4.1 INTRODUCTION

The main aim of this research is the search for knowledge through objective and systematic method of finding solutions to the problem of introducing e-governance in the administration of affiliating Indian universities, so as to improve performance at all levels. The systematic method consists of enunciating the problem, formulating hypothesis, collecting and analyzing data through questionnaire and personal intensive interviews and reaching conclusion and recommendations by using statistical methods for data analysis.

Many types of research including descriptive, analytical, applied, fundamental, quantitative, qualitative, conceptual, empirical, laboratory, historical and basic research have been developed for this purpose, and each type has its own specific features. No matter what type of research the researcher intends to use, they need to focus their efforts on answering two specific questions. Firstly, what methodologies and methods will be used in the research? Secondly, how do they justify this choice and use of these methodologies and methods? Justification of their choices and particularly uses of methodology and methods is something that reaches into the assumption about reality that they bring to their work (Crotty, 1998).

---

41 C R Kothari, 1997
This chapter provides details on the methodology adopted for this study, data collection procedure and tools used for data analysis.

4.2 RESEARCH PROBLEM
Defining a research problem involves the task of laying down boundaries within which a researcher shall study the problem with a predetermined objective in view.

The researcher has given a detailed study of various administrative activities involved in the context of affiliating Indian university in chapter II. Since, number of colleges affiliated to an university is large in number, heavy clerical work is involved in administration. Hence, the main aim of this study is to identify areas where e-governance can be effectively implemented. Since, all the people involved in the various activities in an university system are highly educated and already familiar with the use of e-mail and internet, this is the most ideal situation for effective implementation of e-governance. Hence, in this research the researcher have taken up the study of the problems involved in the implementation of e-governance in affiliating Indian universities and identify potential areas where e-governance can be implemented.

4.3 RESEARCH DESIGN
Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure\(^{42}\).

---

\(^{42}\) Claire Seltiz and others, Research Methods in Social Sciences, 1962, p.50
The research design is the conceptual structure within which research is conducted. It consists of the following steps.

- Formulating the objective of the study
- Designing the methods of data collection
- Selecting the sample
- Collecting the data
- Processing and analyzing the data
- Reporting the findings

4.3.1 OBJECTIVES OF THE STUDY

The following are the main objectives of the present study.

- To identify the potential areas in affiliating Indian university administration where e-governance can be implemented.
- To determine the preparation required for implementing e-governance for each of the identified areas.
- To identify the minimum infrastructure required to implement e-governance in Indian affiliating universities.
- To examine potential problems that may be encountered, while implementing e-governance in Indian affiliating universities and suggest/find methods for overcoming the same.
4.3.2 HYPOTHESIS

The following are the main hypothesis of the present study

- $H_1$: PU is positively significant on impact of Intention to Use
- $H_2$: FC is positively significant on impact of Intention to Use

4.3.3 METHODOLOGY

For data collection in various social sciences related research the questionnaire method is most extensively used. Through this efficient data collection mechanism, the questionnaires can be distributed to a large number of individuals simultaneously and the entire process is less expensive and less time consuming.

For this study the population comprises faculty members and nonteaching staff of the university, students of the university departments, research scholars, distance education students and students in affiliated colleges in India. The researcher used the descriptive survey method using a structured questionnaire to collect the necessary data for this study. In addition to this the researcher employed intensive personal interviews with administrators and academicians at various levels in different universities to get additional information such as problems that may be encountered in implementation of e-governance, possible steps to be taken to overcome such problems.

It was confirmed in the covering letter to all the academics that the data collected would be strictly handled in consideration of issues of anonymity and confidentiality.
In order to improve the response rate, the researcher often reminded the respondents to establish the representativeness of the sample.

4.3.4 QUESTIONNAIRE DESIGN

In this study, the researcher got the response for each question from the respondents in a five point scale. In a likert scale, the respondents recorded their views using the following five degrees.

| Strongly Agree | Agree | undecided | Disagree | Strongly Disagree |

4.3.5 PILOT STUDY

The size of the pilot group may range from 25 to 100 subjects (Cooper & Schindler, 1998). For this research the Pilot Study was carried out with 50 respondents from each category. Based on the Pilot testing, improvement in the questionnaires were made and the final study was undertaken. Based on the pilot study the researcher modified a few questions and deleted some questions which the response was found to be inconsistent.

