CONJOINT ANALYSIS OF USER PREFERENCES FOR LIBRARY SERVICES

ABSTRACT

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THESIS
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Background

The role of future managers in Library and Information Services is significant and it is a challenging task to ensure a free flow of information from generators to end-users. Prompted by technological changes, an elaborate information resource base and increased user expectation levels since the dawn of the new millennium, market scenario is likely to reflect continuing changes in the level of service offered in information centres.

It is believed, therefore, that the information agencies or managers will require to develop knowledge of marketing concepts and acquire ability to implement marketing practices and more comprehensive marketing intelligence in order to remain a competitive service provider. As a result, information managers should be searching constantly for new ways to develop a service model to keep up with those expectations.

In conjunction with the development of a service model, the preference measurement from a customer's point of view is fundamental and understanding the knowledge of consumer's preference structure allows one to develop a competitive information product. The preference measurement is central to the determination of marketing information service model.

This study will demonstrate how marketing research techniques such as Conjoint Analysis can be used to achieve the goal.

Literature Review

The literature review highlighted certain points summed up as follows:

1. The need for Librarians to incorporate the use of marketing into their management practice is strongly evidenced.
2. The use of marketing research methods such as conjoint analysis are noticeably absent in the literature related to library services and no studies using conjoint analysis is reported so far by library professionals in India.
3. Traditional conjoint analysis method is being refined at various steps of analysis.
4. New variants of conjoint analysis are being developed.

With this background, it is important to demonstrate an application of conjoint analysis study to measure the library service preferences.

Methodology

This research has applied conjoint analysis to measure user preferences for library services in the special libraries. Eight attributes of library services are selected for this study. They are : (1) *Hours of Library Service* (2) *Computer Application* (3) *Access to Collection* (4) *Inter library Loan (ILL)* (5)*Alert Services* (6) *Assistance to Patrons* (7) *Definitiveness* (8) *Online Access.*

The study addresses to the following objectives:

i) To discover the relative importance (part-worth utility range) that consumers place on each of a pre-determined set of attributes that is thought to influence consumer choice over Library services.

ii) To discover the combination of attribute levels that would result in best use of Library services.

iii) To develop a socio-demographic profile of library customers that may be useful in providing a cluster-based segmentation approach to improve accuracy in prediction over individual level services.

iv) To discuss if the relative importance (part-worth utility range) of attributes is significantly different for service segments distinguished on the basis of frequency of use of the Library, age, job position, subject, years of experience, familiarity in library use and the organization to which users belonging to.

Hypothesis

The hypotheses to be tested in this research are :

H_0 (1):

There is no significant difference in the relative importance (part-worth utility range) that organisational member's assign to the pre-determined set of attributes used in this study.

H_0 (2):

There is no significant difference in the relative importance (part-worth utility range) that organisational members assign to the pre-determined set of attributes used in this study, for respondent segments that are distinguished on the basis of:

a) Age of respondent

b) Position

c) Work experience

d) Library use

e) Familiarity of respondent with the use of services

f) Organization to which respondent belong

g) Educational qualification

h) Sex of the respondent

Research sites and Sampling

The city of Bangalore is the research site of this study. Availability of good research libraries, personal familiarity and accessibility were the main factors contributing to the selection of the site. Accordingly four organizations, IIAL, IISC, ISRO and NAL were selected. 250 respondents from each organisation were taken as sample population.

Data Collection

Initially 25 atributes were identified and a pre-test was conducted among the 80 respondents, 20 from each organization, with the intention to reduce the number of attributes. Data of the pre-test was analyzed using median rank. The results

of the pre-test allowed to narrow down the scope of 25 attributes to 8 attributes without loosing the main effects.

Final study was carried out using mail questionnaire-telephone method to collect the data. The respondents were give a data collection instrument consisting of directions and 18 profiles, formed by levels from each attribute using Orthogonal Array method, for rating. The definitions of the attributes were also given for reference.

Respondents were directed to rate on a scale of 0 (Least preferred) to 100 (Most preferred) on 18 profiles. The final sheet of the instrument contained questions on socio-demographic data.

Data Analysis

Part-worth utility value, ANOVA and F-tests have been used for analysis of data and derivation of final results.

Findings

The findings of the study are :

(i) Online access (online access via Internet or Intranet-25.61%) and Hours of Library services (any time library opens-23.12%) are the two major preferences, while computerisation (completely computerised service-14.35%) and definitiveness (providing complete and accurate answer-12.89%) are in third and fourth relative position of preferences respectively to attain a major share of relative importance (75.97%).

(ii) As one might expect, the respondents prefer a definite answer to their queries from the time the library opens till it closes. And also prefer completely computerised service and all databases available through online access.

(iii) Contrary to expectations, there are no significant differences in utility scores of levels of attributes among the various organisational respondents. Alert service has little impact on preferences (4.06, 7^{th} Rank).

(iv) Overall, the results of this study indicate a fairly stable pattern of preferences for library services among the respondents of the four organisations.

Suggestions

It is hoped that the results of this study may provide some direction to further research. For example, similar research can be done by using Hybrid Conjoint Analysis, or Adaptive Conjoint Analysis (ACA) to determine the preferences on more number of attributes and levels for effective and reliable design of library services for different library communities.

Latest trends show a considerable increase of conjoint analysis in service sectors. It may not be out of place to mention here that development of various conjoint analysis models suitable for the study design, modified approaches to conjoint analysis for obtaining stable results for problems involving large number of attributes and standardised microcomputer packages have reduced the complexity of the Conjoint analysis. If these technological potentialities are not exploited by the LIS professionals, the field of user preferences and user studies will remain devoid of valid and reliable research finding.

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September 2002

I, Varghese J. Manathrachira, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this did not form basis of the award of my previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/ Institute.

This is being submitted to the North-Eastern Hill University for the dgree of Doctor of Philosophy in Library and Information Science.

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CHAPTER - 01

INTRODUCTION

1.1 Introduction

The role of future managers in Library and Information Services is significant and it is a challenging task to ensure a free flow of information from generators to end-users. While technological innovations have provided for libraries with enhanced information service, the satisfaction and expectation level of users have increased. As a result, information managers should be searching constantly for new ways to develop a service model to keep up with those expectations. In this scenario, managers require to develop knowledge of marketing concepts and acquire ability to implement marketing practices.

In conjunction with the development of a service model, the preference measurement from a customer's point of view is fundamental and

understanding the knowledge of consumer's preference structure allows one to develop a competitive information product. The preference measurement is central to the determination of marketing information service model.

Prompted by technological changes, an elaborate information resource base and increased user expectation levels since the dawn of the new millennium, market scenario is likely to reflect continuing changes in the level of service offered in information centres. It is believed therefore, that the information agencies will require more comprehensive marketing intelligence in order to remain a competitive service provider. This study will demonstrate how marketing research techniques can be used to achieve the goal.

1.2 Theories and Concepts Affecting This Research

Demand is critical to this study .The term demand refers to the number of units of a particular good or service that customers are willing to purchase or use during a specified period and under a given set of conditions. For managerial decision-making, the primary focus is on "market" demand, which is viewed as the aggregate of "individual" demand. As a result, insight into the market demand relationships is gained by understanding the nature of demand at the

individual consumer level. At the level of the individual, demand is determined by the "value" associated with the acquisition and use of goods or services.

One consumer behaviour model of individual demand, suggests that the worth of a good or service (its utility) is the prime determinant for individual demand. In this model consumers are viewed as attempting to maximize the total utility provided by the goods and services they consume. This optimisation process requires them to examine relationships as the marginal utility of acquiring additional units of a product or service and the relative value of acquiring one product as opposed to another. In this circumstance, characteristics of both the product and the individual are important determinants of demand (Pappas et al., 1983). In the context of this research, characteristics of the product include such factors as Definitiveness, Alert Service etc.

The notion of **exchange** is also an important consideration with respect to this research. Visitors to libraries may expect more benefits as they spend more time. This notion can be explained by the logic of exchange theory, which suggests that increased wait time need to be balanced by some perception of increased benefits. This means that in their transactions individuals aim to maximize their benefits and minimize their efforts or time. Accordingly, it may be that in evaluating various services, individuals strike a balance between

efforts and other attributes that are offered in the various combinations available. Or, it may be that, consumers merely select the 'best' available service as their final choice set. The question is, what relationship exists between those attributes that constitute the choice set(s) available? More specifically, library managers can benefit by knowing how important each attribute is in the purchase decision and should aim to provide services that will optimise library use behaviour or satisfaction. That is, managers should develop services that are comprised of the optimal combination of attributes. By offering such services to customers, these managers will have greater opportunity of securing the maximum numbers of customers.

Compton and Lamb (1986) note that, the term allocation implies the different amounts of services are assigned to selected groups on the basis of some principle or standard. The generally accepted standard for allocating public services is equity. In this context, equity addresses the question of fairness. That is, some standard of equity is implicit every time services are offered, and in particular when fees are charged.

1.3 Consumers and Library Services

In order to transform libraries into service organizations, it is necessary to provide a package of services that will either meet or exceed user expectations. Charles Osburn (1940) describes the situation as "not focused so much on the consumer goals, methods, habits and motivations as we have on the efficiency of techniques to control and retrieve to our own professional satisfaction." Likewise, Susan S. Dimattia (1992) in her KQ editorial addressing says, "Our promotional efforts tell us about how libraries make information affordable, accessible, and available. We keep telling the public how wonderful we are, but we don't ask the public what they need. We don't seem to listen too much, we're so busy talking."

User's individual needs and preferences are the key elements of a high-quality library services. In this regard, one should look deep into their customers to learn what their needs and how it varies individually. Andrew Green and others believe that "the correct identification of needs is an essential preliminary to the devising of appropriate means to judge the effectiveness of a library or information service". While a librarian or an information scientist establish an extensive close relationship with the customer by knowing his/her needs or preferences to a particular service, it can play an active role in shaping

a solid and accurate service provided with an enhanced quality in a friendly and courteous way.

A library is much more than just a building full of books that could not be described as a warehouse or a book distributorship. Otherwise, it should be a sting service centre. A customer is going to evaluate their use of the library based on their personal experience while using the library services. The personal experience is positive.

1.4 Role of Marketing in Library Services

The ideas of marketing library services are not new to the library world. In India, it starts in the form of the "Library Movement" at the beginning of the Century. Renberg and Sweden (1997) gives a brief history of marketing library services in their article. Their paper shows development to improve personal relations (PR) between librarians and "the common man in the street" into planned extension work and PR.

In recent years, libraries of all types have found it necessary to compete for both money and clients as major changes have occurred. Corporate librarians have realized that they must show management why they are useful and how

they contribute to the bottom line. All types of libraries face stiff competition for funding. Additionally, personal computer revolution, reference materials and databases in CD-ROMs and Internet bring a whole new dimension of competition for librarians and his crucial customers may stand away from libraries. This shows a need for more proactive strategic planning and marketing to keep librarians from being discounted even more.

Because of all these existing challenges and many more, it is not surprising that at least a handful of libraries have turned to successful business models for improved planning and development and that they are employing marketing plans as one method for moving forward. Suzanne Ward (1997) believes that "as times goes on, libraries must think in this way to achieve goals. Many recent library literatures also support the concept of marketing in the field of Library Services.

To use the concept "Marketing", Librarians have brought some management tools from the commercial world. This has been advantageous for the global library world. It has forced librarians to look at libraries as enterprises, even if you cannot put a price on the outcome.

1.5 The concept of Marketing

According to Philip Kotler (1994), "The social marketing concept holds, that the organizations task is to determine the needs, wants and interests of target markets and to deliver the desired satisfaction levels more effectively and efficiently than competitors, in a way that preserves or enhances the consumer's and the society's planning, implementation and control". This puts even more emphasis on identifying the needs or preferences of the clients on various attributes of services, and on providing a service or product that is of the required quality.

Various concepts need to be understood with respect to marketing in the context of this research. A phrase that often comes up is "exchange" which is the act of obtaining a desired product, service or ideas from someone by offering in return, a feeling of doing something worthwhile, job satisfaction or decision making etc. Marketing mix represents, the unique blend of service quality, offerings, and distribution designed to meet the needs of a specific group of customers.

Relationship marketing is currently talked about in developing a close relationship with customers and is most important particularly for the

information and Library sector to make worthwhile the efforts to get a new customer.

The concept of market differentiation also has relevance with respect to this research. Dickson and Ginter (1987) note that product differentiation should be defined as a market condition. They define product differentiation as existing when a product offering is perceived by the consumer to differ from its competition on any physical or non-physical product characteristic (quality, timely searches etc.)

What is clear from this discussion is that these market jargons can provide the basis of marketing strategies. Definitions of more phrases/terms are given in section 1.9 of this chapter.

1.6 The Concept of Complex Decision Making

The decision-making process of marketing information is essentially same as it is in any other area of human affairs. In a larger context, individuals who purchase specific products/services over other alternatives do so only after having gone through a process of complex decision-making. The study of consumer decision-making requires ascertaining of how buyers trade off conflicting criteria in making purchase decisions (Green & Carmone, 1970).

Research suggests that respondents' decision-making processes can be summarized crudely as a two-stage process. In the first "conjunctive " stage the consumer eliminates options with one or more unacceptable attribute levels. In the second "compensatory" stage the options that remain are traded off on the multiple attributes (Lussier & Olshavsky, 1979; Payne, 1976). The modelling of such consumer judgements or preferences among multi attribute alternatives has been one of the major activities in consumer research for the last few decades (Green & Srinivasan. 1978). The modelling of an individual's preference or choice among competing stimuli can be achieved in many ways. The expectancy-value class of models (Fishbein, 1967; Rosenburg, 1956) has been the most researched in this area.

Centres need to develop a customer loyalty though treating each customer as far as possible as an individual and having a closer and better relationship towards his needs. He also will be happy when the organization makes their tools and systems user-oriented or user friendly, simpler, and faster. Also, the library or library services will be easily reachable to the customers, the information given should be accurate and complete and transparent. Louviere (1988) describes the decision making process involving the following steps:

1. Need Awareness
2. Search and learning
3. Valuation of Key Decision Criteria
4. Evaluation of Alternatives on Key Decision Criteria
5. Decision to Choose/ Not Choose Any Alternative
6. If Choosing an Alternative, Which One?

In this context consumers are involved in the process of assessment, comparison, and/or evaluation during which they decide which aspects of products or services are important, compare products or services on each of the important aspects, and decide which one(s), if any, to choose. This process is complicated. Louviere (1988) believes that consumers do not perceive physical variables in physical measurement terms. Rather, they make psychological or perceptual judgments about each. Engel, Blackwell and Miniard (1986) suggest that this involves the consumer's beliefs, which lead to the formation of attitudes about alternative products. Ultimately these attitudes lead consumers to form an intention to purchase, to pick the 'winner' or product that they will purchase/use. In any case, consumers form impressions or opinions about the positions of various products on each determinant attribute that matters; and this process involve integrating perceptual information.

For the purposes of this research, both the evaluation of alternatives and choosing the final alternative (i.e. which product is chosen among alternatives) are significant. For example, Library/Information managers need to know which of the evaluative criteria's are important to the consumer. In this context, the evaluative criteria are best thought of as product-based representations of the consumer's underlying motives.

Equally important to the Library/Information manager is the notion of purchase behaviour. For example, which combination of evaluative criteria (i.e. which product) will the customer prefer to use? In marketing, product optimisation is the operative concept related to this question. Green et al. (1981) suggest that the following series of questions are central to the concept of product - optimisation:

1. What is the most profitable new/modified product/service to make consistent with one's current product line and what is the best target market for this new product?
2. What market segments will optimise maximum use for the current product/service line and, given a specifically defined segment, what is the most profitable product for it?

3. Given the competitive introduction of a new product, what is one's best retaliatory strategy from a product/market standpoint?

For this study question number one (1) above is considered; the optimal product being viewed as having the greatest utility to the purchaser/client. That is, within the range of management's potential, what combination of attributes and/or attribute levels will result in maximum use? While the question of potential segments is of concern, this study does not attempt to identify the most profitable segments. Nor does it consider retaliatory strategies given competitive introduction of new products.

1.7 Need for the Study

The need for Librarians to incorporate the use of marketing into their management practice is strongly evidenced in the literature related to Management of libraries. This is particularly true with current potential consumers in the 'change' process. It is evident that the vast majority of marketing-related decisions are based on observations of actions (Crompton and Lamb, 1986; Driver 1985). Thus, it is important to demonstrate the need and value of marketing information such as that which will be generated by this

study. At the very least, this study will require library managers to fully discuss marketing issues that pertain to their agency goals.

