



To Evaluate the Factors Influencing Consumer Purchase Inclination at Online Shops or Retail Outlets Using Normal Variant of Normal Distribution Function

J. Sheik Mohamed*
Asst. Professor, MCA Department
SITAMS, Chittoor, A.P., India
Sheik_50@yahoo.co.in,

S. Mohaseena
MCA Department
SITAMS,
Chittoor, A.P., India

Dr. S. Sreekanth
Professor & Director
MCA Department
SITAMS, Chittoor, A.P., India

Dr. S. Ramakrishna
Professor & BOS Chairperson
Department of Computer Science
S. V. University, Tirupathi, A.P., India

Abstract-Among people, who often use the Internet, some make purchases at online shops and others do not. What decision-making factors affect their behavior? A questionnaire survey regarding the purchase was conducted and analyzed the survey responses. As a result of a Principal Component Analysis on 20 questionnaires, 10 factors were extracted. Furthermore, a Discriminant Analysis showed that the factors strengthening the trend of making purchases at an Retail outlet were switching costs, real information, first-hand examination, trust and distrust of online shops and that those strengthening the trend of making purchases at online shops were net information, time saving and price. The resultant of Discriminant Analysis of online store and retail outlet are applied in normal variant of Normal distribution function to test the Null Hypothesis which gives acceptance or rejection of either one.

Keywords-Dispersion, Retail Outlet, Normal Distribution, Principal Component Analysis, Discriminant Analysis.

I. INTRODUCTION

Along with the prevalence of the Internet, electronic commerce for general consumers has been expanding. Various goods, including books, CDs, DVDs, hobby-related goods, clothing items, electronic goods, and even food items are being sold at online shops. However, some people regularly make purchases at online shops, but some others do not, even if they regularly use the Internet. Some consumers do not purchase goods at online shops even when prices are low and orders are easy to submit. What are the factors of consumers' thinking and feeling that guides their decision-making processing deciding whether to buy goods at either retail outlet or online shops? In order to answer this question, It is planned for consumers' purchasing factor model and sought to verify it by analysis of a questionnaire survey. This model will contribute to the development of marketing strategies for online shops and stores.

The term "outlet" means a retail site with a physical location. The term "online shop" means a retail site established on the Internet, without a corresponding physical location. The term "shop" on its own is used to indicate either a physical store or an online store[2].

II. RELATED WORK

A. Frictionless Commerce:

Internet represents a new nearly "frictionless market." The research empirically analyzes the characteristics of the Internet as a channel for two categories of homogeneous products—books and CDs. We find that levels of price dispersion depend importantly on the measures employed. When we compared the prices posted by different Internet retailers we find substantial dispersion. Internet retailer

prices differ by an average of 33% for books and 25% for CDs[1].

However, when we weight these prices by proxies for market share, we find dispersion is lower in Internet channels than in conventional channels, reflecting the dominance of certain heavily branded retailers. Unique characteristics of the Internet will bring about a nearly perfect market. In the extreme version of this "Internet efficiency" view, the characteristics of the Internet will lead to a market where retailer "location" is irrelevant, consumers are fully informed of prices and product offerings, and all retailers make zero economic profit. At the same time, there is anecdotal evidence that the Internet may not be completely efficient [1].

The methodology tracks two types of retailers: those that sell over the Internet and those that sell through conventional outlets. For each product category, we selected eight Internet and eight conventional retailers. Half of these retailers (four Internet retailers and a matched set of four conventional retailers) are "hybrid" retailers. They maintain operations both on the Internet and in conventional outlets. Our finding of lower prices on the Internet would be unambiguously strengthened if a "complete" selection of books and CDs could have been tracked and priced. By examining price levels, price changes over time, and price dispersion across stores[1].