4.3.6 DATA COLLECTION

Collection of data from all Indian affiliating universities is practically impossible because they are scattered in twenty nine states in India. Hence, in addition to data collection by visiting universities in Tamil Nadu, Kerala and Karnataka it was decided to use email and post for further data collection from most of the institutions. Further intensive personal interviews with administrators at various levels were carried out to get further data on various issues of introducing e-governance.
The researcher made sincere efforts to collect data from all Indian affiliating universities and sent questionnaires to all 245 universities. However, the researcher was able to receive the filled questionnaires from 162 universities including one medical university, two engineering universities, ten central universities and one hundred and forty nine state universities.

The various groups of people involved in Indian university affiliating systems are:

- Teaching faculty in the university departments and in the colleges affiliated to the university.
- Administrative staff (non-teaching) in the university.
- Students studying in the university departments.
- Students from the colleges affiliated to the university.
- Distance Education mode Students.
- Research scholars in the university departments and research centers in the colleges affiliated to the university.

For this study the researcher has taken the population as group of people mentioned above. To collect data from each of the above groups the researcher personally visited universities in Tamil Nadu, Kerala, Karnataka and Andhra Pradesh and some of the colleges affiliated to these universities. The questionnaires were distributed randomly to the individuals in each of the above categories and the filled-in questionnaires were collected from them.
Apart from such personal visits, the researcher contacted heads of institutions/departments in various universities throughout the country through email, sent questionnaires with a request to distribute the same to members in the various categories and return the filled-in questionnaire through email. The researcher was able to collect data from various universities throughout the country. The researcher targeted a sample of size 500 for each category. The process of data collection was spread over a period of six months starting from July 2008.

The researcher has designed and developed a different set of questionnaires for each of the above mentioned categories on the basis of some specific factors which are significant for the implementation of e-governance and the details are given below.

The data was collected from the respondents through survey method using structured questionnaires. Table 4.1 gives the information about the sample size.

<table>
<thead>
<tr>
<th>Category</th>
<th>Mail</th>
<th>Direct</th>
<th>Post</th>
<th>Total number of collected data</th>
<th>Total number of usable data</th>
</tr>
</thead>
<tbody>
<tr>
<td>College students</td>
<td>263</td>
<td>172</td>
<td>Nil</td>
<td>435</td>
<td>414</td>
</tr>
<tr>
<td>Distance education mode students</td>
<td>274</td>
<td>122</td>
<td>28</td>
<td>424</td>
<td>409</td>
</tr>
<tr>
<td>University students</td>
<td>301</td>
<td>139</td>
<td>Nil</td>
<td>440</td>
<td>423</td>
</tr>
<tr>
<td>Research scholars</td>
<td>354</td>
<td>72</td>
<td>4</td>
<td>430</td>
<td>423</td>
</tr>
<tr>
<td>Teaching faculty</td>
<td>372</td>
<td>69</td>
<td>7</td>
<td>448</td>
<td>441</td>
</tr>
<tr>
<td>Non-teaching faculty</td>
<td>345</td>
<td>76</td>
<td>11</td>
<td>432</td>
<td>421</td>
</tr>
</tbody>
</table>

Table 4.1
4.3.6.1 TEACHING STAFF

In this questionnaire for teaching staff the researcher has included 32 questions, which were divided into five factors. The questionnaire is given in Annexure A and the five factors are given below.

- Creation of Database for teaching staff in the university department
- Online maintenance of students record
- Online facility for staff members
- Examination related activities
- Administration related activities

Items 1 to 6 in the questionnaire deal with the database creation for teaching faculty in an Indian affiliating university. Items 7 to 13 in the questionnaire deal with the online maintenance of student records, items 14 to 22 deal with the online facility for staff members, items 23 to 27 deal with the examination related activities and items 28 to 30 deal with administration related activities.

4.3.6.2 NONTEACHING

The non-teaching staff in the university forms the major group, whose total involvement is absolutely essential for successful implementation of administrative reforms, including e-governance. Hence, a questionnaire consisting of 74 items were developed for this group with the following seven factors. The questionnaire is given in Annexure B.