The use of marketing research methods such as conjoint analysis are noticeably absent in the literature related to library services and no studies using conjoint analysis is reported so far by library professionals in India. Michael Halperin (1982) introduced the topic conjoint analysis first time among the professionals of library services providers. Later, two research studies were conducted by Gregory A. Crawford (1994) and H. T. Landrum (1995) by using the conjoint analysis techniques. A detailed discussion on their work is done in the following chapter. Thus, by demonstrating the process and application of conjoint analysis in this study, it is hoped that library professionals will make further use of the process.

Practically, the results of this study will provide a sound basis upon which library managers can test various marketing mix (attribute level) alternatives prior to their introduction into the system. Previously, changes were introduced and their affects were only measurable after implementation. Similarly, the result may provide a basis for more efficient and effective library service provision.

1.8 Problem Statement

At present, research concerning preferences of library services is characterised by numerous theoretical and methodological difficulties, which inhibit the discipline from advancing on this research front. These difficulties include:

1. A lack of research studies among users to identify preferences on library services to redesign the existing services or designing services for a new library.
2. Poor concentration of research groups towards marketing techniques to promote the utilization of library resources and services.
3. Lack of interest to implement effective marketing research practices such as "conjoint analysis" to develop service package for the best use of library services.
4. Negative attitude towards management techniques to understand the customers and keep them more closely.
5. Miss-conceptions among librarians to understand user requirements better and not necessary that they introduce any latest techniques or surveys to be conducted.
6. Lack of rigorous theoretical base for the significance of the research questions addressed and the quality of research methodology employed.

7. The pre-dominate use of simple statistical procedures that inadequately describe complex social interactions and measurement of users' judgment.

Addressing the barriers in customer's research in Libraries, Manjunatha K. and Shivalingaiah D. (2000) say, "The present day librarian needs to possess more professional and technical skills than before to understand the user's requirements. Further need is to apply marketing techniques to promote the utilization of library resources and services. Proper understanding of customer requirements calls for customer surveys on regular basis and such reports provide the basic input for designing user-defined services. Analysis of the methods adopted by the librarians to understand customer needs, and the perceived barriers to conduct user surveys. .....The other perceived barriers such as 'Negative attitude of management', 'Fear of criticism and inability to implement the suggestions', 'Absence of alternatives (for users)', and 'Lack of expertise and resource constraints' have been disconfirmed by the libraries. The common views held by the librarians are 'Whatever the services we provide in the library are essential and best in the interest of the users', and 'we are aware of our weakness."

Another study is conducted by the same authors (Manjunatha K. and Shivalingaiah D. (1998)) to find out the nature and direction of Library Information Science (LIS) research during 1987 to 1997. Their attention was to identify the areas of research, which are receiving insufficient attention from LIS scholars. The study results revealed that subject areas like marketing of library and information services, models for market research methodologies for understanding customers, customer satisfaction, innovation in LIS services with few more subjects gets lack of attention is LIS research.

Feather and Struges (1997) points out that LIS research is some times criticised for lack of theoretical base. They remark, "The role and status of LIS research has been the subject of controversy. As a professional field with an emphasis on practice rather than theory, LIS research has been criticised for its lack of rigors theoretical base for the significance of the research questions addressed and the quality of research methodology employed."

Thus, the search for reliable and valid means with sound theoretical back ground and marketing research technique for measuring preferences on LIS service is one of the most pressing research needs in LIS research. This study will explore original methods in attempting to find a solution.

The **benefit** from this research include:

1. Boosting novice research library/information managers to conduct more studies on redesigning or marketing of library services for the 21st Century customers.

2. Importance of application of various marketing research methods such as conjoint analysis to measure user preferences towards designing/re-designing library services.
3. Provide a detailed discussion on conjoint analysis for measuring preference of users.
4. Provide with individualized preference structure model for better user services.

All these benefits will contribute to a heightened quality of library service being provided to the service population of all librarians worldwide. The practical applications of this research can measure utility or part-worth functions of each and every levels of attribute and will proved with an individualized library service package on the basis of preference measurement, which can be identified from participant's rating scale through conjoint software.

In addressing the problem of measuring preference on library services, this study focuses on library service in special library settings. In this context, special library users who seek individualized library services are the primary group who will benefit from this research project. In the past decades, this group has become increasingly composed of scientists and engineers, senior scientist of the country, younger generations of scientific research scholars and students specializing Master of Science. As more affluent members of the communities have a growing range of opportunities to access information through the Internet, Intranet information system at the rate of free information services. The same trend may continue among other community and university students. Thus, the immediate findings of this study will be applicable to library service that are being provided too more disenfranchised population.

1.9 Definitions and Terminology

The following definitions, concepts and terms are used throughout the study.

Attribute: This is the term used for the determinant decision criteria customers are assumed to use to evaluate products or services.

Attribute Interaction: This term refers to the effect that the presence of particular levels of "other" attributes influences a particular attribute evaluation as well as the overall utility. In the presence of particular "other" attributes, utilities of one attribute's levels may be diminished or increased.

Brand: This term denotes a particular product or service available or possible on the market that can be evaluated and possibly selected by a customer, i.e. a choice alternative.

Choice: This term refers to the cognitive process by which a consumer, after evaluating all the brands and forming a final choice set, decides to select one of the brands or not to make a choice.

Choice set (Final): This is the set of brands a consumer seriously considers prior to making a choice. In marketing this choice set is often called the "evoked set".

Client/Consumer/Customers: The ultimate user who purchases a product or service to satisfy their needs.

Cluster

A category assigned to a neighbourhood based on the assumption that the households share certain demographic, social, and economic characteristics.

Conjoint analysis: A multivariate technique used to quantify the value that people associate with different levels of product/service attributes. Respondents trade product attributes against each other to establish product (brand) preference and the relative importance of attributes. Based on utility theory and consumer rationality. Better for functional than fashionable brands.

Estimate: A numerical value obtained from a statistical sample and assigned to the population parameter.

Forecast: An estimate, based on assumptions about future trends in births, deaths and migration, or of a demographic characteristic such as population or number of households. Forecasts and projections are terms that are often used interchangeably.

Marketing: The process of planning and executing the conception, pricing, promotion and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational objectives.

Marketing concept: The business philosophy that a company's effort should be adapted to the needs and wants of its customers.

Marketing mix: The combination of different elements in such a way to get the right balance to achieve desired outcomes.

Measurement: Process of assigning numbers or labels to things in accordance with specific rules to represent quantities or qualities of attributes.

New product category: This term is used for products that are satisfying new needs or wants, or satisfy established needs and wants only possible in the specific combination of features of the product.

Overall utilities (overall evaluations). Judgments, impressions, or evaluations consumers' form of products and services, taking all the determinant attribute information into account. It is assumed that this evaluation is performed holistically (in a Gestalt sense) and not holistically, but one makes the simplifying assumption that this judgment may be decomposed into its parts with reasonable approximate accuracy (for the distinction between holistic and holistic perceptions of a system see Lendaris 1986, p. 605).

Part-Worth: Judgment that a customer makes regarding "how good", "how satisfactory", or "how whatever" particular positions of particular products might be on particular determinant attributes. They are also referred to as part-worth utilities for the positions (levels) of those attributes.

Physical variable: This term refers to observations or measurements of various physical properties of the product or service considered. These properties are antecedents of determinant attributes in the theory of information integration (Anderson 1981, 1982).

Position (= level): "Beliefs" that customers have about the amount of each determinant attribute possessed by products or services, called the "positions" on attributes. They are also referred to as levels when only discrete positions are considered.

Predictive validity: The degree to which the future level of criterion can be forecasted by a current measurement scale.

Preference: The state of being preferred; i.e., chosen over another or others.

Pre-test: A trial run of a questionnaire sent to a small sample to be sure that actual responses are clear and that any problems with the questionnaire are detected.

Product Concept: A brief written description of a new product or service idea

Respondent: The individual from whom data are collected. Also called participant, unit, and unit of analysis, subject or experimental unit.

Response: A reply or answer to a question or statement on the questionnaire.

Stimuli (Exhibits/Exhibit Cards): Printed cards, pictures, statements, actual products or advertisements given or shown to a respondent during the course of an interview, and usually relating to specific questions within the questionnaire.

1.10 Limitation

Major limitations of conjoint analysis that are generic to the method apply for the current study as well:

This study is limited to the investigation of consumer's decision-making as it pertains to limited number of characteristics, it is also limited to users of four organizations in the city of Bangalore.

In conjoint analysis, consumer's overall impressions, evaluations or judgements of the attributes that constitute the available choices are relative to their previous experiences and knowledge and limited by the attributes included in the analysis. Thus their judgements may change if (a) additional attributes were added to those included in the evaluation and (b) if new information or experiences are acquired by consumers that change their values or beliefs concerning attributes prior to them making a related purchase decision.

For many applied marketing problems the number of attributes is large to get a realistic context (10 to 15) and over. Furthermore, for large set of factors, responses may be unreliable because of respondent fatigue of simplifying strategies not employed in real decision contexts. However, the desire is not to contaminate studies with effects unaccounted for, also leads this study to limit the number of attributes to figures deemed appropriate for this experiment (i.e. eight (8) attributes). Eight attributes constitute the empirically found upper bound concerning capability of people to process pieces of information simultaneously.

Other approaches to the size problem are self-explication models, procedures, which sacrifice task realism. This study should not have suffered from such limitation as it was designed so that individual-level conjoint analysis is still possible.

It is acknowledged that using ratings likelihood of purchase only captures one-choice situations. There is no (explicit) provision for no-purchase or multiple purchase choices. However, this alternative is only relevant when one wants to determine penetration of a market with a new product not competing on the same attributes, i.e. competition between product categories, and if one wants to determine what factors modify the utility function of the customer for final choice (Sheth, Newman, and Gross 1991a, 1991b). These deliberations are external to the scope of this study, which focuses on tradeoffs among alternatives described on the same attribute set.

Traditional conjoint analyses do have a "flat" choice structure, i.e. no attribute hierarchies are modelled. However, it is conjectured that such inter attribute effects, if they exist, are caught with interaction terms in the model.

It seems that a balance is necessary between what is desirable as the conceptual model, and what is feasible from a respondent standpoint (Wyner 1992a and 1992b).

Advanced experimental designs, for instance the inclusion of interaction terms or high fractionation, often force researchers to sacrifice some flexibility for individual respondent-level analysis, i.e. resort to group-level analysis.

1.11 Organization Plan

Chapter II contains a review of the literature that is relevant to this research. Chapter III: methodology presents objectives & hypothesis, study design and data procedure. The results obtained from the study, the answering of the research questions with empirical data is discussed in Chapter IV. Major findings, contributions to library service design and marketing, limitations, suggestions and directions for future research are presented in Chapter V.

Chapter - 02

REVIEW OF THE LITERATURE

This chapter presents review of the literature on the major conceptional and methodological issues addressed in this study. First, an overview of the approaches used to measure consumer judgments is presented. Then, conjoint measurement and development of conjoint analysis are explained. Third, use of conjoint analysis in measuring consumer judgments is examined briefly. Fourth, theoretical bases of conjoint Analysis and steps involved are addressed. Finally, review of library service surveys and applications of conjoint analysis in the field of library and information science are presented.

2.1 Consumer research

The quantification of managerial or consumer judgment has long posed problems for marketing researchers, irrespective of their interest innovative or descriptive decision making (Green & Rao, 1971). The study of consumer

decision-making has been found to require ascertaining how buyers trade off conflicting criteria in making purchase decisions (Green & Carrnone, 1970). Research suggests that respondents' decision processes can be summarized crudely as a two-stage process. In the first "conjunctive" stage the consumer eliminates options with one or more unacceptable attribute levels. In the second "compensatory" stage the options that remain are traded off on the multiple attributes (Lussier & Olshaavsky, 1979; Payne, 1976). The modeling of such consumer judgments or preferences among multi-attribute alternatives has been one of the major activities in consumer research for the last few decades (Green & Srinivasan, 1978).

2.2 Approaches to measurement of Consumer's Judgment

Substantial effort has been devoted by marketing researchers to the study of consumer attitudes towards product characteristics. In essence, such efforts have attempted to estimate the structure of consumers' preferences (e.g., part-worths, attribute importance weights) and the specification of representational models that best reflect their evaluations of multi-attribute alternatives (Green and Srinivasan, 1978; Green and Wind, 1975). These models assume that consumers make decisions about alternative products or services (library services for this research) having made an assessment of product characteristics (Beckwith and Lehmann, 1973; Bettman et al.,

1975). It is further assumed that these models can be expressed in mathematical form (Timmermans and van den Heijden, 1984).

The major choices associated with attempts to model consumer choice are two-fold. First, is the decision to focus on actual behaviour or expressed preferences? The second is whether to use a compositional approach, in which the model components are specified separately and then combined into an aggregate model, or a de-compositional approach, which starts with an expressed preference or observed behaviour followed by analysis that aims to identify the interior structure of that preference or choice (June and Smith, 1987). Several authors noted advantages and disadvantages associated with each choice (Akaah and Korgaonkar, 1983; Cattin and Wittink, 1982: Green and Srinivasan, 1978; Jaccard et al., 1986: Mazis et al., 1975). June and Smith (1987), summarized the advantages and disadvantages of each as shown in Table 2-1 and Table 2-2.

Table 2-1 : Summary of The Arguments Concerning Compositional Versus Decompositional Model Designs.

MODEL DESIGN	SUBSTANCE OF ARGUMENT	
	FOR	AGAINST
Compositional	1. Relatively simple to design and implement. 2. Researcher has complete control over choice of variables and combination rules.	1. Respondents often find model design too simplistic and unrealistic. 2. Adequacy of model can be compromised by poorly chosen Variables or model structure.
Decompositional	1. Model design usually produces more realistic survey instruments for respondents. 2. Calibration of model tied more closely to dependent variables.	1. Can require more complex survey designs and analytical methods. 2. Researcher has less control over ultimate form of model and of weights associated with individual model components.

Table 2-2 : Summary of the Arguments Concerning Overt Behaviour Versus Expressed Preference Data in Choice Modeling

MODEL FOCUS	SUBSTANCE OF ARGUMENT	
	FOR	AGAINST
Behaviour	1. May more reliably indicate actual future behaviour. 2. Less hypothetical, and less open to "wishful thinking" or game playing. 3. More reliable and objective than opinion data.	1. Reflects available supply, not necessarily real preferences or choices if supply were larger. 2. May be less stable owing to temporary influences on behaviour where as attitudes may be more stable and indicative of future behaviour. 3. Data not available from current non-participants or non-purchasers.
Preference	1. Not constrained by current opportunities. 2. Can be used to study possible choices of proposed products. 3. Not constrained to current participants or purchasers.	1. Link between opinions about preferences and actual behaviour not always strong. 2. Respondents may have difficulty answering survey questions reliably. 3. Validity of data depends on ability of researcher to design a good survey form.

Jaccard etal. (1986) describe and statistically compare six methods used for identifying the importance of product attributes as they influence consumer preference and choice. They review elicitation measures, information-search measures, importance ratings, subjective probability measures, Thurstone measures and conjoint measurement.

The elicitation approach asks subjects to rank order the characteristics that are important to them in evaluating a product or service, in an open-ended fashion. Responses are content-analyzed and the order of elicitation is used as the basis for determining the importance of attributes listed. Indirect support for this approach is provided by several authors (Kaplan and Fishbein, 1969: Tversky and Kahneman, 1973; and Szalay and Deese, 1978).

Information-search measures require respondents to select one of several products (product descriptions) from a list of available choices. They are also presented with a list of attributes, each of which provides access to information concerning the attribute. Information is requested by the respondent one attribute at a time. Respondents are permitted to select as much or as little information as they want prior to making a decision about which product they would purchase from the list of available choices. Analysis is based on the order of selection, duration, and number of times an attribute's information is accessed (Jacoby, 1977).

Importance ratings typically require respondents to rate the importance of each of several attributes on a likert-type rating scale. The results are then analyzed to determine the relative importance of each attribute (McDonald et al., 1986).

Subjective probability measures typically ask respondents to rate their probability of purchasing a given product on a likert-type rating scale. Measures are asked as key attributes are manipulated to extremes. For example, respondents may be asked to rate their probability of buying a certain product (a) if the product was expensive, and (b) if the product were inexpensive. The absolute difference between the two conditional measures serves as the index of importance (Jaccard et al., 1979).

Thurstone measures (paired comparisons) present respondents with pairs of attributes and ask them to indicate which of the two would be more important to them in evaluating a given product. All possible pairs are presented and traditional paired comparison analysis is undertaken. In this approach only aggregate level estimates are possible (Fishbein and Ajzen, 1975).