With regard to price levels and price changes, our goal is to compare the characteristics of Internet channels for books and CDs to the characteristics of existing conventional channels for the same products. In conventional outlets, menu costs are driven by the cost of physically relabeling the prices of goods on store shelves. On the Internet, we hypothesize that menu costs should be much lower—comprised primarily of the cost to change a single entry (per

title) in a database. If this hypothesis were true, we would expect to see less “price stickiness” among Internet retailers.

Because the Internet is a multifaceted market, it is worth looking at the question of dispersion from a variety of perspectives[1].

First analyzed the several aspects of price dispersion by looking at posted prices. We then repeat analysis after weighting all the price observations by a proxy for market share in each channel. Each of these measures highlight different aspects of Internet commerce, and are both useful in characterizing Internet markets. We analyze dispersion resulting from posted and weighted prices. It has been widely speculated that electronically mediated markets will have less friction than comparable conventional markets[1].

The analysis indicates that Internet retailers charge lower prices than conventional retailers—whether one considers prices alone or “prices” including the costs of getting the item to the users’ homes. We also find that Internet retailers make price changes in smaller increments than comparable conventional retailers[1].

B. Consumer Decision-Making At An Internet Shopbot:

Internet shopbots compare prices and service levels at competing retailers, creating a laboratory for analyzing consumer choice. We analyze 20,268 shopbot consumers who select various books from 33 retailers over 69 days for a total of 1,512,856 observed offers. Although each retailer offers a homogeneous product, we find that brand is an important determinant of consumer choice. Consumers use brand as a proxy for retailer credibility in non-contractible aspects of the product and service bundle, such as shipping reliability. The results also suggest that consumers are sensitive to how total price is allocated between the item price, shipping price, and tax[4].

Shopbots are Internet-based services that provide “one-click” access to price and product information from numerous competing retailers. In so doing, they reduce buyer search costs for product and price information by at least 30-fold compared to telephone-based shopping and even more compared to physically visiting the retailers. Shopbots collect and display information on a variety of product characteristics, lists summary information for both well- and lesser-known retailers, and typically rank the retailers based on a characteristic of interest to the shopper such as price or shipping time[4].

The resulting comparison tables reveal a great deal of variation across retailers in relative price levels, delivery times, and product availability. These shopbots provide researchers with an opportunity to observe customer choice behavior as consumers evaluate the listed alternatives and click on a particular product offer. Consumer choice behavior can then be analyzed using econometric models to reveal how consumers respond to different aspects of the product bundle, such as price, brand and shipping time[4].

For example, how important is retailer brand in determining consumer choice? Is brand more important for some types of consumers and for some types of decisions than for others? How do consumers react to the allocation of total price to different components such as tax or shipping cost? We address these questions through panel data gathered from an Internet shopbot in the market for books. We use these data to study how customers responded to the presence of brand both in aggregate and then by analyzing how consumers respond differently to contractible aspects of the product bundle versus non-contractible aspects such as promised delivery times. This approach to analyzing

electronic markets complements recent empirical studies that examine Internet pricing behavior from the perspective of efficiency and price discrimination[4].

While these studies are able to analyze competitive strategies across retailers and markets, they provide only second-order evidence of consumer behavior in electronic markets. In contrast, the current paper and a companion paper , directly analyze customer behavior by using the shopbot as a laboratory of sorts where consumers respond to heterogeneous offers from a variety of retailers. The data show that shopbot consumers, who might be considered among the most price sensitive consumers on the Internet, respond very strongly to well-known, heavily branded retailers. While there have been predictions that the Internet would “commodify” many industries and reduce the role of differentiation, the results show that branding can be important even for homogeneous goods such as books. Not all consumers value brands equally, however[4].

We find that that branding is especially important for consumers who care about non contractible aspects of the product bundle. In particular, consumers who care about shipping times are especially likely to prefer well-known brands, potentially because promised shipping times are difficult to enforce. We also find that customers respond strongly to the ordinal ranking of offers in the price comparison table (as opposed to the absolute price) and that customers appear to be more sensitive to changes in sales tax and shipping cost than they are to changes in item price, even when the total price they must pay is unaffected[4].