- Creation and maintenance of records
- Distance education related activities
- Processes of affiliation
- Finance related activities
- Meetings of various bodies
- Examination related activities
- Communication between sections in the university

Items 1 to 11 in the questionnaire deal with the creation and maintenance of records in the Indian affiliating university. Items 14 to 19 in the questionnaire deal with the distance education related activities, items 20 to 30 deal with the affiliating process, items 31 to 41 deal with the finance related activities, items 42 to 51 deal with the meetings of various bodies, items 52 to 62 deal with the examination related activities and items 63 to 76 deal with communication between sections in the Indian affiliating universities.

4.3.6.3 RESEARCH SCHOLARS

The questionnaire for research scholars consists of 27 questions with the following five factors. The questionnaire is given in Annexure C.

- Database creation for research activity
- Thesis evaluation process.
- Details of projects/doctoral thesis
- Facility for research
- Communication between the research scholar and the university

Items 1 to 6 in the questionnaire deal with the database creation for research activity in an Indian affiliating university. Items 7 to 13 in the questionnaire deal with the
thesis evaluation process, items 14 to 16 deal with the details of projects/doctoral thesis, items 17 to 23 deal with the facilities available for research and items 24 to 27 deal with communication between the research scholar and the university.

### 4.3.6.4 UNIVERSITY STUDENTS

The questionnaire for university students consists of 32 questions with the following four factors. The questionnaire is given in Annexure D

- Admission process
- Database creation
- Examination related activities
- Students centered activities

Items 1 to 6 in the questionnaire deal with the admission process in an Indian affiliating university. Items 7 to 17 deal with the database creation, items 18 to 20 in deal with the examination related activities and items 21 to 32 deal with the students centered activities.

### 4.3.6.5 DISTANCE EDUCATION MODE STUDENTS

The questionnaire for distance education mode students consists of 14 questions with the following three factors and the questionnaire is given in Annexure E.

- Database creation
- Course material and examination
- Admission
Items 1 to 4 in the questionnaire deal with the database creation, items 5 to 10 deal with the course material and examination related factors and items 11 to 14 deal with admission related activities.

4.3.6.6 COLLEGE STUDENTS

The questionnaire for college students consists of 10 questions with the following three factors. The questionnaire is given in Annexure F

- Database creation
- Course material
- Examination

Items 1 to 4 in the questionnaire deal with the database creation, items 5 to 7 deal with course material and items 8 to 10 deal with examination related activities.

4.3.7 DATA ANALYSIS

The data collected from respondents were coded and entered into Statistics package, SPSS ver. 16 for data analysis. Data was entered by an independent volunteer to check the codes and verify with the original questionnaire randomly for errors and corrections. Data analysis and Interpretation is classified into three categories and different statistical tools were used for data analysis. To interpret the data we checked the reliability test, Cronbach's Alpha, KMO and Bartlett's Test and factor analysis.

4.3.7.1 RELIABILITY TEST

In statistics, reliability is the consistency of a set of measurements or measuring instrument, often used to describe a test. This can either be whether the measurements
of the same instrument give or are likely to give the same measurement (test-retest),
or in the case of more subjective instruments, such as personality or trait inventories,
whether two independent assessors give similar scores (inter-rater reliability).
Reliability is inversely related to random error.

Scale reliability is the ratio of true score variance to observed score variance. If there
is less error inherent within the scale, then the scale will yield consistent results across
observations and research settings. In other words, reliability of an instrument is the
degree to which it yields a true score of the variable under consideration. Reliability is
also defined as the extent to which any measuring instrument yields the same results
on repeated trials (Carmines and Zeller, 1990).

4.3.7.2 CRONBACH'S ALPHA

Cronbach’s alpha is designed as a measure of internal consistency; that is doing all
items within the instrument measure the same thing. Alpha is measured on the same
scale as a \( r \) (correlation coefficient) and typically varies between 0 and 1. The closer
the alpha is to 1, the greater the internal consistency of items in the instrument being
assessed.