Conjoint procedures as described later in this chapter were also included in this comparison.

Jaccard et al. (1986) suggest that conclusions made about attribute importance may be quite different depending on which of the methods described above are used. They refer to the possibility of using a multidimensional approach that involves at least two different measures of attribute importance. They noted however that the low levels of convergence might primarily be the result of unreliability of the measures used and also cautioned that a multidimensional approach would require an elaboration of the conceptual foundations underlying attribute importance and how these relate to product evaluation. While the findings of this comparison suggest lack of convergence among the methods used, the authors emphasized that each of the methods considered, either has a substantial theoretical base, or is widely used in applied research. This serves to reinforce the validity of these methods, including conjoint analysis.

Also of note in any discussion of methods used in the evaluation of attribute importance is multi-dimensional scaling (MDS). This technique is intended to infer the underlying dimensions of attribute importance from a series of similarity and/or preference judgments provided by respondents (customers) about products. Typically, respondent's rate alternatives two at a time using a 10-12 point likert-type scale with end points indicated as highly similar and highly dissimilar. Computer programs then generate visual output indicating the perceived similarity between the products, usually on a two-dimensional basis (Engel et al., 1986). Green et al., (1987), suggest that the

advantages of multidimensional scaling lie in its display power, noting that relationships among brands, attributes, and target segments can be easily portrayed in terms of relative distance using a perceptual map. These authors suggest using multidimensional scaling techniques to represent the results of conjoint simulations in a user-friendly, graphic way.

2.3 Conjoint Measurement

The modeling of consumer judgments or preferences among multi-attribute alternatives has been one of the major activities in consumer research for the last few decades (Green & Srinivasan, 1978). The modelling of an individual's preference or choice among competing stimuli can be achieved in many ways. The expectancy-value class of models (Fishbein, 1967; Rosenburg, 1956) has been the most researched in this area conjoint measurement was developed as another method of modelling consumer preferences.

Conjoint measurement has been used within mathematical psychology as a measure of individual choice behavior consisting of a series of tests used to determine whether a person's rank order of preferences could be described by a formal composition rule applied to a set of independent variables (Krantz & Tversky, 1971; Luce & Tukey, 1964)

The foundations for conjoint measurement were built in mathematical psychology (Luce and Turkey, 1964) and it is generally agreed that 1964 marks the start of conjoint measurement with the seminal paper by Luce, a mathematical psychologist, and Turkey, a statistician (Luce & Turkey, 1964). These authors can be appropriately characterized as having provided the conceptual foundations of conjoint measurement (Green & Rao, 1971). Shortly thereafter, a number of theoretical contributions and algorithmic developments appeared (Carroll, 1969; Krantz, 1964; Kruskal, 1965; Tversky, 1967; Young. 1969).

This method was developed as a means of measuring the joint effects of a set of independent variables on the ordering of a dependent variable (Green & Rao, 1971). For example, one's preferences for various houses may depend on the joint influences of such variables as nearness to work, rates, quality of school system, anticipated resale value, and so on (Green & Rao, 1971). Theoretical justification for the multi-attribute modeling of consumer preferences is provided in the growing literature on the Fishbein-Rosenburg class of expectancy-value models and the new economic theory of consumer choice (Ratchford, 1975). Conjoint measurement as practiced by these early mathematical psychologists has primarily been concerned with the conditions under which there exist measurement scales for both the dependent and independent variables given the order of the joint effects of independent variables and a pre-specified composition rule.

2.4 Development of Conjoint Analysis

Green and Srinivasan (1978) have suggested that the name "conjoint analysis" be used to cover models and techniques that emphasize the transformation of subjective responses into estimated parameters.

Although, one of the foundations for the development of conjoint analysis is the expectancy value model, but the models differ from each other in many ways. While expectancy value models draw upon a compositional or build up approach, conjoint methodology is based on a de-compositional approach in which respondents react to a set of "total" profile descriptions. It is the job of the analyst to find a set of part-worths for the individual attributes that, given some type of compositional rule (e.g., an additive one), are most consistent with the respondent's overall preferences. Furthermore, a key distinction between these two approaches lies in the predominant purpose for which each approach is used. Users of conjoint analysis have generally emphasized predictive validity and regarded explanation largely as a desirable but secondary objective, while the converse has generally been true for the expectancy-value theorists (Wilkie & Pessemier, 1973).

The development of conjoint analysis has also been closely related to two other developments in applied psychology, the modeling of clinical judgments and functional measurement. The modeling of clinical judgments approach involves de-compositional modeling of subjects' responses to

profile descriptions representing diverse topics (Green & Srinivasan, 1978). Functional measurement has been used for both parameter estimation and model testing (Green & Srinivasan. 1978).

2.5 Conjoint Analysis

The term conjoint analysis is now broadly used to refer to any de-compositional method that estimates the structure of a consumer's preference given his/her overall evaluations of a set of alternatives that are pre-specified in terms of levels of different attributes (Green & Srinivasan, 1978).

Based on the evaluation of a set of competing products, conjoint analysis programs derive estimates of each purchaser's utility function. The utility function quantifies the relationship between the purchaser's overall reaction to the product and the individual attributes of the product. The importance of a particular attribute is expressed as its "part-worth" or the percentage of the total decision described to that attribute. Moreover, because the degree of preference for each level of an attribute is obtained, given a set of utility functions for a group of purchasers, one can then simulate market behavior for any set of products defined by the key attributes (Auty, 1995).

Conjoint Analysis has been an aggressive method among academic researchers as preference measurement since its introduction into marketing by Green & Rao (1971). Since then, the techniques enjoy a fast-growing number of applications till the date. Green and Wind (1928) used the technique in measuring consumer judgment for new product formulation. Package design etc., while Addelman (1975) recognized conjoint analysis as a tool to value various product attributes.

The techniques are usually carried out in the individual level so that substantial amount of personal varieties in consumer preference may be taken care. Major issues in implementing conjoint analysis discussed while presenting the various steps in conjoint analysis.

Some resources have been carefully demonstrated the reliability and/or validity of conjoint analysis. As an instrument to test of reliability, conjoint analysis used to estimate the reliability of a respondent's pre-judgment and to measure the parameters of the preference model. While the internal validity of conjoint analysis can be estimated in terms of the correlation between input versus estimated values of the dependent variables, the external validity can be tested by comparing prediction against a respondent's actual behaviour with respect to real "stimuli" (Parker & Srinivasan, 1976).

Conjoint Analysis offers a tremendous analytical power based on a function of known attribute levels. (Green etal 1987). The method offers an excellent opportunity for consumer researchers. Another important use of conjoint analysis is its power of estimation of preference judgments at the individual level and is aggregate.

The most significant advantage associated with conjoint analysis is that customer's preferences judgment by relative importance of complete product descriptions rather than individual attributes of a product (Green, Wind and Junior 1972). Individual's preference for certain product characteristics may be inferred from the rating of the product descriptions.

2.6 Application of Conjoint Analysis

Since 1971, conjoint analysis has been applied to a wide variety of problems in consumer research (Green & Srinivasan, 1978). Wittink and Cattin (1989) report that the large majority of conjoint studies pertain to consumer goods (59%) and industrial goods (18%) with financial (9%) and other services (9%) accounting for most of the rest. New product/concept evaluation, repositioning, competitive analysis, pricing, and market segmentation are the principle types of application. Despite its apparent popularity, diffusion of conjoint analysis-based research has been relatively slow within commercial applications, primarily because of the mathematical complexity

of the programs and to a lesser extent because of the perceived difficulty of administering the survey instrument (Auty, 1995).

Despite this perceived difficulty, however, conjoint analysis has emerged as the most widely applied marketing research tool for modeling consumer preferences among multi attribute alternatives since its introduction to the marketing research community in the early 1970s (Akaah, 1991). Cattin and Wittink (1982) and Wittink and Cattin (1989) report 698 commercial applications of conjoint analysis for the period 1971 to 1981 and 1062 commercial applications for the period 1981 to 1985.

The annual commercial use of conjoint analysis in the early 1980s has, as cited above, exceeded the annual use during the 1970s. The increased usage is thought to be associated with the introduction of software that facilitates stimulus set construction, administration, and analysis of the data. As a consequence the number of commercial users and research suppliers offering conjoint analysis has grown (Wittink & Cattin, 1989).

State of the art review published by Wethink and Cattin (1989) updated the commercial use of conjoint analysis. They found that the application of conjoint analysis for consumer goods (61%); industrial goods (20%) transportation (4%); financial service (8%); government (3%) and other services (5%). According to Wittink etal (Wittink, Uren & Burhenne,

1994). US identified seven categories of conjoint study's purpose into commercial use. They are new product concept/development, pricing, market segment, competitive analysis, repositioning, advertising and distribution. The most frequently used conjoint application the US is new product developed (Cattin and Wittink, 1982, Wittink and Cattin 1989). Researchers renders level or estimate the consumer preference for each competitive product attribute or levels. This lead the researchers to concentrate their research activities more on a particular attribute or levels for the competitive product optimization (Zufryclm, 1977; Green, Carroll and Goldberg, 1981, Green Krieger, 1985).

While the traditional market segmentation issue is always discussed in two categories: a prior segmentation and post hoc (cluster–base) segmentation (Wind, 1978; Green 1977), since the launch of Conjoint Analysis, Green etal proposed a new segmentation procedure–componential segmentation procedures (Green and De Sarbo, 1979), the approach differs from traditional procedures. This approach focuses on joint effect of customer and product attribute levels. Its primary objective is to predict how a respondent would make his or her choice among a set of product alternatives. By accomplishing componential segmentation, the researches can better understand market mix in terms of consumer preferences.

2.7 Software tools for Conjoint Analysis

The hot topic in today's competitive markets is New Product Development (NPD). The extensive use of the CA techniques in the field of NPD, researchers wanting to use microcomputers in the studies. Also, conjoint analysis has become an increasingly popular approach to modeling preference structure, new developments have occurred. Since the application is high, vast majority of firms started offering conjoint as a service. The trend leads to the growth of software tools for conjoint analysis. This resulted with the introduction of several new conjoint software programs into the market place.

There are few major commercial packages for designing and conducting conjoint studies. A detailed review in JMIR has evaluated these packages (Carmone and Shaeffer, 1995). They are Conjoint Value analysis (CVA), Adaptive Conjoint Analysis (ACA) package from Sawtooth software, Bretton Clark and the CONSERV package from Intelligent Marketing Systems. These packages differ in a number of dimensions, such as, use the full-profile method or an adaptive approach. General administration of questionnaire can be done on PC, such as measurement scales, the algorithmic options, market stimulation criteria, etc. In addition to these software, an analysis can conduct using standard Statistical packages including SPSS, SAS, MS Excel etc.

2.8 Conjoint Analysis Study Design (traditional conjoint models).

The two basic objectives in designing a conjoint study are to permit the estimation of a respondent's preference functions and to make the task such that internal validity of the results is maximised. In conjoint analysis these two objectives are viewed as being in compatible given the inverse relationship between number of treatments (cards) used, and the accuracy of the preference function estimation. As the number of treatment increases, the accuracy of the preference function estimation decreases (Louviere, 1988).

The necessary steps as well as the alternatives for implementing each step in the development of a conjoint analysis study are listed in Table 2-3. Following is a summary of the steps and alternatives involved in conjoint analysis, as well as descriptions as to when each alternative should be employed.

There are several optima available for each of these steps. Among the numerous combinations of options, combinations, which are not feasible, will be pointed during the discussion.

Table 2-3 : The Steps and Alternatives for Constructing a Conjoint Analysis Study.

Sl. No.	Steps	Implementation Alternatives
01	Model of preferences.	Vector model
		Ideal-point model
		Part-worth function model
		Mixed model
02	Data collection method	Two-factor-at-a-time procedure
		Full-profile method
		Paired comparison
03	Data collection mode	Telephone
		Mail questionnaire
		Telephone-mail
		Questionnaire-telephone (TMT)
04	Stimulus set construction for the full-profile method (Identification of attribute and levels, Attribute combination, Fractional factorial model)	
05	Stimulus presentation	Verbal description
		Paragraph presentation
		Pictorial or three dimensional method
06	Measurement scale for the dependent variable	Paired comparison
		Rank order
		Rating scale
07	Estimation method	Ordinally scaled (non-metric)
		Choice probability model (non-metric)
		Intervally scaled (metric)

2.8.1 Preferences Model

The preference model is the mathematical representation for the judge's decision-making scheme. There are four alternative preference models in use for the traditional conjoint analysis : *(a) the vector model, (b) the ideal-point model, (c) the part-worth function model, and (d) mixed model* (Green & Srinivasan, 1978).

These four models differ in terms of their flexibility of shape. That is, the vector model is a linear model, the ideal-point model is a curvilinear model,

and the part-worth model is a piecewise linear model (Cattin and Wittink, 1982) have found that the part-worth model is the most commonly used model.

2.8.1.1 Vector Preference Model

The vector preference model referred to as the composite criterion model by Srinivasan and Shocker (1973) and Parker and Srinivasan (1976).

The vector model represents preference (S_j) for the j^{th} stimulus as

$$S_j = \sum_{P=1}^{t} w_p y_{jp}$$

Where the w_p are the individuals weights for the attribute.

P = 1,2,.....t (set of 't' attributes)

Y_{jp} = the level of the p^{th} attribute for j^{th} stimulus.

This model is identical in mathematical form to the Fishbein-Rosenberg class of multi attribute models (Green & Srinivasan,1978). In the vector model the preference function is monotone (increasing or decreasing) over increasing levels of an attribute while holding other attributes constant.

Judges always prefer greater durability of a product or lower price of a product.

2.8.1.2 Ideal-Point Model

In the ideal-point model, S_j is negatively related to the squared (weighted) distance dj^2 of the location (y_{jp}) of the j^{th} stimulus from the individuals ideal point (x_p) where

$$dj^2 = \sum_{P=1}^{t} w_p (y_{jp} - x_p)^2$$

The ideal-point model posits that judges may prefer moderate levels of an attribute as opposed to always preferring increasing levels of an attribute, the underlying assumption of the vector model. For example, a person may prefer moderate levels of automobile size or moderate temperature levels. Without the restriction of linearity, the ideal-point model is more flexible than the vector model.

2.8.1.3 Part-worth Function Model

In the part-worth function model:

$$S_j = \sum_{P=1}^{t} fp\,(y_{jp})$$

The part-worth function model is the most flexible model. It makes no assumption about the attribute levels and preference ratings. For example, a

judge may like both the hot extreme and the cold extreme for tea while not caring much for in-between temperature. A part-worth function model would accommodate such a preference pattern. Also, if attribute levels are categorical as opposed to scaled (e.g., brand name, type of car), one must use the part-worth model. Both the vector model and the ideal-point model demand the use of scaled attribute level data.

2.8.1.4 Mixed Model

Green & Srinivasan's (1978) mixed model allows some attributes to be treated as following the part-worth function model while other attributes follow vector and ideal point models.

Choice of a preference model may depend on models ability for: i) Simpler process ii) Predictive validity and iii) Consistency with the respondents actual behaviour. Using an estimate of the expected mean square error of prediction (Hargerty and Srinivasan (1989), one can compare the prediction error across the models. This approach applies when multiple regression is used as the estimation procedure. Green and Srinivasan (1989) note that this estimate is likely to be largest for the vector model since it uses most restrictive (linear) form.

In summary, the part-worth function model is a very attractive choice because it allows the greatest flexibility for differing shapes of the preference function. The model is very accommodating when little or no priori information exists regarding judges' preferences for various attribute levels. Also, the part-worth function model is the only model that is applicable if attribute level data are categorical (Green & Srinivasan, 1978).

2.8.2 Data Collection Methods

Basically, there are three collection methods in conjoint analysis. The full-profile or concept evaluation method (green and rao, 1971), two-factor at-a-time method or trade-off matrix method (Johnson, 1974) and the paired comparison method.

Accuracy result conducted by Cattin & Wittink (1989) noted that majority of the CA applications has involved the full profile approach. While full profile method was used by 61% of commercial conjoint studies, the use of paired comparisons was 10% and 6% studies used trade off methods and the remaining 23% use a combination of these or some other method of data collection.

2.8.2.1 Full Profile Method

The full profile method requires judges to evaluate a number of hypothetical products in terms of how likely they are to purchase each one. These products are generated using statistical design techniques and are presented to respondents using verbal descriptions, paragraph descriptions, or pictorial three-dimensional models (Auty, 1995).