III. PROPOSED MODEL

Both frictionless commerce and internet shopbots considered only few factors with related online store alone. As internet is not completely sufficient and it is lower friction, it needs comparison of purchase preference behavior both in online and retail outlets.

Proposed system objective is to distinguish the factors influencing consumers’ decisions whether to purchase preference given either to online shops or to retail outlets based on the survey of 20 questions with respect to 10 components taken from the bargain hunters’ community

IV. PROBLEM ARCHITECTURE

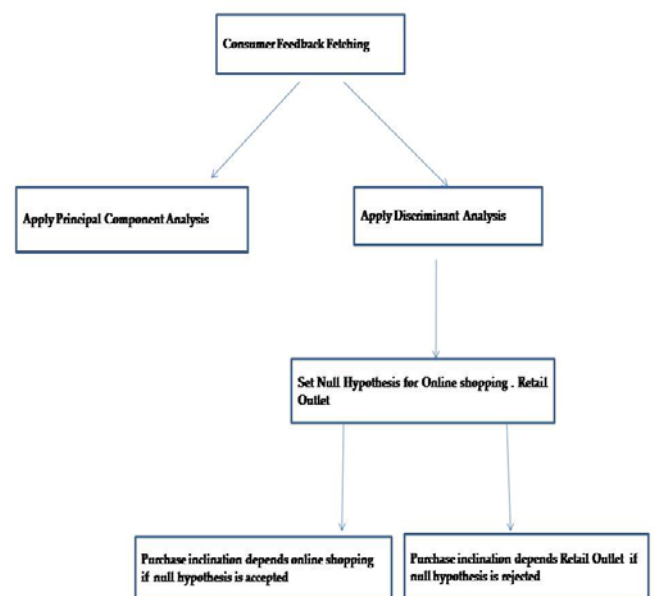


Figure 1 Architectural Design of Proposed model

A. Description:

- a. The consumer gives their details and their feedback on different components.
- b. After getting the feedback, principal component analysis is determined
- c. The consumers who accepts or rejects online shopping are segregated and Discriminant analysis is determined separately for them.
- d. The evaluated results are applied in the normal variant of normal distribution function which gives the actual purchase preference based on null hypothesis depends on the data that is fetched from the feedback in the stipulated time.

V. IMPLEMENTATION PROCEDURE

a. Feedback Questionnaire Framing:

- a) Questions are framed for fetching consumer Decisions
- b) It maintains consumer details such as consumer-id and name of the consumer.



Figure 2 New or Existing Consumer selection

- c) Each questionnaire in table 1 is framed with 3 options “Agree, Disagree and Neutral”

Table 1 Feedback Questionnaire

| | |
|-----|---|
| 1. | Changing shop is trouble some |
| 2. | I like to buy goods at the shop I have bought before |
| 3. | I buy goods at the Shops Where orders are submitted easily |
| 4. | Like to buy goods at the fixed Shops |
| 5. | Trust of the shop is important |
| 6. | Reputation of the shop is important |
| 7. | Security of the shop is important |
| 8. | Return policy is important |
| 9. | Usually buy at a shop which sell quality goods |
| 10. | I ask a shop clerk for recommended goods |
| 11. | I cant Select goods with net Information |
| 12. | The information provided by shop is Important |
| 13. | I like to compare prices |
| 14. | I think there is shop where I can buy cheaper |
| 15. | I trust stores |
| 16. | Speedy delivery is important |
| 17. | Its important to purchase at shops Where convenience is satisfied |
| 18. | Shopping at different online shops is highly Risk |
| 19. | There are many unreliable Online Shops |
| 20. | It is easier to find goods over Internet |

b. Consumer Feedback Fetching:

Each consumer has to give feedback by selecting one choice(Agree or Disagree or Neutral) for each question among 20 questions. This selection is adapted for each component among ten components.