Based on the formula \( \alpha = \frac{rk}{(1+ (k-1) r)} \), where \( k \) is the number of variables
considered and \( r \) is the mean of the inter-item correlations. The alpha value is inflated
by a larger number values; so there is no set interpretation as to what is an acceptable
alpha value. A rule of thumb that applies to most situations is; \( \alpha >0.9 \) – excellent;
\( \alpha >0.8 \) – good; \( \alpha \geq 0.7 \) – acceptable; \( \alpha >0.6 \) – questionable; \( \alpha >0.5 \) – poor; \( \alpha <0.5 \) –
unacceptable.
4.3.7.3 KMO AND BARTLETT'S TEST

The Kaiser-Meyer-Olkin (KMO) measure is based on the principle that if variables share common factors, then partial correlations between pairs of variables should be small when the effects of other variables are controlled. The KMO measure provides an approach to comparing the zero-order correlations to the partial correlations. The KMO measure may vary between zero and one with larger numbers indicating a greater difference between the zero-order correlations and the partial correlations.

Kaiser (1974) recommends a bare minimum of 0.5 and that values between 0.5 and 0.7 are mediocre, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great and values above 0.9 are superb (Hutcheson & Sofronious, 1999).

4.3.7.4 CHI-SQUARE TEST

Chi-Square test is based on chi-square distribution and as a parametric test it is used for comparing sample variance to a theoretical population variance. As a non-parametric test, chi-square can be used as a test of goodness of fit and test of independence. In the goodness of fit it is used to test how well assumed theoretical distribution fit to the observed data. In case of independence, it is used to test whether or not the two attributes are associated.

4.3.7.5 STRUCTURAL EQUATION MODELING

Structural equation modeling (SEM), also known as latent variable analysis (Baumgartner and Homburg 1996; Hair et al., 1998), is a development from multiple regression analysis to combine a series of multiple regression equations within one
structural model (Hair et al., 1998). The approach simultaneously runs several multiple regression equations, and has been used in this research to combine the relationships investigated into one broad model that integrates the relationships in the pathway from service performance to behavioral loyalty.

SEM is a confirmatory approach and is used to test theory rather than to develop theory (Byrne, 2001; Tabachnick and Fidell, 2001). SEM has a number of benefits over multiple regression, in that it recognizes interdependence and allows a dependent variable in one multiple regression to become an independent variable in a subsequent equation (Hair et al., 1998). It also allows independent variables to act simultaneously on more than one dependent variable, thus identifying both direct and indirect effects on a dependent variable (Hair et al., 1998). In addition, the approach enables the inclusion of latent variables within the model. Latent variables are hypothesized but unobserved variables (Byrne, 2001; Hair et al. 1998; Tabachnick and Fidell, 2001). Finally an additional strength of structural equation modeling is the treatment of error variance. In most data there will be elements of error incorporated into the data and SEM includes estimates of error variance in contrast to other multivariate approaches that ignore error (Byrne 2001, Hair et al., 1998).

Although SEM provides a number of advantages over other statistical approaches, there are also limitations associated with its use. It is important, when using SEM, to ensure that the model is correctly specified as SEM is vulnerable to specification error. A predictor variable is omitted from a model thus distorting results for the included variables (Hair et al., 1998). There are a number of indicators that are used to assess the validity of a hypothesized model that is the fit between the sample and the
estimated population covariance matrices (Hair et al., 1998; Tabachnick and Fidell, 2001).

Although the chi-square ($\chi^2$) is accepted as the conventional overall test of fit, a number of alternative fit indices have been developed to overcome concerns with the chi-square statistic, mainly associated with issues of sample size (Hu and Bentler, 1995). Whilst the model fit is important, the issue of over fitting the model is also of consequence with it, being necessary to balance the model fit with parsimony (Hair et al., 1998). The fit indicators can be grouped into categories of absolute fit indices; incremental or comparative fit indices and parsimonious fit indices (Byrne, 2001; Hair et al., 1998).