The full profile approach utilizes the complete set of factors. Profiles are obtained by developing a completely orthogonal matrix, one that includes all combinations of all attribute levels. Once all of the profiles are developed, they are presented to the respondent for rank ordering from most favorite combination to least favorite combination or each individual profile is given a rating on a scale, such as "likeliness to purchase."

The biggest limitation of this approach is the possibility of information overload because of the large number of possible combinations among attribute levels. For example, in a study with three attributes with three levels each and two attributes with two levels each, the resulting number of profiles is $3^3x2^2 = 108$. This can result in temptation on the part of the respondent to simplify the experimental task by ignoring variations in the less important factors or by simplifying the factor levels themselves. The conjoint results obtained under such conditions may not be representative of

the real life behaviour of the individual where he/she may have time and motivation to deliberate on the choice from among a smallest of alternatives. Because of the information overload problem, the full profile procedure is generally confined to at most five or six factors.

One way to combat the problem of information overload is to use various types of fractional factorial designs, as suggested by Green and Rao (1971). This type of design allows the Combinations to remain manageable while at the same time maintaining the orthogonaty of the experimental design.

The full profile approach when implemented by various kinds of fractional factorial designs-entails fewer judgments to be made by the respondent (Louviere, 1988).

2.8.2.2 Two-Factor-at-a-Time Approach

In the two-factor-at-a-time approach, attributes are considered on a two-at-a-time basis. The respondent is asked to rank the various combinations of each pair of factor levels from most preferred to least preferred.

The advantages of this approach are that ability to use many attributes it is simple to apply, reduces information overload on the part of the respondent speed with which the interview is completed, and suitable for a mail

questionnaire. However, the approach has a number of limitations such as some sacrifice in realism respondent confusion, the possibility of patternised responses and large number of combinations to evaluate. The procedure appears to be most suited for to verbal descriptions of factor combinations rather pictorial or other kinds of graphical representations

2.8.2.3 Paired Comparison

In the paired comparison approach, the respondent is asked to choose between pairs of full profiles rather than ranking individual profiles. This approach seems to be gaining in popularity (Wittink & Cattin, 1989)

However, there are limitations to the two-factor-at-a-time procedure. First and foremost, there is a sacrifice in realism. Consumers do not encounter nor do they process information about products/services in the "real world" on a two-factor-at-a-time basis.

2.8.2.4 Comparisons between Full-Profile and Trade off Procedures

The main argument in favor of the full profile approach is that it gives a more realistic description of stimuli by defining the levels of each of the factors, and it can potentially take into account the potential environmental Correlations between factors in real stimuli. However, it has the

disadvantage of making the task difficult for the respondent by having to consider several factors at one time.

An additional advantage of the full profile method is its ability to measure overall preference judgments directly using behaviorally oriented constructs, such as intentions to buy, chances of switching to a new brand, etc. The elicitation of such constructs from respondents requires that each option be described on all of the attributes, that is, the full profile approach (Green & Srinivasan, 1990).

Green and Srinivasan (1978) suggest that in contexts where the environmental correlation between factors is large and the number of factors on the stimulus card is small, the full profile approach is likely to be better in terms of predictive validity. However, if the environmental correlation between the factors is small and the number of factors on the stimulus card is large, the two-factor-at-a-time approach is likely to be better.

2.8.2.5 Empirical study Comparison

Montgomery, Wittink, and Glaze (1977) found that the two-factor-at-a-time approach yielded higher predictive validity than the full profile approach in a study of job choice by MBAs. Also, Alpert, Betak, and Golden (1978), in a study of commuters' choice of transportation modes, found that the

goodness-of-fit to input data was better for the two-factor-at-a-time approach. However, Jain, Acito, Malhotra, and Maharani (1979), in a study of various bank checking accounts, found that the two methods yielded approximately the same level of cross-validity. Similarly, Oppedijk van Veen and Beazley (1977) in the context of a durable good product class, found that the utilities determined by the two methods were roughly similar. The two studies that favored the two-factor-at-a-time approach used a large number of attributes and the problem contexts in all four studies were such that there were no substantial environmental correlations across factors.

Finally, Reibstein, Bateson, and Boulding (1988), in contrast to earlier studies, found that the reliability of the full profile approach was more dependent on the choice of attributes than were paired comparisons or trade-off matrices and that the full profile procedures led to higher reliability than the trade-off matrix. Previous studies found no such differences in the reliability between full profile and trade-off matrices (Jain, Acito, Malhotra, & Mahajan, 1979; Leigh, MacKay, & Summers, 1984; Segal, 1982).

As stated by Auty (1995), there appears to be little difference in the reliability and validity comparisons between the two procedures and the decision of which method is to be utilized can be determined by previously mentioned considerations.

2..8.3 Data Collection Mode

In the last decade there has been a trend toward alternative data collection modes including mail questionnaires and telephone interviews (Wittink & Cattin, 1989). The appeal of these alternative modes is the fact that they are faster to use than traditional in-person interviews at some central location. Also, these methods are less expensive than in-personal interviews, especially if the target population that is to be examined is spread out over a wide geographic area. However, the benefits aside, there are a concern regarding the appropriateness of these methods given the inherent difficulty of the conjoint task. For example, the use of telephone interviews does not allow for the physical examination of conjoint stimuli before respondents make their evaluations. Also, the use of telephone interviews requires respondents to mentally keep track of their evaluations without the benefit of physical stimuli. While the use of mail questionnaires allows for the physical examination of stimuli, it does not permit the asking of questions in case task instructions are unclear (Akaah, 1991).

Akaah (1991) examined the predictive performance of self-explicated, traditional conjoint, and hybrid conjoint models across three data collection modes (i.e., in-person interviews, mail questionnaires, and telephone interviews). The author found that the conjoint models (self-explicated, traditional conjoint, and hybrid conjoint models) were fairly comparable in

predictive performance across data collection modes. The author concludes that alternative data collection modes can be successfully used for data collection in conjoint research. He recommends, however, that adoption be approached cautiously given the complex nature of conjoint tasks. Cerro (1988) points out that mail questionnaires are appropriate as a data collection mode if the target population has the background to undertake conjoint tasks without the help of an attendant.

The predictive performance of conjoint models might be enhanced if they involve the use of combination modes. One such combination is the telephone-mail-telephone approach (TMT). In the TMT approach, respondents are recruited by telephone and given a brief explanation of what the task will entail. A date for a follow-up phone call is agreed on. The questionnaires are mailed to the subjects. On the agreed upon date, the interview takes place over the phone. Auty (1995) reports that response rates for this type data collection alternative can reach 80%. More research needs to be performed on the TMT methodology, in order to study the effects, if any, on the reliability and validity of results.

2.8.4 Stimulus Set Construction for the Full - Profile Method

Various issues involved with stimulus set construction are briefly discussed in the following sections.

2.8.4.1 Attribute Selection

The most important determinant of a successful conjoint study is selecting the right attributes and levels. The researcher must identity what Alpert (1971) calls determinant attributes which relate to preference and choice and distinguish the choice alternatives in meaningful ways.

To develop hypothetical stimuli for the full profile method the researcher must first define the attributes and the various levels of each attribute.

It is not enough for attributes to be important to the consumer, but chooser on the basis of objectives of the study. All the attributes should be a determinant factor or have a significant impact on the purchase decision.

Auty (1995) warns that no decision is more critical to the validity of the conjoint exercise than the one that must be made about which attributes to include. By including an attribute, one is guaranteeing that a certain level of importance will be attached to it, even if in reality no purchase decision ever hinged on it. The author points out that, if the attributes chosen do not include the ones actually involved in purchasers' trade-off decisions, then one will have a mass of spurious data on preferences and simulated market shares.

There are several alternate means for identifying the attributes that are relevant to consumers in forming their preferences and to help the researcher ensure that he will not be collecting spurious data (Alpert, 1971). A preliminary data collection effort, or questioning consumers regarding attributes important to them, usually helps in identifying those attributes most frequently regarded as relevant (Braun & Srinivasan, 1975). Focus group interviews, or judgments of product managers, retailers, and others knowledgeable about the product/service and its uses can also be used for this purpose. The more difficult and often subjective task is to reduce the number of attributes to a manageable size so that the estimation procedures are reliable while at the same time accounting for consumer preferences sufficiently well (Green & Srinivasan, 1978).

The number of attributes to include in a study depends on study objectives, the time allotted for data collection process, the level of respondent involvement, the form of conjoint analysis etc. Popular methods for the identification attributes are expert judgments of clients, group interviews, previous research findings etc.

Another reason to keep the number of attributes somewhat constrained is that for mathematical reasons it is important to have the ratio of cards to attributes be over 1.5, and preferably higher (Auty, 1995).

Little guidance available from Rosenberg and Fishbein in selection of attributes (Rosenberg,1956; Fishbein, 1967). Common problem in attribute selection between large numbers of attributes (on or realistic) smaller group (ease the task).

Once it has been determined what attributes to include, it is then necessary to make sure the vocabulary matches the distinction that buyers are making. As Auty (1995) points out, sometimes an attribute is understood slightly differently by purchasers than by manufacturers. An important choice factor may be excluded because the attribute has been misunderstood. The researcher will need to talk informally to respondents before designing the survey and then go back to managers to refine the information.

The range of levels for each attribute and the list of attributes must adequately portray the product so as to be believable but also differentiating (Green and Srinivasan, 1978).

Green and Srinivasan (1978) recommend that the range of attribute levels be made larger than reality in order to guarantee differentiation of levels, but not so large as to be unbelievable.

One important point that impacts the decision regarding the number of levels for each attribute is discussed by Wittink, Krishnamurthi, and Nutter

(1982). The Authors State that without mathematical correction attributes with more levels will have proportionally higher important rating than those with fewer levels. To avoid such difficulties of interpretation and again to keep the number of cards manageable, a uniform three or four levels work best. However, there are problems when attempting to employ such a strategy.

2.8.4.2 Attribute Combinations

Cattin and Bliemel (1978) point out that, as the number of attributes and levels thereof increase, so does the number of combinations of attributes one can define. When there is a small number of attributes and levels, it is feasible to ask an individual to evaluate all the combinations that can be defined. However, with a larger number, one has to resort to sampling attribute and attribute level combinations from the population of alternatives. Requiring a large number of attributes and levels within attributes places a severe information overload on respondents. Wright (1975) states that, when faced with such large tasks, respondent's resolution to simplifying tactics resulting part-worth estimates may distort their true preference statements. As stated earlier, a conjoint study with three attributes at three levels each and two attributes at three levels each results in a total number of descriptions $3^3 \times 2^3 = 456$.

2.8.4.3 Fractional Factorial Models

To overcome this problem, Green (1974) has suggested the use of various types of fractional factorial designs to reduce the number of combinations to a manageable size while at the same time maintaining orthogonal. These types of design assume that there are no interaction effects. Therefore, not every combination of all attribute levels is necessary. The model appears to be realistic given the type of preference models discussed earlier. Attribute combinations are developed using a partially balanced incomplete block design in order to ensure that they are representative of the larger orthogonal matrix. Green and Srinivasan (1990) indicate that fractional factorial designs and other kinds of orthogonal plans that either exclude or markedly limit the measurement of interaction effects currently dominate the field of conjoint analysis research.

The major issue in constructing the stimulus profiles for the full-profile approach is number of stimuli to be evaluated. It is often difficult to increase the number of stimuli above 30 in a controlled prediction error. If a full factorial design is used, the number of possible stimuli definitely becomes very large. (eg. With three attributes at three levels each and two attributes at four levels each, the total number of possible stimuli is $3^3 \times 4^2 = 432$). As number of attributes and levels increase, the number of profiles also go high in number. The situation may give more burdens to respondent and data collection becomes more unrealistic Green (1974) has suggested the use of

various types of fractional factorial designs to reduce the number of combination to a manageable size while at the same time maintaining orthogonality. Microcomputer packages can be used to prepare orthogonal designs. A discussion of various kind of fractional factorial can be found in the paper by Green, Carroll and Carmone (1978).

2.8.5 Stimulus Presentation

According to Green and Srinivasan (1978), presentation of the hypothetical stimuli in the full profile approach has typically involved variations and combinations of three basic approaches: verbal description, paragraph description, and pictorial presentation. The majority (75%) of the applications involve verbal descriptions for the presentation of stimuli to respondents. (Cattin and Wittink, 1982; Uriens & Burhenne, 1996). The two-factor-at-a-time approach has primarily used the verbal description approach. The typical verbal description task involves giving the respondent stimulus cards, each card defining the levels of each of the attributes. The respondent is asked either to orderly rank them or to rate them on a scale. This procedure has the advantages of being simple and efficient. This procedure is convenient (easy to use), inexpensive and straightforward.

Some researchers (Hauser and Urban 1977) have adopted the paragraph description approach. The advantage of this approach is that it provides more realistic and complete description of the stimulus.

A significant drawback of this procedure is that it limits the total number of descriptions to a small number, therefore, the parameter estimates are likely to be less valid when estimated at the individual level.

2.8.5.1 Pictorial Representation

Pictorial representations use various kinds of visual props or three-dimensional models. This presentation type has several advantages: information overload is reduced because the respondent is not required to read and then visualize large quantities of information, higher homogeneity of perceptions is obtained across respondents, stimuli are more realistic, the task is more interesting, less fatigue and it is very effective in studies concerned with appearance and aesthetics associated with package design and product styling.

The primary drawback to the pictorial approach is the increased cost and time on the part of the researcher in preparing the stimulus descriptions. There is also danger in the picture displaying information different than what the researcher intended.

2.8.5.2 Verbal Description

According to Green and Srinivasan (1990), studies that employ profile cards, with attribute-level descriptions, are by far the more popular presentation methods.

2.8.6 Measurement Scale for the Dependent Variable

There are two categories of alternatives for the measurement of the dependent variable, metric and non-metric. A metric measurement scale is a rating scale that assumes approximate interval scale properties, or ratio scales containing constant-sum paired comparisons. The nonmetric measurement scale is either paired comparisons or rank ordering.

Fig. 2-1 : Measurement Scale Classification and Alternatives

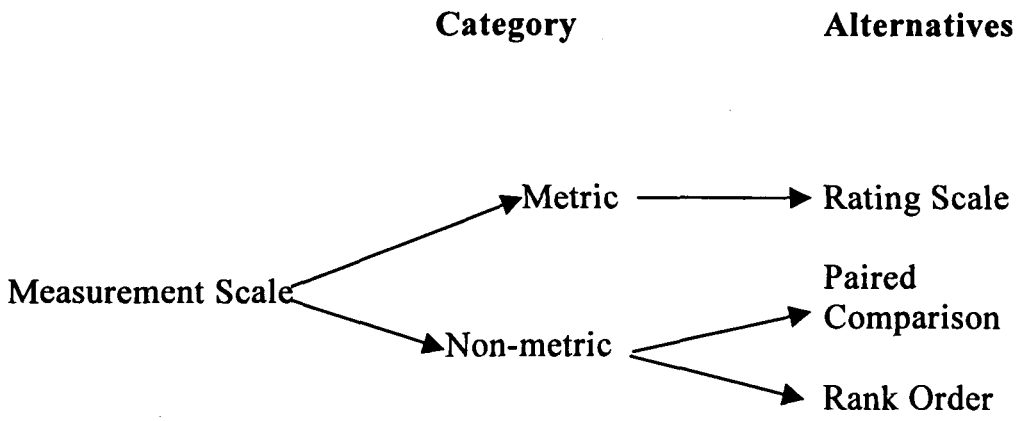

Fig. : 2-1

For a metric measurement scale, the measurement can be either in terms of overall, preference or intention to buy (likelihood of purchase). The metric approach has the enormously large advantage of the increased information content potentially present in these scales. However, Green and Srinivasan (1978) state that:

> "the nonmetric methods do have the following advantages: (1) ranked data are likely to be more reliable, since it is easier for a respondent to state preference as compared to expressing magnitude of preference; (2) data analysis based on a nonmetric dependent variable allows the part-worth functions to be combined in either an additive or multiplicative manner, (estimation of an additive model with a nonmetric dependent variable is also consistent with a multiplicative model since the logarithmic transformation is just one of the

permissible monotone transformations of the dependent variable); and (3) with the two-factor-at-a-time approach the nonmetric method is more appropriate than the metric method. The metric scale value for the dependent variable will necessarily depend on the levels of the (t-2) missing factors, whereas the rank order of each of the cells in a trade-off table need not depend on the levels of the missing factors, except if the attributes are correlated."

Ranking necessitates the use of a deck of cards whereas rating which can be presented as several profiles on a page. Auty (1995) indicates that some respondents in certain situations find the deck cumbersome while others may find it more intriguing than a standard questionnaire.