c. Functional Approaches:

a) Principal Component Analysis:

Definition

The new variables/dimensions are linear combinations of the original ones and uncorrelated with one another .Orthogonal in original dimension space capture as much of the original variance in the data as possible are called Principal Components

- i. Principal component analysis is done by taking 10 components as Principal Components such as, 1. Switching cost 2. Distrust on online shop 3. Net information 4. Convenience 5. Price 6. Time saving 7. Trust 8. Service 9. Actual Feeling 10. Real Information

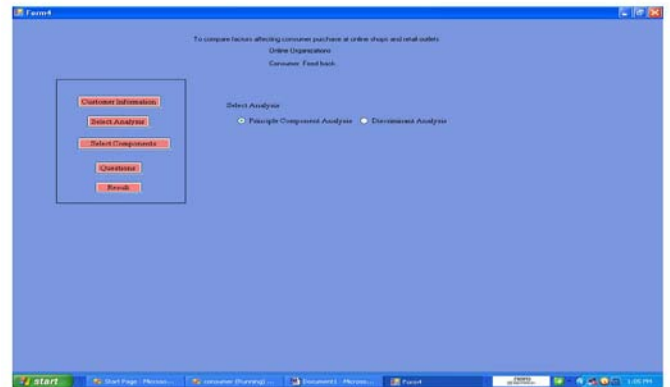


Figure 3 Functional analysis Selection

This screen is used to select the analysis that is required to verify i.e. Principal Component Analysis or Discriminant Analysis

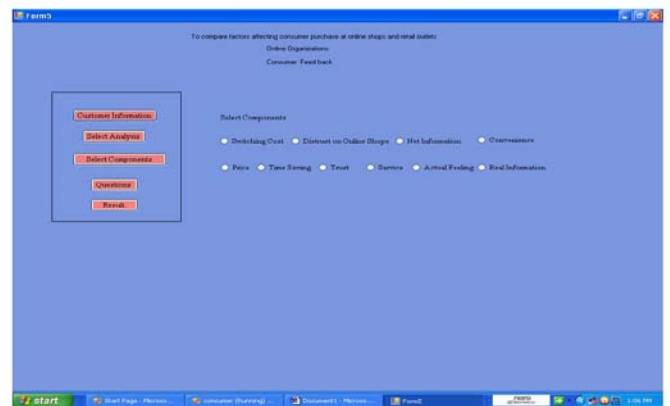


Figure 4 Component selection for feedback

This screen is used to select each component by each consumer for giving their feedback.

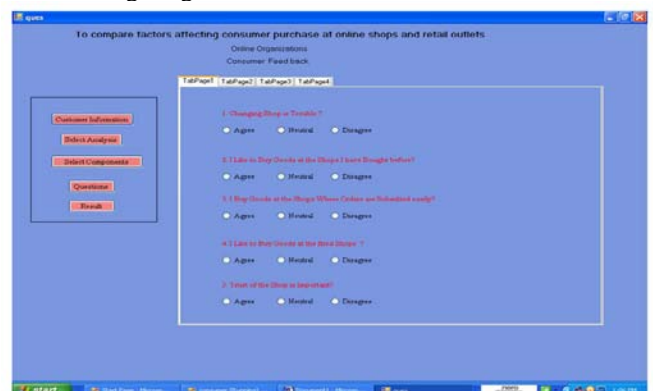


Figure 5 Sample Questionnaire for feedback

This screen shows the sample questionnaire which is used to get feedback from each consumer after selecting each component.