The absolute fit indices include chi-square ($\chi^2$), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), root mean square residual (RMR) and the root mean square error of approximation (RMSEA). The incremental fit measures include the normed fit index (NFI) and the comparative fit index (CFI). The chi-square ($\chi^2$) statistic is recognized as the conventional overall test of fit (Hu and Bentler, 1995). However research has shown that the chi-square statistic is not entirely reliable as an indicator of good model fit and can reject an acceptable hypothesized model (Byrne, 2001; Hu and Bentler, 1995). In particular the chi-square statistic is sensitive to sample size with large samples often resulting in high values of chi-square indicating a poor fit whereas alternative measures suggest an acceptable fit. In this research the chi-square statistic is reported as it is accepted as a fundamental measure of fit (Hu and Bentler, 1995).
Absolute fit indices, such as the goodness of fit index (GFI) effectively compare the hypothesized model with the null model and measure the relative level of variance and covariance (Byrne, 2001). Hu and Bentler (1995) have observed that the GFI performs better than the other absolute fit indices. Results for the GFI are normally in the range of zero to one with higher values indicating a better fit (Byrne, 2001). A GFI of above 0.90 is generally accepted as indicative of a good fit (Hair et al., 1998; Hu and Bentler, 1995). The adjusted goodness of fit index (AGFI) is similar to the GFI but addresses the issue of parsimony by adjusting the degrees of freedom.

The root mean square error of approximation (RMSEA) is recognized as “one of the most informative criteria in covariance structure modelling” (Byrne, 2001 Pg 84). The RMSEA reports the discrepancy or misfit in the fit of the model to the population covariance matrix and is adjusted for the degrees of freedom (Byrne, 2001). RMSEA is affected by sample size and there is a tendency to reject acceptable models when the sample size is small (Byrne, 2001). Values range from zero to one, with lower values indicating better fits. Values between 0.05 and 0.08 are seen as representing well fitted models, values between 0.08 and 0.10 represents mediocre fits and above 0.10 a poor fit (Byrne, 2001; Hair et al., 1998). Although a lower value indicates a better fit a result of zero would indicate a perfect fit. This is seen as optimistic (Byrne, 2001).

In contrast to the absolute fit indices, the incremental or comparative indices of fit compare the hypothesized model with a baseline model, normally the null model (Byrne, 2001; Hair et al., 1998). The comparative fit index (CFI) is developed by
Bentler (1990) to reflect the criticisms associated with the NFI. As with the NFI the result for the CFI range from zero to one with larger results indicating better fit. A result of above 0.90 is indicative of a good fit (Byrne, 2001).

The normed chi-square statistic is proposed by Joreskog (Hair et al., 1998) to overcome some of the concerns over the chi-square statistic and the chi-square statistic is divided by the degrees of freedom. The statistic provides a range of acceptable results thus indicating whether the model will be over or under fitted. An over fitted model is typically represented by a value less than one whilst a model that is not reflective of the data is represented by a value above 3 (Hair et al., 1998) although a more liberal limit of five has been suggested as appropriate (Wheaton, Muthen, Alwin and Summers, 1977).

4.3.7.6 BAYESIAN METHOD

The Bayesian method has a strong history in survey sampling theory (Ericson, 1969; Ghosh and Meeden, 1997) and offers an integrated solution to both analytic and descriptive survey sampling problems, since no distinction is made between population quantities (e.g. population sums) and model parameters. In both cases, the inference problem is treated as a prediction problem. The Bayesian approach therefore has considerable theoretical appeal. Unfortunately, its practical application has been somewhat limited to date by the need to specify appropriate priors for unknown parameters and by the lack of closed form expressions for estimators when one deviates substantially from normal distribution population models. Use of improper non-informative priors is a standard way of getting around the first problem, while
modern, computationally intensive techniques like Markov chain, Monte Carlo methods now allow the fitting of extremely sophisticated non-normal models to data. Consequently, it is to be expected that Bayesian methods will play an increasingly significant role in survey data analysis.

### 4.3.7.7 FACTOR ANALYSIS

Factor analysis is a set of techniques which, by analyzing correlation between variables, reduces their number into fewer factors which explain much of the original data, more economically. Even though a subjective interpretation can result from a factor analysis output, the procedure often provides an insight into relevant psychographic variables and results in economical use of data collection efforts. The output of factor analysis is obtained by requesting Principal Component Analysis and specifying the rotation. There are two stages in factor analysis, stage one being the factor extraction process, wherein the objective is to identify how many data’s are to be extracted from the data. There is a rule of thumb based on the computation of an eigen value, to determine how many factors to extract. The higher the eigen value of a factor, the higher is the amount of variance explained by the factor.

### 4.4 INTERPRETATION

After collecting and analyzing the data, the tasks of drawing inferences were made and the findings, suggestions and recommendations were explained on the basis of TAM2.