Rating according to likelihood of purchase is less likely to result in strategic simplification than ranking, in which respondents invariably simplify the task by seriously considering only one or two attributes. However, a likely problem with rating scales is inconsistencies across product ratings because respondents do not have to look back to see how they have rated a similar product earlier.

Wittink and Cattin (1989) summarized the area with the conclusion that most commercial users of conjoint analysis because of the greater design, flexibility and the relative simplicity of the task have preferred rating scales.

2.8.6.1 Comparison

Based on the survey result conducted by Cattin & Wittink (1982) preference rank order was more frequently used (45%) when compared with the rating scale (34%). However, rating scale has become more popular and is used in almost half of the commercial conjoint applications (Wittink and Cattin, 1989; Wittink, Uriens and Burhenne, 1996; louviere, 1988). This dominant is partly due to the heavy use of ACA that incorporates preference intensity rating scales in its paired comparison section. Although there is no sufficient evidence in support, Green & Srinivasan (1978, 1990) believe that rank order continue to be popular because ranked data are likely to be more reliable. The paired comparison approach is least efficient, in terms of information obtained per unit time, of the methods. Finally, more empirical studies are needed to avoid conflicting considerations involved in the choice of a metric versus non-metric measurement scales.

2.8.7 Estimation Methods

The estimation methods available may be roughly classified into three methods.

First, the methods that assume that the dependent variable is ordinaly scaled or broadly described as non-metric.. Alternatives among this category

algorithms include (a) MONANOVA (Kruskal, 1965), b) PREFMAP (Carrol, 1972) (c) Johnson's nonmetric trade of procedure (Johnson, 1973; Nehls, Seaman and Montgomery, 1976) (d) LINMAP (Srinivasan and Shockar, 1973; Pekelman and Sen, 1974). A detailed list of this class of algorithms is given in a book by Rao (1977). MONANOVA and Johnson's non-metric trade off are used with the part worth function model, while PREFMAP is used with either the part - worth function model, the vector model or the ideal point model and LINMAP is best for the ideal point model.

Fig. 2-2 : Estimation methods Classification and Alternatives

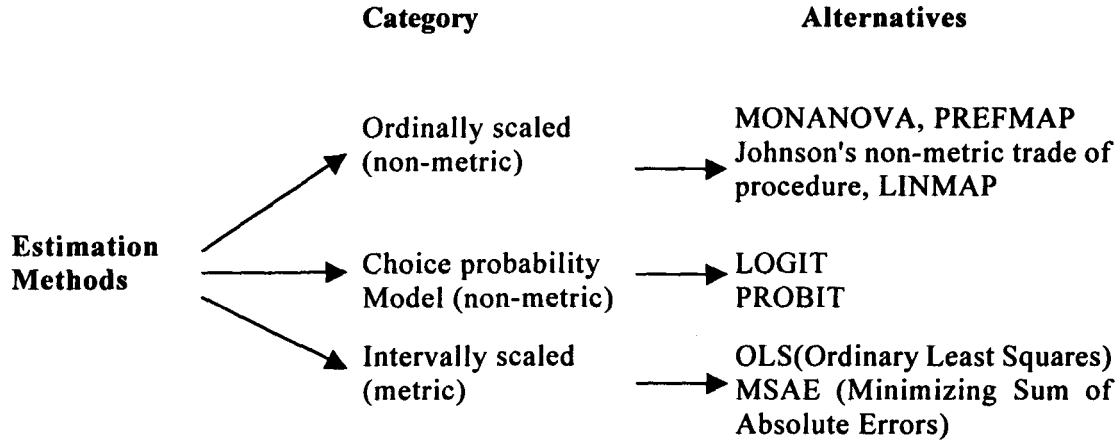

Fig. : 2-2

Secondly, the methods, which relate paired comparison data to a choice probability model (also non-metric). Method in this class are LOGIT (MeFadden, 1976; Ben-Akiva, 1973; Gensch, Golob, and Recker, 1976; Green and Carmone, 1977; Punjad, Staelin, 1978) and PROBIT (Goldberger, 1964; Rao and Wister, 1977).

Finally, methods which assume that the dependent variable is intervally scaled classified as metric. Algorithms in this category are Ordinary Least Squares (OLS) regression (Johnston, 1972) and Minimizing Sum of Absolute Errors (MSAE) regression (Srinivasan and Shocker, 1973).

A substantial amount of academic research has focused on the relative performance of alternative algorithms. Initial studies favoured nonmetric (method 1 & 2) estimation procedures such as MONANOVA and LINMAP for rank order data. However, simulation and empirical studies showed that OLS applied to rank order data provides comparable results (Green and Srinivasan, 1978). In a study conducted by Wittink and Cattin (1989), the authors found that during the period from 1981 to 1985 OLS was used five times as often as MONANOVA whereas MONANOVA was the more frequently used method during 1971-80. A recent study by Wittink et al. (1996) found that a dominant use of OLS in Europe (59%) during the period from 1986 to 1991. The trend is consistent with results indicating that metric analysis is very robust regardless of the measurement scale for the dependent variable (Carmone, Green and Jain, 1978). In addition, in another study (Luinel, Malhotra and Smith, 1988) MONANOVA, LINMAP and OLS estimation procedures were used to predict respondents overall utilities and found that OLS regression method predicted better than either of the other two methods.

The choice between the non-metric and metric methods should logically depend on the scale properties. When OLS regression applied to integer ranks, produces more predictive validity (Cattin & Wittink, 1976; Carmone Green and Jain, 1978). The simulation study reported by Cattin and Wittink (1976) found that the metric and nonmetric methods differed by only very small amounts in this predictive validities.

Once the parameter estimation method has been decided upon and the parameters have been estimated, the researcher must then decide at which level to examine the data. The categories for data level analysis within each estimation method are: (a) individual level. (b) aggregate level, and (c) segment level.

2.8.7.1 Individual Level

Early conjoint analysis studies provided results as a separate estimated utility function for each individual. Several researchers have found that the predictive ability of the individual level model is very good (Johnson. 1974; Wittink & Montgomery, 1979).

Although individual models have demonstrated good predictive power, the output of the estimation procedure, a separate set of utility weights for each individual, makes analysis and understanding difficult when the number of

respondents is large (Moore, 1980). For applied research this presents the potential problem of providing unactionable information. If a manufacturing company, for example has commissioned the conjoint study to determine what factors make up a successful product in a particular category, what output do they receive with this type of analysis? As a large number of individual estimated preferences, how will this help them with product design? The answer is that it will not help very much. Therefore, something else needs to be done with the data that gives insight as to what the populations, or various populations' preferences are.

Researchers have suggested that these individual utilities be put into a choice simulator (Green & Wind, 1975; Johnson, 1974). The choice simulator uses the estimated part-worth utilities to predict the utility for each object in a set of real or hypothetical objects. These simulators then predict market share for products assuming that each individual has chosen the object with the highest utility. Furthermore, a search routine can be employed to find the one product configuration that would have the highest predicted market share for a given set of competitors. However, this is not as easy to use as a single set of utility weights would be. Finally, individual level analysis requires that enough information be collected from each person to estimate separate utility functions.

Given all the drawbacks associated with the individual level analysis, the decision regarding use of it must be tempered against its very good predictive power.

2.8.7.2 Aggregate Level

At the other end of the analysis level aggregation continuum from the individual level is the case in which all the preference ratings are pooled across all respondents and one overall utility function is estimated. These pooled utility estimates are the same as the average of the individual utility estimates if each of the respondents has evaluated the same set of objects (McCann, 1974). Results from this type of analysis level are very easy to explain and understand.

The biggest drawback to this level of analysis is refined to as the "majority fallacy" (Kuehn & Day, 1962). The majority fallacy occurs when the item chosen by the "average" customer is not the one chosen most often. Although, it appears that this effect should be named the "average fallacy' because the majority is the mode and the model choice is what the researcher is trying to capture. Moore (1980) points out that,

> the majority fallacy is caused by heterogeneity of preferences. For example, if half of the respondents prefer large cars and half prefer

small cars then the average respondent would like an average size car, when in reality this size was never chosen. Heterogeneity of preference reduces the predictive power of the aggregate model (Wittink & Montgomery, 1979). Thus, though these models have the desirable property of producing estimated choice probabilities, they are also subject to the majority fallacy.

2.8.7.3 Segment Level

The ideal level of analysis is one that combines the most desirable properties of the two extreme levels of aggregation, individual and aggregate, and avoids the problems of each. The ideal analysis level would have the predictive power found in individual level models and a small number of utility functions that are easily explained to managers which is found in the aggregate analysis level. Furthermore, models employing an intermediate level of aggregation have the benefit that managers may feel more comfortable working with segments than with either of the extreme levels of aggregation (Moore, 1980).

Wind (1978) reviews four types of segmentation models that can be employed to analyze conjoint analysis data: two traditional methods, a priori and clustering, and two newer methods, flexible segmentation and componential segmentation.

The traditional methods, the a priori method and the clustering method, both look at how a person's background variables affect his/her preferred level of a particular attribute. The primary difference is that clustering is empirically based and a priori is theoretically based. This means that with the a priori method the groups are clustered based on their background or demographic variables and then their utility functions are pooled. With the clustering method, however, the opposite is the case, the like utilities are pooled and then differences on consumer background variables are ascertained. Through this mechanism one is able to predict how a person with a certain set of background characteristics reacts to a particular product. Thus, a person's reaction to a product is broken into the sum of two pieces: (a) the average part-worth utilities due to the attribute levels of that product, pooled across all respondents and (b) the interactions between the person's background variables and the attribute levels (Moore, 1980).

Flexible segmentation differs from the traditional approaches in that it allows for the researcher to build up segments of consumers based on how they react to latest products. In order for this type of segmentation to be employed, the researcher must utilize a choice simulator program to predict consumer choices and then consumers who exhibit similar choice behaviors are clustered together.

Componential segmentation is an extension of conjoint analysis and orthogonal arrays (Green, Carroll & Carmone, 1977). In componential segmentation, the same design principles that guide the selection of product attribute level combinations in a fractional factorial model are applied to the selection of respondents. An example of this is provided by Wind (1978),

> in a study for a new health insurance product, four sets of respondents characteristics were identified on the basis of previous experience and management judgment: age (under 50,50-65, and over 65), sex (male, female), marital status (married, single), and current insurance status (have some health insurance with the given company, have health insurance with another company, and do not have health insurance). Given these factors and levels if a full factorial design were used one would have 36 possible customer profiles (3 x 2 x 2 x 3). Employing an orthogonal array design, one can use only nine combinations. Such a design requires the screening of respondents to select those who meet the nine profile requirements.

One main advantage of the segmentation methods is that they provide a large amount of information in a form that is much more usable than a list of each person's utility weights. Another potential advantage of segmented analysis is that each respondent is required to rate only a subset of the concepts to estimate more aggregate level utilities while at the same time allowing for the modeling of individual differences (Moore, 1980).

Moore (1980) describes clustering segmentation as forming benefit clusters or segments by grouping the respondents into segments that are homogenous with respect to the benefits they want from the product or service class. One general criticism of clustering segmentation is that clustering occurs even when there is no real structure to the data. A potential advantage of this method of segmentation is that people in different segments need not differ in terms of background variables, whereas componential (and a priori) segmentation will uncover the groups only if they differ in terms of background variables. Though it is useful to be able to differentiate segments by background variables, it can also be valuable just to know that there are two distinct groups (in terms of preference) even if it is not possible to determine which person is in which group (Moore, 1980).

Moore (1980) predicts that componential segmentation will provide higher predictive power than clustering segmentation when background variables are strongly related to utilities and there is a large number of attributes or a large number of levels on a smaller number of attributes.

Moore (1980), in a study comparing individual level, aggregate level, and two types of segment level analyses (cluster and componential), found that the individual model had the highest predictive power and the aggregate level had the lowest predictive power. The two segment models were in the

middle and the clustered segmentation model gave considerably better prediction that the componential segmentation model.

Hagerty (1985) and Kamakura (1988) have proposed another innovative approach to improving the accuracy of full-profile conjoint analysis through market segmentation. Hagerty (1985) has suggested using a Q-type factor analysis to pool data from similar respondents' conjoint full profile responses can reduce the variance of individual respondents' estimated part-worths without unduly increasing the bias of the estimates. He shows that his factor analytic approach can improve predictive accuracy at the individual respondent level.

Kamakura (1988) uses the same general approach by pooling respondents who are similar in terms of their conjoint full profile responses but employs an agglomerative clustering algorithm. The number of clusters is chosen to maximize predictive accuracy.

Green and Helsen (1989) compared conventional individual level-based conjoint analysis with the methods proposed by Hagerty (1985) and Kamakura (1988) and found that neither method led to a higher predictive validity than traditional conjoint analysis. The authors' overall conclusion is that it appears that conventional, individual level-based conjoint analysis may be difficult to improve in a major way. They also stress the need for

more empirical research to determine whether the segmentation-based methods do improve predictive validity.

2.9 Hybrid Conjoint Models

In the last decade, a new type of conjoint model has been introduced to reduce the complexity of the data collection task when there is a large number of attributes. Though originally developed for the full profile procedure, hybrid models can also be used with a trade-off matrix approach. Hybrid conjoint models make use of an old idea in multiattribute utility estimation the self-explicated compositional utility model (Green, 1984).

The goal of hybrid modeling is to combine the simplicity of the self-explicated approach (where the respondent indicates his or her importance for attributes a priori) with the greater generality of conjoint models to develop multi attribute utility functions that retain individual differences. Hybrid conjoint modeling is characterized by the condition that three kinds of data are collected from each respondent: (a) attribute-level desirability levels for the levels of each attribute separately, (b) attribute importance data and (c) conjoint responses to a limited set of full profiles drawn from a larger master design. Once these data are collected, the researcher can then develop individual utility functions in which some aspects of the resulting part-worths are measured at the individual level and other aspects at the

total sample or possibly subgroup level. Relatively little is known about which hybrid conjoint models are "best" and the conditions under which these models perform better or worse than traditional conjoint models.

Cattin, Hermit, and Pioche (1982) conjecture that hybrid models might predict relatively better than the traditional conjoint model as the number of attributes increases. The number of respondents increases, the significance of selected interactions increases, respondents' part-worths become more homogenous, and the validity of the self-explicated data increases. Green (1984) further suggests hybrid models predict better than traditional conjoint models as the number of levels within attributes increases, the discriminability among attribute levels is reduced, and the number of full profiles to evaluate increases. Green (1984) concludes, however, that the development of hybrid models has outstripped their empirical evaluation.

Adaptive Conjoint Analysis (ACA), developed by Sawtooth Software, is a hybrid model that is an interactive computer-based program (Johnson, 1987). First respondents are asked if any attribute levels are completely unacceptable. If so, no further questions are asked about them. Next, respondents must rank order the desirability of each remaining level within attribute and rate the importance of each attribute. Then, relative preference judgments are made on a series of partial profile paired comparisons. These responses are combined with the self-explicated responses in a regression to

estimate a utility weight for each attribute level. Finally, the respondent rates his or her likelihood of choosing a small number of full profile concepts on a 0 to 100 scale. The predicted utility for a concept (based on the utility weights estimated in the above regression) is converted into a likelihood rating with the LOGIT model (Green & Srinivasan, 1990).

In the empirical studies that have been performed to examine these hybrid models, respondents participated in either a two-at-a-time trade-off (Klein. 1986) or full profile rating task (Green, Krieger, & Bansal, 1988), indicated which attribute levels were unacceptable, and responded to a number of holdout profiles. Also, Green, Krieger, and Bansal, (1988) tested a strong and weak version of the wording of the unacceptable levels instruction. Srinsvasan (1988) used unacceptable levels with a self-explicated preference model to study MBA job choices. In each of the studies. the respondents identified unacceptable attribute levels and then rated the importance of each attribute and their preference for each of the acceptable levels. Neither of the conjoint studies found a significant difference in the first-choice predictive accuracy of the models.

This means that an unacceptable level incorrectly eliminated a first choice as often as it correctly eliminated an alternative that was predicted to have the highest utility by the model. Elimination and compensatory models provide similar levels of first-choice predictive accuracy. In contrast to the

conjoint studies, Srinivasan (1988) found that no one choose a job with an unacceptable level. Possible reasons for this difference include the importance of title topic, differences in the utilities of adjacent levels, and validation based on choices rather than a paper and pencil task. Two further explanations involve the strength of the wording of the unacceptable levels portion of the questionnaire and the percentage of unacceptable levels in the validation profiles.