- ii. From the feedback taken from “N” Consumers, the probability of each choice of every questionnaire of each component is calculated and it is saved.
- iii. It gives the result that which component influences the factor with respect to agree or disagree or neutral more which in turn results the purchase inclination of consumers either in online shop or retail outlet more
- iv. The formula for calculating PCA is given as follows,

$$(PCA)_i = H_N / T_N \quad (1)$$

Where,

$(PCA)_i$ stands for Principal Component for i^{th} component (for each component among 10 components)

H_N stands for Highest count value among 3 options: Agree or Disagree or Neutral for N Consumers at the stipulated time

T_N stands for N number of consumers given feedback for 20 Questionnaire

- v. But condition applied here are, if the option Agree becomes highest Count then the resultant of eqn. (1) would be consider as positive sign or if the option Disagree becomes highest count then the resultant of eqn. (1) would be consider as negative sign or if the option Neutral becomes highest count then the resultant of eqn. (1) would be consider as Zero.

| Question_id | Question_Text | Comp1 | Comp2 | Comp3 | Comp4 | Comp5 | Comp6 | Comp7 |
|-------------|----------------------|-------|-------|--------------|--------------|-------|-------|-------|
| 1 | Always gives... | 0.6 | 0.8 | 0.7777777777 | 0.7777777777 | 0.6 | 0.7 | 0.7 |
| 2 | Like to Buy... | 0.8 | 0.6 | 0.8888888888 | 0 | 0.8 | 0.7 | 0.8 |
| 3 | Like to Buy... | 0.7 | 0.6 | 0.4444444444 | 0.7777777777 | 0 | 0.8 | 0.8 |
| 4 | Like to Buy... | 0.9 | 0.7 | 0.6666666666 | 0.8888888888 | 0 | 0.6 | 0.8 |
| 5 | Trust of the... | 0.6 | 0 | 0.4444444444 | 0.7777777777 | 0 | 0.7 | 0.8 |
| 6 | Reputation of... | 0.6 | 0.8 | 0.7777777777 | 0.7777777777 | 0 | 0.6 | 0.6 |
| 7 | Security of the... | 0.7 | 0.8 | 0.8888888888 | 0 | 0.8 | 0.6 | 0.6 |
| 8 | Return policy... | 0.9 | 0 | 0.6666666666 | 0.6666666666 | 0 | 0.6 | 0.8 |
| 9 | Usually Buy... | 0.6 | 0.8 | 0.8888888888 | 0 | 0.8 | 0.7 | 0.8 |
| 10 | Like to ask a... | 0.5 | 0.5 | 0.5555555555 | 0.4444444444 | 0 | 0.5 | 0.5 |
| 11 | Learn about... | 0.9 | 0.7 | 0.8888888888 | 0.8888888888 | 0 | 0.6 | 0.8 |
| 12 | The Information... | 0.8 | 0.6 | 0.8888888888 | 0.8888888888 | 0 | 0.8 | 0.8 |
| 13 | Like to Compare... | 0.9 | 0.6 | 0.8888888888 | 0.7777777777 | 0 | 0.9 | 0.6 |
| 14 | I Think There... | 0.6 | 0.9 | 0.5555555555 | 0 | 0 | 0.8 | 0.8 |
| 15 | Trust Stores? | 0.6 | 0.8 | 0.4444444444 | 0.7777777777 | 0 | 0.8 | 0.8 |
| 16 | Speedy Delivery... | 0.8 | 0.5 | 0.6666666666 | 0.7777777777 | 0 | 0.6 | 0.8 |
| 17 | Is important to... | 0.8 | 0.7 | 0.75 | 0.8888888888 | 0 | 0.6 | 0.7 |
| 18 | Shipping at Diff... | 0.5 | 0.8 | 0 | 0.5555555555 | 0 | 0.7 | 0.5 |
| 19 | There Are Many... | 0.6 | 0.4 | 0.6666666666 | 0.5555555555 | 0 | 0.5 | 0.8 |
| 20 | It's Easy to Find... | 0.9 | 0.9 | 0.8888888888 | 0.6666666666 | 0 | 0.8 | 0.8 |

Figure 6 Empirical Result of PCA for 15 consumers feedback

The Screen shows the result of Principal Component Analysis of 15 Consumers

b) Discriminate Analysis:

