ease of use

Behavioral intention to use

Actual system use
```

Source: Davis et al. (1989)
Behrens et al. (2005) investigated TAM of Davis (1989) to reason out, why an online assignment submission system, has become successful. Their findings revealed that TAM measures of perceived usefulness and perceived ease of use are effective predictors of IT success.

Saunders and Jones (1992) developed the "IS Function Performance Evaluation Model" to describe how measures should be selected from the multiple dimensions of the IS function relative to specific organizational factors based on the perspective of the evaluator. Delphi technique has been applied to examine how IS function performance dimensions are ranked in importance by IS executives, how the IS executives measured performance of each dimension, and the value they placed on the measures. The authors also interviewed several chief executive officers (CEOs) of the study organizations to find out the degree of their awareness and support for IS function activities. The highest-ranked dimension is found to be the IS function impact on strategic direction, followed by the integration of the IS function planning with corporate planning, the quality of information outputs, and the IS function's contribution to organizational financial performance.

One of the most commonly cited models for IT success is the one developed by Delone and McLean (1992). They reviewed the research publications during the period 1981 to 1987, and created taxonomy of IS success based upon this review. Their model proposed six interrelated variables to measure the success of IT viz. system quality, information quality, system's use, user satisfaction, organizational impact, and individual impact (Figure 2.2). However, these six variables are not independent success measures, but are interdependent variables. They contended that system quality and information quality singularly and jointly affect both use and user satisfaction. Additionally, amount of use can affect the degree of user satisfaction and vice versa.
After the publication of the Delone and McLeon (1992) success model, many modifications have been proposed by researchers to this model. Seddon (1997) recommended for the removal of system use as a success variable, claiming that use is a behavior and appropriate for inclusion in a process model but not in a causal model. Pitt et al. (1995) proposed addition of service quality dimension to Delone and McLeon model. Other researchers have agreed with this, citing the need for a service quality measure to be a part of IT success (Kettinger & Lee 1994; Wilkin & Hewitt 1999). Some researchers have modified it to evaluate success of specific applications such as knowledge management (Kulkarni et al., 2006; Wu & Wang, 2006) and e-commerce (DeLone & McLean, 2004; Zhu & Kraemer, 2005).

Iivari J. (2005) tested the model of information system success proposed by Delone and Mclean (1992). The results have shown that perceived system quality and perceived information quality are significant predictors of user satisfaction but not of system use. User satisfaction is found to be a strong predictor of individual impact, whereas the influence of system use on individual impact is observed to be insignificant.
Based on criticisms and suggestions received by various researchers, Delone and McLean (2003) in their later study revealed that IT quality has three major dimensions viz. information quality, system quality and service quality which will affect "use" and "users' satisfaction". The primary difference between the original model of Delone and McLeon (1992) and updated model (2003) is the inclusion of service quality to reflect the importance of service and support in successful IT systems (Figure 2.3). Another update to the model addressed the criticism that an information system can affect levels other than individual and organizational. Because IT success affects workgroups, industries, and even societies (Myers et al., 1997; Seddon et al., 1999), therefore Delone and McLean (2003) replaced the variables of individual impact and organizational impact, with net benefits, thereby accounting for benefits at multiple levels of analysis. This revision allowed the model to be applied to whatever level of analysis the researcher consider more relevant.

**Figure 2.3: Updated DeLone and McLean IT success model (2003)**

Petter et al. (2008), using the technique of a qualitative literature review, identified 90 papers in the academic literature published between the period 1992 to 2007 dealing with the six IT success measures of the Delone and McLean model i.e. system quality, information quality, service quality, use, user satisfaction, and net benefits (individual
impact and/or organization impact). They found considerable support for Delone and McLean (1992) as well as Delone and McLean (2003) model.

Landrum and Prybutok (2004) collected the responses from 385 end users at two U.S. army corps of engineers’ libraries and tested the Delone and McLean model in libraries success. They found that system quality, information quality and service quality have significant effect on user satisfaction and usefulness.

Almutairi and Subramanian (2005) applied Delone and McLean model in private sector organizations of Kuwait and found that information quality and system quality impact user satisfaction significantly and system usage has significant influence on individual impact. Further results indicated that service quality is an important factor in success.