Mehta Moore, and Pavia (1992) found that respondents receiving the more strongly worded questionnaire said fewer attribute levels were unacceptable than those receiving the standard message. The authors compared the standard wording for the unacceptable level option in ACA and the "strong" version of Green, Krieger, and Bansal (1988) to an even stronger version similar to that of Srinivasan (1988). Stronger wording reduced the percent of unacceptable levels and percent of holdout profiles with unacceptable levels. Second, some respondents appeared to judge the profiles in a compensatory manner because the elimination models produced lower violations than corresponding compensatory models. Third, elimination and compensatory models had equal success in predicting first choices." Recently, questions have been raised concerning whether one should ask respondents to identify unacceptable attribute levels (Green, Krieger, & Bansal. 1988). Self-explication of attribute importance requires one to assume that individuals can provide valid and accurate evaluations of

attribute weights independently of a specific context. Additionally, research has shown that even with a large number of profiles the first choice of some respondents contains an unacceptable level of an attribute. Furthermore, respondents rarely assign a zero likelihood of purchasing profiles containing unacceptable levels.

2.10 Hierarchical Information Integration Models

Another alternative to handling a large number of attributes is Hierarchical Information Integration Model, which was proposed by Louviere (1988). This approach is performed in the following manner: (a) categorize attributes into several non-overlapping sets based on theory, logic, empirical evidence, or application demands, so that the sets are representative of constructs like "value," "quality," "atmosphere" etc.; (b) design and administer various, separate sub experiments to define each construct in terms of the attributes that make it up; and (c) develop an overall bridging design based on the constructs, which permits the researcher to examine the results of each sub experiment or one fully specified utility model (Oppewal, Louviere, & Timmermans, 1994).

As pointed out by Oppewal, Louviere, and Timmennans (1994), the fill approach avoids the need to use self-explicated weights that are employed in hybrid models. However, this methodology does have problems of it own:

(a) fill does not test the assumed hierarchical decision structure, (b) the overall estimated model's goodness of fit can not be directly tested. (c) the validity of bridging experiments is still not proven at this time. and (d) construct interactions are not tested Support for this relatively new type of approach is weak at best. In Oppewal, Louviere, and Timmermans' (1994} empirical study of they concluded that results from their study of consumers' choice of shopping centers partially supported the HII approach and predictive validity.

2.11 Review of Literature related to Library Services

The primary purpose of library service development and management is to provide the opportunity for consumers to benefit for entire information resources available. Individuals may tend to use any service that provides them with maximum benefits in relation to his need for information. In visiting a library or using a library service, a user requires a well-designed service package to the situation. Different libraries may have different bundles of service characteristics associated with the objectives of parent organization, environment of the organization etc. Marketing (maximum use) these bundles of service is possible only when the bundles of service are formulated by the characteristics desired or needed by the users. There were few lots of studies conducted to identify user needs, requirements, and desires in library services. These studies focus on users rate on libraries

collections, services, programs, staff and facilities. The purposes of most of these user surveys were to learn what the library clients thought about the library services? what did users value ? what did they feel needed improving ? What did users want from the service managers in the future? What did users prefer on different service aspect? All of these answers are critical in an era of increasing user expectations. The results from the user surveys will help the service providers to design a service package and plan future actions.

The UCSD Libraries User survey (1995) evaluated user's point of view – users perceptions about UCSD Libraries and what they expected from the UCSD Libraries to meet their needs. The team decided to use proven market research methodology and appointer Kerry Martin as a consultant for that. The survey focused on resources used for research purpose, and satisfactory level of various services including library hours, assistance and reference desk and circulation desk, photocopiers, on-line services, research materials (indexes, abstracts, journals, conference proceedings, CD-ROM data basis/indexes etc), inter library loan (types of materials available, wait for loan service, length of loan period) library policies and procedures (circulation policy, renewal by on-line/telephone, length of loan period) and overall satisfaction with library services.

Understanding customer preferences or expectations or needs/requirements is a pre-requisite for delivering superior service. A. Parasuraman, Leonard L. Berry and Valarie A. Zeithaml (1991) argue that the key to providing superior service is understanding and responding to customer expectations. Branting and Broos (1997) describe how user preferences can be acquired in the form of preferences predicates by a learning apprentice system and instance-base algorithms.

Beavers, Russel and sibia (1996) suggest that the real potential effects of current needs related to technology and information delivery, and impact of economic realities. The suggestion is based on a survey conducted to identify nature of information related conditions, special aspect of information needs, considerations concerning the identification, location and delivery of information.

Future planning of library should be based on the information needs of the library clients. Malliah and Badam (1993) conducted a survey to determine the use of information services facilities among research scholars of Mangalore University. Analysis covers the use of library collection and catalogue and information needs. Another study to evaluate library resources it was conducted by Dalai and Ramesh (1994). The study conducted among the users of library of Regional research laboratory, Bhubaneswar. The purpose of study was to evaluate the extent of library

use, needs and requirements of various categories of users, peak hours of highest usage and period of transactions at various service points. In order to find the gap between current academic library priorities and students need a study was conducted by M.Ward (1996). The result shows that there is a need for an ongoing measurement by libraries and vendors of end user needs.

S. M. Childs (1996) conducted a survey to develop a multidisciplinary library services in trust hospitals in Sunderland. The survey commissioned to determine the needs for library services for all staff. Results and recommendations of the survey used for trusts further actions into the wider context of the need for well resources library and information services.

M. Satyanarayana (1996) suggests the necessity to reshape the library service as community based. He studied usage pattern, reading behaviour and other characteristics of library users of Visakapatnam District Central Library. M. S. Sridhar (1989) studied pattern of library visits, traffic and length of stay at the ISRO Satellite Centre (ISAC) library and documentation division. B. K. Chatto-Padhyay (1995) examines the differences in borrowing patterns between students of government and non-government teachers training college in West Bengal.

While J. Pinard and R. Savard (1996) discuss important of measuring user satisfaction level regarding existing services and identify further needs. R. Raina etal (1995) conducted a survey on user satisfaction. They evaluate the level of user satisfaction and the degree to which the students were a part of the process of Library Development.

A questionnaire Survey (V. C. Devi, 1997) to determine the attitudes of end users of the information service of the National Ship Design Research Centre (NSDRC) revealed an overwhelming preference for on-line searching data bases over manual searching. The study investigated use patterns for individual rated according to their participation of convenience, (immediacy) of access time-saved, global access to information, and high result obtained.

2.12 Conjoint Analysis in Library Service Research

The importance of information service to its patrons by the libraries has been widely acknowledged. The primary goal is to provide services that meet the information needs and desires of library clients. The promotional efforts of information managers should be based on the smooth marketing of information to its customer. The successful marketing if library service is fully depends on the providers inside into the individual preferences of consumers towards the various levels of attributes of a service.

The conjoint analysis, a management techniques widely used in the field of marketing research, method is well suited for measuring consumer's preferences at the individual or group for the characteristics or the levels of a product or service. The method can be used for modelling user-oriented services which can market easily among the consumers.

In Library and information science research, there have been only a few attempts to use conjoint analysis in the study of Library services. This section offers a discussion on those applications briefly. Michael Halperin and Maureen Strazdon (1980) used conjoint analysis in determining student's references for reference service. This study attempted to determine preferences for eight factors of reference service. They are completeness and accuracy of answer (4 levels) , data base service (4 levels) inter library loans (2 levels), time needed to answer question (2 levels) attitudes of librarians (3 levels) hours of reference service (2 levels), knowledge of librarians (2 levels) and wait for service (2 levels). The study used a full - profile method in which respondents were asked to rank, in order of preference, sixteen profiles of reference service. The authors concluded :"Conjoint analysis is a technique that allows us to quantify some of the seemingly intractable quantitative aspects of library service. In doing so it represents a new and potentially fruitful method of relating library services to user requirements". His suggestions for future research includes:

inclusion of attributes not tested, use of more extreme levels, study might focus entire range of library services, study might include a variety of user groups from different types of libraries etc.

In another article, Halperin (1982) discussed the potential of conjoint analysis to help to inform library administrators of user preferences for information services. Although they did not actually perform a study using conjoint analysis, Kenneth D. Ramsing and John R. Wish (1982) illustrated the use of the technique to determine the service preferences of library users, with their main example being online searching. Thus, Halperin, Slazdon and Ramsing and Wish have shown that conjoint analysis has potential applicability to library and information science.

Gregory A. Crawford (1994) demonstrated the usefulness of the conjoint technique as a potential tool for evaluating reference service. The study evaluated six dimensions of reference service in academic libraries. They are: definitiveness of answer, in line wait times, service time, number of items given to patron, hours of service, and cost of service. Because of the case of instrument construction and administration, this study used a two factor at a time approach and found a fairly stable pattern of preferences for reference services in the academic library. He suggested the similar type of research to determine the preferences of other members of the academic community who may have different service preferences, then

undergraduates (He studied only the undergraduates students from two colleges and one university).

H. T. Landrum (1995) proved the techniques conjoint analysis is a potential tool which could able to measure the value in the collection development process. He conducted a small pilot study in a federal library that tested whether or not a conjoint analysis programme could predict successfully what CD-ROM titles would be selected by a group of librarians. The study results indicate the program can predict which titles are preferred by a specific group, based on criteria the group considers important for making selections. The study suggests that the new techniques may be useful in measuring what library customer's value when selecting from among competing titles. He recommends further analysis using customers and a larger, more random sample.

In summary, original analysis is a potential tool to determine the attributes of a library service. Utilities can be measured for all the levels of attributes from the respondent's conjoint instruments. Since the utility scores are additive, it should be possible to determine the level of pattern satisfaction with current library services and also to formulate a service package which is best suited for over all consumers.

2.13 Conclusion

This review of literature contributed to the formulation of the problem statement that guided this research, and to the choice of methods and analysis in the study conducted. Chapter 03, describes the approach and methodology in detail.

Chapter - 03

METHODOLOGY

The purpose of this study is to investigate consumer/Client preferences for a pre-determined set of attributes thought to influence choice of library services provided by library managers. The literature suggests that conjoint analysis is an appropriate method for measuring consumer preferences (Green and Srinivasan, 1978; Jaccard et al., 1986; Louviere, 1988; Timmermans, 1987).

The chapter is composed of two parts. First, objective, research question and hypothesis concerning this study are stated. Next, conjoint model and conjoint methodology are described as they are applied in this study. Finally, a description of the procedures and data for measurement is provided.

3.1 Objectives and Hypothesis

Objectives and hypothesis are explained below.

3.1.1 Objectives

The primary objective of this research study is to introduce Conjoint Analysis model to design library services, which investigate consumers to influence types of services developed by library professionals.

To the end, this study, more specifically, addresses the following problems:

1) To discover the relative importance (part-worth utility range) that consumers place on each of a pre-determined set of attributes that are thought to influence consumer choice over Library services.
2) To discover the combination of attribute levels that would result in best use of Library services.
3) To develop a socio-demographic profile of library customers that may be useful in providing a cluster-based segmentation approach to improve accuracy in prediction over individual level services.
4) To develop a simulation model, which library managers could use to evaluate, how the proposed changes in attribute levels used in this study may affect the consumer preference of library services.

5) To discuss if the relative importance (part-worth utility range) of attributes is significantly different for service segments distinguished on the basis of frequency of use of the Library, age, job position, subject, years of experience, familiarity in library use and the organization to which users belonging to.

3.1.2 Research Question

This study, more specifically, addresses the following research questions:

a) What is the influence of the different types of attributes chosen for the evaluative task on consumer value structure and predictive validity?

b) What is the influence of specific factorial designs, i.e. the specific combinations of product attribute values, on estimation of customer value structure and predictive validity?

c) Which individual–level model for consumer value structure performs best with respect to prediction?

d) Which aggregate model for customer value structure performs best with respect to prediction?

3.1.3 Hypothesis

The hypothesis to be tested in this research includes:

H_0 (1): There is no significant difference in the relative importance (part-worth utility range) that organisational member's assign to the pre-determined set of attributes used in this study.

H_0 (2): There is no significant difference in the relative importance (part-worth utility range) that organisational members assign to the pre-determined set of attributes used in this study, for respondent segments that are distinguished on the basis of:

i. Age of respondent
ii. Position
iii. Work experience
iv. Library use
v. Familiarity of respondent with the use of services
vi. Organization to which respondent belong
vii. Educational qualification
viii. Sex of the respondent

3.2 Conjoint Model and Methodology

In this section, value measurement model is presented as they are applied in this study. First, Traditional model representation and related terminology is introduced. Then, general considerations are narrated.

3.2.1 Traditional Conjoint Model

In traditional conjoint analysis (in this paper , we will deal only with the full profile method), concepts are described in terms of levels on several attributes. Each respondent evaluates every concept on some affective scale such as preference, or its effect on behaviour such as likelihood of purchase. In this part-worth model, assuming there are J attributes and Kj levels on the jth attribute, the following regression is run for each respondent:

$$Y_i = B_0 + \sum_{j=1}^{J} \sum_{k=1}^{K_{j-1}} B_{jk} + e_i$$

Where

-Y_i is the respondents' affective rating of the j^{th} concept

-X_{ijk} is a dummy variable that indicated whether the i^{th} concept possesses the k^{th} levels of the j^{th} attribute

-B_o is an intercept and

-e_i is an error term.

3.2.2 General Design and Estimation Considerations

There are generally two approaches to measuring the dependent utility variable: as a rank-ordered or as an interval-scaled rating variable. Ranking involves data collection methods that present respondents with at least two attributes or profiles at a time, and the procedure can become quite unwieldy with a large number of attributes. Rating procedures asks respondents to rate a particular profile on some form of preference or behavioural intention scale. Both methods and associated estimation procedures did not yield substantially different results (Jain, Acito, Malhotra, and Mahajan 1979; Green and Krieger 1993). Rated overall utilities and OLS regression are also the methods of choice in this study. Due to the number of levels and attributes in this study, it is necessary to employ a highly fractionated experimental design. Details of the design and analyses are provided in later sections of this chapter.

3.3 Data Procedure Approach

This section explains, how data is collected and treated, which alternative procedures are followed, etc.

3.3.1 Selection of Attributes and Levels

For conjoint analysis to work it is important to understand the decision problem and its environment faced by target individuals. It works best when all key determinant decision attributes are identified. However, the inclusion of particular attributes is always an uneasy compromise between striving for completeness of the relevant decision criteria and keeping the evaluation task in line with respondent capabilities. Furthermore, decision attributes should be as amenable to managerial manipulation as possible, i.e. they should be actionable and measurable. This information was condensed, the attributes and their respective levels were chosen so that they denoted broad categories of choice criteria. Levels were chosen so that metric variable comprised the extreme values of current, most widely available for real products. Levels of metric attributes were evenly spaced, and non-metric levels were chosen to imply an order.

Maximum attributes for this study were identified from previous studies and few are selected after expert considerations to a list of 25 attributes. The levels for these attributes were derived on the basis of detailed study and consultation with experts and experienced hands in the field.

3.3.2 Pre-test Study

A pre-test was conducted with the intention to narrow down the list of Twenty Five (25) attributes to about Eight (8), at two or three levels which is considered to be a good balance between demands for conjoint design and realism of respondent task before one may experience simplified decision strategies. The pre-test also encouraged to state the criteria a respondent would use but they were not included in the importance ratings.

Result of the pre-test is analysed through median rank and seventeen (17) attributes from the list were dropped to select Eight (8) attributes for this study. Details of the pre-test and related analyses are provided in Appendix - I. Table 3-1 Provides an overview of attributes and levels used for this study.

Table 3-1: Attribute List with Levels

Sl. No.	ATTRIBUTES	LEVELS
01	Hours of Library Services	Any Time Library Open
		Specified Time Only
		By Appointment Only
02	Computer Application	Completely computerised
		Partially computerised service
		Not computerized
03	Access to Collection	Open access to all collection
		Restricted access to special collection
		Close access to all collection
04	Inter Library Loan	Provided only at local level
		Provided at State level
		Provided at National level
05	Alert Service	Inform daily through notice board
		Inform weekly through library bulletin
		Inform through e-mail
06	Assistance to Patrons	Individualised assistance
		Group level assistance
		No assistance service
07	Definitiveness	Accurate and complete answer
		Accurate but not complete
		Possible answer
08	Online Access	Online access via Internet, Intranet etc.
		No Online access

3.3.3 Stimulus Set Construction and Presentation

Decision on number of attributes and levels is one of the preliminary considerations for construction of the stimulus sets. Stimulus set includes the combinations of attribute levels, which are presented to the respondents. These can be thought of as independent variables with respect to the conjoint analysis task. A total of 8 attributes and 23 levels (see table 3-1) were used in this conjoint analysis study.