- i. The feedback which has taken from N consumers for all 10 components with respect to 20 questionnaires are fetched with the dimension of agree as acceptance or disagree as rejection or neutral as common to both.
- ii. Then by using Discriminant function procedure we perform Discriminant analyzes for each component for N consumers with respect to acceptance or Rejection or Neutral (common for both acceptance and Rejection) i.e., one Discriminant function evaluates for those consumer who accepts online shopping and other Discriminant function for those consumer who rejects online shopping.
- iii. The number of consumers who gives option as agree then it is assigned to the Discriminant function1 which is meant for acceptance of online shopping by N

consumers of each component and it is calculated by using the eqn. $(A_N / T_N) * 1$

- iv. The number of consumers who gives option as disagree then it is assigned to the Discriminant function2 which is meant for rejection of online shopping by N consumers of each component and it is calculated by using the eqn. $(R_N / T_N) * -1$
- v. The number of consumers who gives option as Neutral then it is assigned to the both Discriminant function1 and Discriminant function2 which is meant for Neither acceptance Nor rejection of online shopping by N consumers of each component and it is calculated by using the eqn. $(N_N / T_N) * 0.5$
- vi. The Null hypothesis is constructed for the two functions to evaluate the result either for acceptance or for rejection.

Discriminant Function1= .243261836480752 Discriminant Function2= .24326183

| Comp_id | Comp_name | Discriminant Function_1 | Discriminant Function_2 | var1 | var2 |
|---------|----------------------|-------------------------|-------------------------|----------------|----------------|
| 1 | Actual Feeling | -0.715 | -0.66 | 0.5112499999 | 0.4266000000 |
| 2 | Switching Cost | 0.545 | 0.63 | 0.4160250000 | 0.2963000000 |
| 3 | Default on online... | 0.603281995307 | 0.5757575757 | 0.364022019173 | 0.331496780442 |
| 4 | Net Information | 0.611111111111 | 0.55 | 0.373456790123 | 0.302500000000 |
| 5 | Convenience | 0.291457296432 | 0.247474747474 | 0.084647348144 | 0.061243750637 |
| 6 | Price | 0.635 | 0.54 | 0.402325 | 0.2918 |
| 7 | Time Saving | 0.59 | 0.51 | 0.340399999999 | 0.2601 |
| 8 | Trust | 0.3025 | 0.245 | 0.09150625 | 0.060249999999 |
| 9 | Service | 0.3175 | 0.29 | 0.10280625 | 0.0841 |
| 10 | Real Information | -0.479778583 | -0.4262626262 | 0.45845788202 | 0.3820477053 |
| 11 | Actual Feeling | -0.715 | -0.66 | 0.5112499999 | 0.4266000000 |
| 12 | Switching Cost | 0.545 | 0.63 | 0.4160250000 | 0.2963000000 |
| 13 | Default on online... | 0.603281995307 | 0.5757575757 | 0.364022019173 | 0.331496780442 |
| 14 | Net Information | 0.611111111111 | 0.55 | 0.373456790123 | 0.302500000000 |
| 15 | Convenience | 0.291457296432 | 0.247474747474 | 0.084647348144 | 0.061243750637 |
| 16 | Price | 0.635 | 0.54 | 0.402325 | 0.2918 |
| 17 | Time Saving | 0.59 | 0.51 | 0.340399999999 | 0.2601 |

Figure 7 Empirical Result of DA for 15 consumers feedback

The Screen shows the result of Discriminant Analysis of 15 Consumers

c) Result:

- a) The Hypothesis of the Discriminant functions are compared at 5% levels for accurate evaluation using normal variant of normal distribution function. The normal variant of normal distribution function is given as,

$$Z = \frac{X - \mu}{\sigma} \quad (2)$$

- b) From the result of eqn. (2), hypothesis of **acceptance** is obtained, then Discriminant function1 is considered and it implies that majority of the consumers are interested to purchase the products through online shopping.
- c) From the result of eqn. (2), hypothesis of **rejection** is obtained, then Discriminant function2 is considered and it implies that majority of the consumers are interested to purchase the products through retail outlets.
- d) From Empirical Results, Hypothesis of Acceptance is obtained. That is, Z_{ar} is the Null Hypothesis value set at 5% level which in turn acceptance of Hypothesis is obtained by $Z < Z_{ar}$ or Vice versa
- e) From time to time depends on the feedback that is considered accordingly the result may vary with respect to purchase inclination based on trend.