Building on the work of Bailey and Pearson (1983), and Alloway and Quillard (1981), Miller and Doyle (1987) developed the instrument to evaluate the overall effectiveness of IT systems. The developed instrument consisted of six factors i.e. traditional systems, end-user computing, strategic issues, responsiveness to change, user participation and IT staff characteristics. The instrument tapped the perceptions of respondents (users and IT staff) regarding organizational importance and IT performance on a range of items. Authors collected the responses to the instrument from 800 users and IT managers in the manufacturing, retailing and financial services sectors yielding high IT performance rating associated with high level of correlation between organization importance and IT performance.

Saarinen (1996) studied the IT development projects taken up by Finnish companies and identified the four dimensions of IT success i.e. the development process, use process, IT product quality and impact of the IT on the organization.
Whyte and Bytheway (1996) identified 21 attributes viz. accuracy, business alignment, competence, complexity, control, direction, documentation, effectiveness, friendliness, front office, integration, marketing, necessity, reliability, reporting, responsiveness, specification, training, understanding, upkeep, user each one of which has been likely to influence the user’s perception of information system success.

Wixon and Todd (2005) developed an integrated research model that distinguish beliefs and attitudes about the system (object-based beliefs and attitudes) from beliefs and attitudes using the system (behavioral beliefs and attitude) to build a theoretical logic that links the user satisfaction and technology acceptance. The proposed model (Figure 2.4) provided preliminary evidence that the two perspectives can and should be integrated. The integrated model helps bridging the gap between system characteristics and the prediction of usage.

**Figure 2.4: Wixon and Todd’s model (2005)**

Elpez and Fink (2006) identified key IT success factors for public sector and ranked them according to their importance. Rank wise these factors include; meeting user’s requirement, system usability and performance, information quality and use, user acceptance and IT ownership and interactions with the rest of IT infrastructure.
Gupta et al. (2007) in their study of IT effectiveness in Indian government organizations, treating IT effectiveness as dependent variable and top management involvement, IT management, user satisfaction, organizational culture and IT use as independent variables, found that user satisfaction is the indicator of system success, users are influenced more by the IT staff in comparison to non-IT staff and top management involvement is observed to be high in IT-related problems resulting in higher budget for IT, which in turn played a positive role in increasing the satisfaction of users.

Al-adaileh (2009) in his proposed model of IT success identified five factors i.e. system's ease of use, system's usefulness, user's technical capabilities, information quality and management support. In a survey of 247 IT users of Jordan Telecom Group, he found that among the five factors that he explored in his study, four factors viz. system’s usefulness, user's technical capabilities, information quality and management support are determined as influential factors. System's ease of use has been excluded from proposed model as this factor is not found to have significant impact on the users’ perception of IT success.

Based on the review of literature, researchers have identified IT success factors which include; system quality, information quality, service quality, user knowledge and involvement and strategic issues. Further a model of IT success has been proposed which links these success factors to business performance. As per proposed model the system quality, information quality, service quality, user’s knowledge and involvement and strategic issues affect user’s satisfaction. User’s satisfaction is the direct antecedent of individual impact, which should also have organizational impact. The details of the proposed model to be tested in the present study are given in chapter 3 and the results of the test of proposed model are discussed in chapter 4.
2.4 Research gaps

In our review of literature, we have attempted to cover the studies, which have used both economic and non-economic measures to find out the impact of information technology. Certain gaps identified in the literature are as under are:

i) Very few studies conducted at firm level have measured the IT impact in service sector in general and banking sector in particular.

ii) Studies have reported either positive or negative impact of IT using economic measures. But these studies have not provided the reasons for the outcome.

iii) IT success models available in literature are generic in nature. Normally each industry has its own characteristics and requires separate measures and models to be applied.

iv) Though a few studies on the subject have been undertaken in other countries, but in Indian context very few studies have been undertaken.

v) To measure the IT impact, the existing studies have either relied on economic or non-economic measures. None of the studies have taken together economic and non-economic measures to assess the IT impact.

2.5 Concluding remarks

The studies in the area of measurement of IT impact on organization’s performance are found to be too diverse in their choice of unit of analysis, methodology and their theoretical underpinning. Studies have suggested various economic methods ranged from ratio analysis to statistical and econometric measures to assess the impact of IT on organization’s performance. Many studies have also suggested non-economic or
surrogate measures i.e. user satisfaction with IT, IT service quality, system quality, information quality and IT success models designed by combining these measures. Review of existing studies on the subject has resulted in identification of research gaps which helped the researchers in selection of right variables, method and model for achieving the objectives of the study. Chapter 3 presents the details of research design of our study.
References