The full-profile approach was selected for data collection because it is dominant in the literature and was thought to best represent reality with respect to services/products to be evaluated. A major problem with this method is information overload, which can occur as the number of attributes and levels causes the number of treatments (cards) to increase. i.e., a total number of $2^1 \times 3^7 = 4374$ factorial design possibilities per stimulus set. This number must be reduced to a set of few profiles manageable for respondents. $L_{18}(2^1 \times 3^7)$ orthogonal array method was used to overcome the overload problem. The 18 profiles were developed using L_{18} orthogonal array to arrive at the fractional factorial mode. The basic plan of L_{18} orthogonal array is out lined in Table 3-2.

Verbal descriptions were used to present the cards in the mail questionnaire. The major requirement was that the verbal descriptions adequately portrayed

Table 3-2: Orthogonal Array $L_{18}(2^1 \times 3^7)$

Trial No.	Factors							
	A	B	C	D	E	F	H	I
1	1	1	1	1	1	1	1	1
2	1	1	2	2	2	2	2	2
3	1	1	3	3	3	3	3	3
4	1	2	1	1	2	2	3	3
5	1	2	2	2	3	3	1	1
6	1	2	3	3	1	1	2	2
7	1	3	1	2	1	3	2	3
8	1	3	2	3	2	1	3	1
9	1	3	3	1	3	2	1	2
10	2	1	1	3	3	2	2	1
11	2	1	2	1	1	3	3	2
12	2	1	3	2	2	1	1	3
13	2	2	1	2	3	1	3	2
14	2	2	2	3	1	2	1	3
15	2	2	3	1	2	3	2	1
16	2	3	1	3	2	3	1	2
17	2	3	2	1	3	1	2	3
18	2	3	3	2	1	2	3	1

the characteristics of interest to the respondent (Green and Srinivasan, 1978).

In order to reduce placement bias, the orders of attributes used in the cards as well as levels for each attribute were randomised. The final design included 18 cards. Respondent utility would be maximum when rated 100 and assumed to be the lowest when rated (0). Respondents evaluated 18 profiles of the 4374 factorial.

3.3.4 Dependent Variable Measurement

The study used a rating scale procedure that measured the respondent's degree of Purchase/use likelihood of selected treatment (cards) ranging from 0 (definitely would not use the service) to 100 (definitely would buy the service). Respondents were asked to imagine they were in the situation of evaluating different library service packages for the best use of library. They were then asked to rate a service profile by distributing a number of points ranging from zero (0) to one hundred (100) to the profile being evaluated, denoting his/her stated likelihood of purchase for the given attribute level combinations describing one specific stimulus (i.e. a specific library service). Likelihood of purchase was chosen over preference of desirability because it is assumed to be the better to denote preference with respect to a use situation.

3.3.5 Part-worth Model

The part-worth function model was used in the conjoint analysis that aimed to determine how influential each attribute level was with respect to consumer preferences for selected service attributes. MS Excel program (Bryan K. Orme,2002) was used to conduct the analysis.

For all respondents the rating (0 to 100) for each of the 18 cards were entered into the computer program (MS Excel). In essence, the program used the ratings for each card as the dependent variable and the attribute levels as the independent variables in a multiple regression analysis subject to the constraints defined in the part-worth model. The analysis generated part-worth utilities for each attribute level on an individual respondent basis.

These pooled part-worth utilities were used in the program to calculate the relative importance of each attribute in explaining consumer preference for library services. First, for each attribute, the program found the levels with the highest and lowest part worth, and calculated the magnitude of the difference; referred to as the range. The range was regarded as the measure of the relative importance for the given attributes (Green and Rao, 1970).

In this study, the ranges for each of the eight attributes were added and the relative importance was expressed as a percentage of the total for purposes of comparison.

Consider the example shown in Table 3-2 which uses only three attributes; *Wait for service, Nature of answering, and Cost of Services.* Price has four levels. *Wait for service and Nature of answering* has three levels each and *Cost of Services* has two levels.

In the example, Wait for service is the most important variable accounting for 59.88% (range = 2.8142) of library preference; Cost of Services is the second most important accounting for 32.40% (range = 1.5226) of the preference; and Nature of answering accounts for the remaining 7.72% (range = 0.3627).

Table 3-3: Analysis Example

Sl. No.	ATTRIBUTE	LEVEL	PART-WORTH	RANGE (Rank Order)
01	Wait for service	More than 20 minutes.	-1.0015	+1.8127 - (-1.0015) = 2.8142 (59.88%) **Rank No: 01**
		Less than 10 minutes.	+1.8127	
		10-20 minutes.	+0.0538	
02	Nature of answering	Through telephone	+0.6848	+0.6848 - (+0.3221) = 0.3627 (7.72%) **Rank No: 03**
		Through e-mail	+0.5639	
		Direct approach	+0.3221	
03	Cost of Services	All services are free	+1.0876	+1.0876 - (-0.4350) =1.5226 (32.40%) **Rank No: 02**
		All services are charged	-0.4350	
Total Range				**4.6995 (100%)**

Conjoint analysis can be interpreted statistically and graphically. Both of these methods are common to the interpretation of conjoint results (Anderson, 1982; Caldwell, 1986; Johnson and Meyer, 1984).

Graphical analysis allows for visual inspection of the relationships between levels of attributes and is suggestive of the algebraic form of the data (Caldwell, 1986). In this context, graphical analysis was conducted for the part-worth utilities for each of the attributes. This analysis was used for the aggregate conjoint results but not for the segmented results. Louviere (1988) suggested that this graphical analysis could be used with results derived using the part- worth function model in the primary analysis to determine the appropriateness of using quadratic or vector models (in a mixed model) to evaluate specific attributes.

To illustrate, figure 3-1 shows graphically the part-worth utility values for the attribute wait for service, using the data from Table 3-2. This graphic representation shows the linear relationship wherein respondent preference declined as wait for service increased. This suggested the use of a vector model to interpret the wait for service variable.

Another example of this visual analysis is provided in figure 3-2 which shows the graph of part-worth utilities for the attribute nature of answering, by using the example data from Table 3-2. This result shows distinct

preferences for each level of service, suggesting the appropriateness of the part-worth model to evaluate this attribute.

In conducting a complete preliminary analysis in this manner, the appropriateness of the part-worth model was confirmed. Analysis uses a mixed model with wait for service measured using a vector model and the other attributes using a part-worth model, no differences were found. As a result, further analysis was conducted using only the part-worth model.

Fig.:01

Example of Graphical Analysis Using Wait for Service Utilities

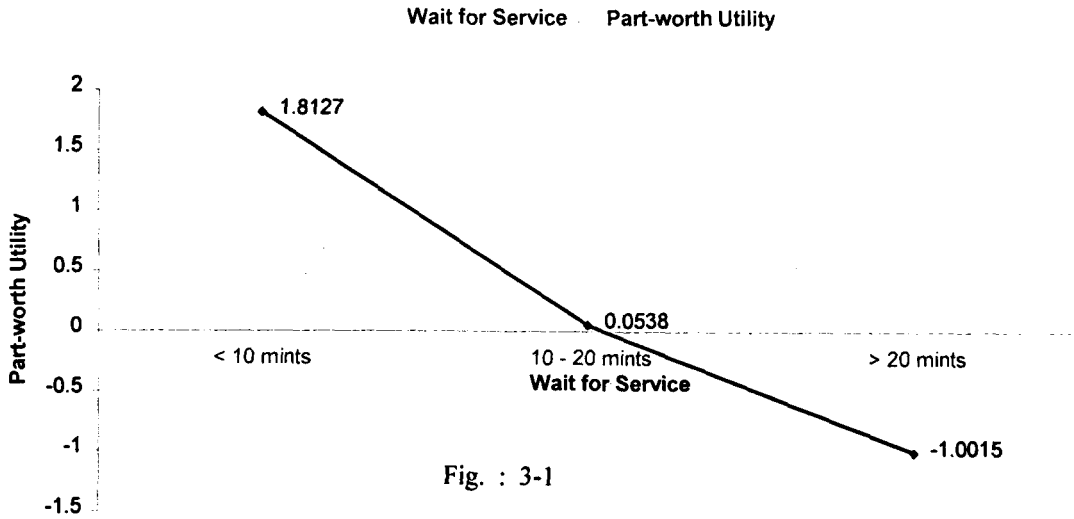

Fig. : 3-1

Fig.:02

Example of Graphical Analysis Using Nature of Answering

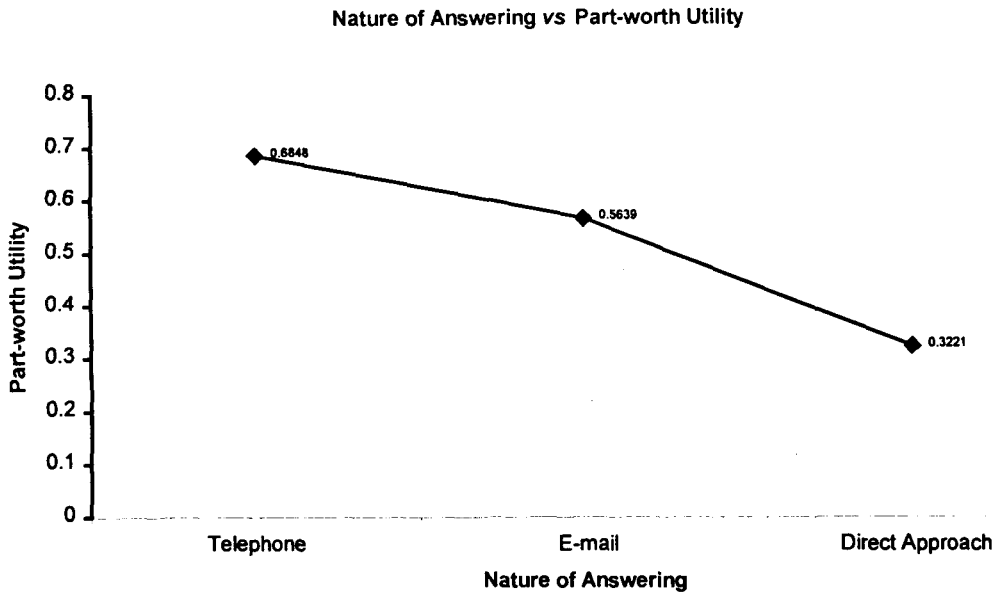

Fig. : 3-2

3.3.6 Segmentation methods

Segmenting the responses based on demographic and socio-economic characteristics allowed the researcher to determine whether or not preferences varied within the sample group. If significant differences in preferences were found using particular segmentation criteria, that segmentation criterion could be used in developing specific marketing mix combinations for use with that segment.

The sample population was segmented on the basis of information collected on the questionnaire. Specific segmentation categories included:

a) Age of questionnaire respondent

b) Gender of the respondent

c) Educational qualification

d) Job position

e) Work experience

f) Organization of the respondent

g) Frequency of respondent's library use

h) Respondent's familiarity with the library and its facilities/services

Background files were constructed for each respondent using data taken from background information asked in the questionnaire. This background data was used as the basis for segmentation of the results. Conjoint analyses for these segments were calculated. When the total sample was segmented using the program, to facilitate the collection of data for this study output only provided the raw part-worth utilities for the segments (i.e. according to the selected criteria). For example, when sex was used as the segmentation criteria the program displayed the part-worth utilities for each attribute level, separately for all males and for females. For each segment, ranges were then hand calculated for each attribute and used in determining the relative importance of specific attributes for the segments in question.

3.3.7 Data Collection Sample

To facilitate the collection of data for this study, respondents were selected from organisation such as Hindustan Aeronautics Limited (HAL), National Aeronautics Laboratory (NAL), Indian Space and Research Organisation (ISRO) and finally from Indian Institute of Science (IISc) specially for students samples doing higher studies. The study is limited to Bangalore City in which all four organisations are situated. These organisations are in special kind and unique research centres.

Required random samples are drawn from this sampling frame. List of employees of each organisation is received from administrator and entered into a MS Excel program. 250 computer generated random samples were selected from each organisation for actual studies. Teaching staff and students only were included from IISc in 3:1 ratio in order to compare student preferences *vs.* employed class including teaching staff. The procedure resulted in a total sample size of 1000. Estimated return rates of 50-55% responses were expected.

The sample covered a wide range of subjects, groups and variety of respondents includes students doing higher studies, teaching staff, Technical Staff, Engineers, Scientists etc.

3.3.8 Data Collection Methods

Questionnaires were used as the basis for data collection. Questionnaires were administered as per the following manner:

1) Surveys were numerically coded to facilitate follow-up procedures.
2) A reminder telephone call for all respondents one week after the initial distribution served to thank those who had already completed and returned the survey and otherwise as a reminder for those who not yet responded.
3) Second reminder call, 3 weeks after the date of the first distribution to all non-respondents was also to thank those who had already completed and returned the survey during the period.

The questionnaire was printed and presented in booklet form measuring 20.5 cm by 15 cm by size. The survey was titled as "A Survey of Conjoint Analysis for Measuring Preferences on Library Services" and the cover page identified the researcher by name and address. A telephone number and email address for enquiries was also provided on the front cover. The survey was divided into three sections. Section one provided with description of service attributes for a reference while evaluating questionnaire. Section two asked to rate Eighteen (18) generic Service Profiles on a zero (0) to one hundred (100)-likelihood usage of service package. The final section asked

for basic demographic data and their familiarity of library. In total the questionnaire was 20 pages in length, including front and back sheets.

3.3.9 Optimal Products

An important aspect of this study was to determine what combination of attribute levels would result in the highest total utility (preference) among library users. That is what combination of attributes would result in the greatest preference and purchase of library services. An additive preference prediction equation of the form $P = W_1 + W_2 + W_3 + \ldots\ldots\ldots + W_j$; where P is preference and, W_1, W_2 etc. represent the most preferred level for each attribute was used for this purpose (Green et al. 1981; June and Smith, 1987). Using the example shown in Table 3-2, the optimal product would offer a full-service library with telephone answering within 10 minutes of initiations of queries, free of cost (total utility = 1.8127 + 0.6848 + 1.08876 = 3.5851).

Table: 3-4 Optimal Product with Utility Values

Attribute Level	Utility
Wait for Services	
Less than 10minutes	+1.8127
Nature of Answering	
Through Telephone	+0.6848
Cost of Service	
All Services are Free	+1.0876
Total Utility Score	**+3.5851**

3.4. Analysis of Hypothesis

Analysis of Variance was used to test the hypothesis in this study. The part-worth utilities for each attribute level were saved in the program excel. This data was retained for each individual respondent. The data set was transformed into a computer format. The data was entered into the EXCEL program and ranges were calculated for each attribute, for all individual respondents. These ranges were then used in the Analysis of Variance relative to the individual hypotheses. This analysis was conducted using EXCEL software. Testing of the first hypothesis involved determining it significant differences existed for the relative importance (measured by part-worth utility ranges for individual subjects) for the eight attributes tested. When significant differences (.05 confidence interval) were found to exist, F- test was conducted to determine where (i.e. between which variables) differences existed.

Testing of the second hypothesis involved determining if significant differences existed within the relative importance's for the eight attributes tested, when the respondents were segmented according to the criteria established in that hypothesis. For example, the preferences expressed by males significantly different from those of females? If yes, which of the attributes accounted for the difference in preferences? Using the individual respondent ranges (as above), Analysis of Variance was conducted. Where the segments (e.g. male *vs.* female) showed significant differences (.05 confidence interval).

CHAPTER 4

ANALYSIS AND RESULTS

The purpose of this study was to investigate consumer preferences for a pre-determined set of attributes thought to influence choice of library service packages of four organisations. Eight (8) attributes in a (2^2 x 3^7) fractional factorial design was used. Seven attributes with 3 levels and one with 2 levels are considered for the study. Respondents were presented with eighteen descriptions of library service situations and asked to rate their relative preference for each on a likert-type scale from 0 (low preference) to 100 (high preference). Each of the eighteen descriptions (cards) represented a different combination of the levels for each attribute generated on a fractional factorial design (L_{18} (2^1x3^7) orthogonal array) process. In addition to the conjoint task, respondents were asked to provide demographic data. The results are presented in three sections:

1. Descriptive Statistics
2. Analysis of the Conjoint Task Results
3. Hypotheses Testing

4.1 Descriptive Statistics

The following data describe the sample of library users who participated in the study.

A total of 537 usable returns were received from an effective sample of 1000 representing a return rate of 53.7%. Maximum returns were from HAL (165, 30.73%) followed by NAL (147; 27.38%), ISRO (127; 23.64%) and IISc (98; 18.24%). Table 4-1 is a frequency distribution of the sample according to the organisation where the respondents were originally identified. The mean number of respondents from each organisation was 134.25; (S.D. =28.72).