VI. CONCLUSION

This system objective is to distinguish the factors influencing consumers' decisions whether to buy goods either at retail outlets or at online shops. As a result of Principal component analysis on 20 questions and 10 factors which decides each factors that affects on online purchase or retail outlet.

The analysis describes the decision making factors for consumer purchase preference. This system offers suggestions for online shops or retail outlet to attract consumers. The online shops make their strategies clear and find ways to penetrate in to the market by considering the purchasing model.

VII. FUTURE SCOPE

This System provides behavior of consumers and factors that **affect** purchase at online shops or .The target of questionnaire and the number of respondents was low. In future it is necessary to make surveys reflecting a broad population distribution. This application can be enhanced with some more components and questions to shape accuracy in result.

VIII. REFERENCES

- [1]. Erik Brynjolfsson and Michael D. Smith, "Frictionless Commerce? A Comparison of Internet and Conventional Retailers", *Management Science*, Vol.46, No.4, pp. 563-585, April 2000.
- [2]. Hee-Woong Kim and Darren Ee Se Toh, "Moderating the Price Sensitivity of Online Customers", *Proc. IEEE Joint Conf. CEC/EEE 2006*, pp.90-96 June 2006, pp.90-96.
- [3]. Kauzo Watabe and Kunihiko Iwasaki "Factors Affecting Consumer Decisions about Purchase at Online shops and Stores", 9th IEEE International conference on E-Commerce, 2007.
- [4]. Michael D. Smith and Erik Brynjolfsson, "Consumer Decision-Making at an Internet Shopbot: Brand Still Matters", *Journal of Industrial Economics*, pp.541- 558, Dec. 2001.

Short Biodata of the Author's

J. Sheik Mohamed has obtained MCA Degree from Bharathidasan University in the year 2000, who is currently pursuing Ph.D(PT) Computer Science at S.V.University, Tirupathi, Andhra Pradesh. He has published 10 papers in international and national journals. He is working as an Asst. Professor in SITAMS, Chittoor, A.P. with the experience of 11 years. He is a life member of CSI and ISTE.

S. Mohaseena has obtained MCA degree from JNTUA, Anantapur through MCA Department, SITAMS, Chittoor, A.P.

Dr. S. Sreekanth has obtained M.Sc. Degree from S.K. University, Anantapur and M.Phil., Ph.D., Degrees from S.V.University, Tirupathi and M.E.(CSE) from Sathyabama University, Chennai. Currently he is guiding 2 Ph.D. scholars in Computer Science at Rayalaseema University, Kurnool, Andhra Pradesh. He is working as a Professor & Director in MCA Department, SITAMS, Chittoor, Andhra Pradesh with the experience of 16 years. He has published 13 research papers both in international and national journals of mathematics and computer science

Dr. S. Rama Krishna has obtained M.Sc., M.Phil., Ph.D., Degrees from S.V.University, Tirupathi and M.Tech (IT) from Punjabi University. He has guided 10 Ph.D scholars in Mathematics and 2 Ph.D. scholars in Computer Science. Currently he is guiding 10 Ph.D. scholars in Computer Science in S.V.University, Tirupathi, Andhra Pradesh. He is working as a Professor & BOS Chairperson in Computer Science Department, S.V.University, Tirupathi, Andhra Pradesh with the experience of 25 years. He has published 35 research papers both in international and national journals of mathematics and computer science