Table 4-2 is a frequency distribution of time taken to fill the questionnaire. The maximum respondent took 30 to 45 minutes (230; 42.83%) while 66 (12.29%) respondent took only less than 30 minutes. Some respondents took more than 60 minutes (150; 27.93%) and 91 (16.95%) respondents took 46 to 60 minutes to fill the questionnaire.

Table 4-3 shows frequency distribution by library visit of the respondents. Sample size ranged from 170(31.66%) in case of 2 or more visit per week and 106(19.74%) for once in week. The mean sample size by library visit was 104.8, (S.D. =17.58) respondents.

Table 4-1: Frequency Distribution by Organization

Organisation	Count	Percent
HAL	165	30.73
IISc	98	18.24
ISRO	127	23.64
NAL	147	27.38
Total	**537**	**100**

Table 4-2: Frequency Distribution by time taken to fill the questionnaire

Time (in Minutes)	Count	Percent
Below 30	66	12.29
30 - 45	230	42.83
46 – 60	91	16.95
60 +	150	27.93
No Response	-	-
Total	**537**	**100**

Frequency distribution of familiarity with use of library among all respondents is reported in Table 4-4. Respondents were grouped into six categories; Very Familiar (148, 27.56%), Familiar (217; 40.41%), Somewhat Familiar (97; 18.06%), Not familiar at all (41; 7.64%), Cannot say (34; 6.33%). The mean number of respondents is 107.4, (S.D. = 76.75) per category.

Table 4-3: Frequency Distribution by Library Visit

Visit	Count	Percent
2 or more times a week	170	31.66
Once a week	106	19.74
Once every 2 to 3 weeks	96	17.88
Once a month	64	11.92
Once a quarter or less	88	16.39
No responses	13	2.42
Total	**537**	**100**

4.4

Table 4-3: Frequency Distribution by Familarity in Library Use.

Familiarity	Count	Percent
Very Familiar	148	27.56
Familiar	217	40.41
Somewhat Familiar	97	18.06
Not familiar at all	41	7.64
Cannot say	34	6.33
No response	-	-
Total	**537**	**100**

In Table 4-5, the dominant age range was below 30 years (33.89%) with (25.7%) representing the 30-40 age group and (23.09%) for 41–50 age group and (10.43%) for 50+. The mean value is 125 (S.D. = 52.22) represented for each age group.

Table 4-6 is a frequency distribution of sex indicated that respondent were predominantly male (381; 70.95%) and (149; 27.75%) was female. The mean value is 265 and (S.D. = 52.22).

Table 4-5: Frequency Distribution of Age Group

Age Group	Count	Percent
Below 30	182	33.89
31 – 40	138	25.70
41 – 50	124	23.10
50 +	56	10.43
No Response	37	6.89
Total	**537**	**100**

Table 4-6: Frequency Distribution of Sex

Sex	Count	Percent
Male	381	71.00
Female	149	27.74
No Response	7	1.30
Total	**537**	**100**

Table 4-7: Frequency Distribution of Education

Education	Count	Percent
Under Graduate	25	4.66
Graduate	227	42.27
Post Graduate	184	34.26
Ph.D.	44	8.19
Any Others	51	9.50
No Response	6	1.11
Total	**537**	**100**

Table 4-7 indicated that the Educational qualification of respondents (227; 42.27%) graduates; (184; 34.26%) post-graduates (25;4.66%) undergraduates and (44;8.19%) Ph.D. The mean value is106.2 and (S.D. = 92.41).

Table 4-8 : Frequency Distribution of Job Position

Job Position	Count	Percent
MD/CEO	0	0
Director/VP/GM	1	0.18
Manager/Lecturer	112	21.00
Scientist/Analyst	178	33.14
Executive	124	23.09
Student	43	8.00
Any Other	79	14.71
No Response	0	0
Total	**537**	**100**

Table 4-9: Frequency Distribution of Work Experience

Work Experience(Years)	Count	Percent
1 – 5	183	34.08
6 – 10	67	12.48
11 –15	102	18.99
16 – 20	83	15.46
20+	102	18.99
No Response	-	-
Total	**537**	**100**

Other demographic characteristics, job position and work experience are shown in Table 4-8 (maximum 178(33.14%) of scientist /analyst). The mean value is 76.71 and (S.D. = 62.66). Table 4-9 shows maximum 183 (34.08%) of 1-5 years of experience. The mean value is 107.40 and (S.D. = 44.72).

4.2 Result of the Conjoint Analysis

Table 4-10 shows the results of the conjoint task for all respondents (group statistics). The relative importance is the preference for each attribute expressed in percent terms (the utility range for a given attribute expressed as a percentage of the sum of the utility ranges for all attributes). In addition, part-worth utility values are shown for each attribute level. These utility values are interpreted as meaning that the respondent rating on the measurement scale (0 to 100) will increase or decrease by the stated value (+ or -) each time the given level appears in a treatment (card).

Results of the conjoint analysis task indicated that on-line access, hours of library service computer application and definitiveness accounted for 74.56% of the preferences of library users. The provision of on-line access to database services contributed positively to preference rating (25.61%). The hours of library service (any time library open), computerization (fully computerized service) and definitiveness (accurate and complete answer) accounted for 23.12%, 14.35%, 12.89% of preferences respectively. In each of these cases, the provision of the attribute contributed positively to the preference rating. Assistance to patron and open access to collection was also an important attribute with respect to preferences contributing 8.53% and 8.5% to the preference function respectively.

The facility of alert service through e-mail and inter library loan contributed 4.06% and 2.93% to the preference function respectively.

Tables 4-11 through 4-18 show the Relative Importance of Attributes segmented according to a variety of variables. Tables 4-11A through 4-18A show the part-worth or utility value segmented for the group of variables. These tables serve as a basis for possible simulation exercises and provide information that may be useful in planning promotional campaigns for specific target markets. For example, visual examination of Table 4-11 shows online access to be the most important attribute for respondents of the HAL (24.84%) while the availability of interlibrary loan is not important (2.93%). This suggests that library service promotion aimed at the HAL

should focus on the online facility of databases through Internet or Intranet and disregard interlibrary loan as an attribute in library service.

4-3 Optimal Products

Conjoint analysis theory notes that optimal products are those that would result in maximum consumer preference (use). Using the group conjoint results (Table 4-10), the optimal product (combination of attribute levels) consisted of the following product description:

Fig. : 4-1 Optimal Library service design

Attribute Levels	Utility scores
• Online access via Internet, Intranet etc.	+1.2607
• any time library open	+0.5143
• Completely computerized service	+0.4004
• Open access to all collection	+0. 3512
• Alert service through e-mail	+0. 1998
• Individualized assistance service	+0. 2796
• Inter library loan provided at national level	+0. 1444
• Accurate and complete answer provided	+0. 4404

Fig. 4-1

Contrary to expectation, hours of library service ranked second while much expected definitiveness and alert service ranked down to rank 4 and rank 7 respectively. It is interesting to note that maximum respondents have least preference for Inter Library Loan (2.93%, Utility range = 0.1444).

Table 4-10: Group Conjoint Results

Attributes	Attribute Level	Utility value	Range	Relative Importance	Rank
Online Access	Online access via Internet, Intranet etc.	1.2607	1.2607	25.61	1
	No Online access	0.0000			
Hours of Library Services	Any Time Library Open	0.5143	1.1382	23.12	2
	Specified Time Only	0.0000			
	By Appointment Only	-0.6239			
Computer Application	Not computerized	-0.3061	0.7064	14.35	3
	Partially computerised service	0.0000			
	Completely computerised	0.4004			
Access to Collection	Close access to all collection	-0.0671	0.4183	8.50	6
	Restricted access to special collection	0.0000			
	Open access to all collection	0.3512			
Alert Service	Inform daily through notice board	0.0765	0.1998	4.06	7
	Inform weekly through library bulletin	0.0000			
	Inform through e-mail	0.1998			
Assistance to Patrons	Individualized assistance	0.2796	0.4200	8.53	5
	Group level assistance	0.0000			
	No assistance service	-0.1403			
Inter Library Loan	Provided only at local level	0.0042	0.1444	2.93	8
	Provided at State level	0.0000			
	Provided at National level	0.1444			
Definitiveness	Accurate but not complete	-0.1941	0.6345	12.89	4
	Possible answer	0.0000			
	Accurate and complete answer	0.4404			

4.4 Conjoint Results by Segments

Conjoint results were calculated according to seven separate segmentation criteria that were identified a priori in the study. The results showing the relative importance of attributes according to these segmentation criteria are shown in table 4-11 through 4-18. The corresponding part-worth utility values are shown in table

4-11A through 4-18A. These data provide a basis for the identification of simulation opportunities. A cursory look at these tables of relative importance and part-worth utilities calculated for each segmentation category do not show any singificant differences. This has further validated by hypothesis testing. However, some differences identified by using F-tests are discussed in the following sections.

Table 4-11: Relative Importance of attributes By Organization

Attribute	Relative importance by organisations (%)			
	HAL	IISC	ISRO	NAL
Online Access	24.84	25.94	26.70	24.80
Hours of Library Services	25.39	20.93	26.16	19.02
Computer Application	13.12	12.93	11.79	18.29
Access to Collection	8.41	11.17	6.87	8.41
Alert Service	4.21	2.09	4.60	5.06
Assistance to Patrons	9.05	7.03	12.43	5.56
Inter Library Loan	3.03	4.49	2.58	3.50
Definitiveness	11.96	15.43	8.88	15.37
TOTAL	100	100	100	100

Table 4-11A: Utility Values by Organisations

Attributes	Attribute Level	Organizations			
		HAL	IISC	ISRO	NAL
Online Access	Online access via Internet, Intranet etc.	1.2320	1.2038	1.3100	1.2883
	No Online access	0.0000	0.0000	0.0000	0.0000
Hours of Library Services	Any Time Library Open	0.5928	0.4778	0.5998	0.3766
	Specified Time Only	0.0000	0.0000	0.0000	0.0000
	By Appointment Only	-0.6664	-0.4935	-0.6838	-0.6114
Computer Application	Not computerized	-0.2564	-0.2435	-0.2277	-0.4712
	Partially computerised service	0.0000	0.0000	0.0000	0.0000
	Completely computerised	0.3946	0.3565	0.3506	0.4790
Access to Collection	Close access to all collection	-0.0612	-0.1742	0.0161	-0.0741
	Restricted access to special collection	0.0000	0.0000	0.0000	0.0000
	Open access to all collection	0.3559	0.3441	0.3370	0.3630
Alert Service	Inform daily through notice board	0.1081	-0.0400	0.1249	0.0769
	Inform weekly through library bulletin	0.0000	0.0000	0.0000	0.0000
	Inform through e-mail	0.2087	0.0571	0.2255	0.2629
Assistance to Patrons	Individualized assistance	0.2826	0.1556	0.3608	0.2888
	Group level assistance	0.0000	0.0000	0.0000	0.0000
	No assistance service	-0.1665	-0.1707	-0.2491	0.0032
Inter Library Loan	Provided only at local level	-0.0236	-0.0479	-0.0146	0.0865
	Provided at State level	0.0000	0.0000	0.0000	0.0000
	Provided at National level	0.1265	0.1604	0.1118	0.1819
Definitiveness	Accurate but not complete	-0.2390	-0.3045	-0.0815	-0.1675
	Possible answer	0.0000	0.0000	0.0000	0.0000
	Accurate and complete answer	0.3540	0.4117	0.3541	0.6309

Table 4-12: Relative Importance of attributes By familiarity in use of Library

Attribute	Familiar with library (%)				
	Very Familiar	Familiar	Somewhat Familiar	Not Familiar at all	Can't Say
Online Access	25.51	24.43	27.20	28.96	24.84
Hours of Library Services	22.22	22.08	23.97	28.82	23.05
Computer Application	14.40	14.68	12.34	16.79	13.22
Access to Collection	7.99	8.89	8.48	4.91	11.95
Alert Service	4.62	3.46	5.00	4.40	3.29
Assistance to Patrons	8.62	8.81	9.37	7.18	5.60
Inter Library Loan	2.44	3.22	3.08	4.27	5.71
Definitiveness	14.20	14.43	10.55	4.67	12.33
TOTAL	100.00	100	100	100	100

Table 4-12A: Utility Values by familiarity in use Library

Attributes	Attribute Level	Familiar with Library				
		Very Familiar	Familiar	Somewhat Familiar	Not Familiar at all	Can't Say
Online Access	Online access via Internet, Intranet etc.	1.2346	1.2887	1.1383	1.4551	1.2932
	No Online access	0.0000	0.0000	0.0000	0.0000	0.0000
Hours of Library Services	Any Time Library Open	0.4612	0.4963	0.5433	0.6321	0.6148
	Specified Time Only	0.0000	0.0000	0.0000	0.0000	0.0000
	By Appointment Only	-0.6141	-0.6683	-0.4599	-0.8160	-0.5855
Computer Application	Not computerized	-0.3072	-0.3150	-0.2606	-0.3537	-0.3103
	Partially computerised service	0.0000	0.0000	0.0000	0.0000	0.0000
	Completely computerised	0.3896	0.4594	0.2558	0.4897	0.3781
Access to Collection	Close access to all collection	-0.0459	-0.1287	-0.0075	0.0258	-0.0458
	Restricted access to special collection	0.0000	0.0000	0.0000	0.0000	0.0000
	Open access to all collection	0.3408	0.3403	0.3475	0.2464	0.5766
Alert Service	Inform daily through notice board	0.0826	0.0852	0.0381	0.1495	0.0170
	Inform weekly through library bulletin	0.0000	0.0000	0.0000	0.0000	0.0000
	Inform through e-mail	0.2235	0.1825	0.2092	0.2211	0.1715
Assistance to Patrons	Individualized assistance	0.2437	0.3705	0.1280	0.2920	0.2410
	Group level assistance	0.0000	0.0000	0.0000	0.0000	0.0000
	No assistance service	-0.1736	-0.0944	-0.2644	-0.0687	-0.0508
Inter Library Loan	Provided only at local level	0.0075	0.0307	-0.0659	0.0784	-0.0601
	Provided at State level	0.0000	0.0000	0.0000	0.0000	0.0000
	Provided at National level	0.1180	0.1697	0.0631	0.2146	0.2372
Definitiveness	Accurate but not complete	-0.2564	-0.2700	-0.0355	-0.0234	-0.0805
	Possible answer	0.0000	0.0000	0.0000	0.0000	0.0000
	Accurate and complete answer	0.4308	0.4909	0.4062	0.2110	0.5615

Table 4-13: Relative Importance of attributes By Frequency of Library visit

Attribute	Visiting Library (%)				
	Two or more times	Once a week	Once every 2-3 weeks	Once a month	Once every quarter or less
Online Access	25.20	26.39	23.88	23.41	25.20
Hours of Library Services	22.95	19.83	25.99	23.36	24.41
Computer Application	14.66	14.37	13.72	14.26	14.70
Access to Collection	10.08	8.60	8.59	8.44	8.28
Alert Service	3.35	3.21	3.53	3.62	4.93
Assistance to Patrons	6.42	10.13	5.58	9.40	7.10
Inter Library Loan	2.81	2.64	6.42	1.63	4.71
Definitiveness	14.54	14.82	12.30	15.88	10.66
TOTAL	100.00	100.00	100.00	100.00	100.00

Table 4-13A: Utility Values by Frequency of Library Visit

Attributes	Attribute Level	Visiting Library				
		Two Or more times	Once a week	Once in 2-3 weeks	Once a month	Once every quarter or less
Online Access	Online access via Internet, Intranet etc.	1.2890	1.3145	1.1533	1.2198	1.2107
	No Online access	0.0000	0.0000	0.0000	0.0000	0.0000
Hours of Library Services	AnyTime Library Open	0.5710	0.4273	0.6048	0.5311	0.4625
	Specified Time Only	0.0000	0.0000	0.0000	0.0000	0.0000
	By Appointment Only	-0.6030	-0.5604	-0.6504	-0.6863	-0.7103
Computer Application	Not computerized	-0.3386	-0.3437	-0.2099	-0.3381	-0.2497
	Partially computerised service	0.0000	0.0000	0.0000	0.0000	0.0000
	Completely computerised	0.4115	0.3722	0.4530	0.4053	0.4568
Access to Collection	Close access to all collection	-0.0963	-0.0679	-0.1345	-0.0413	-0.0617
	Restricted access to special collection	0.0000	0.0000	0.0000	0.0000	0.0000
	Open access to all collection	0.4195	0.3605	0.2803	0.3983	0.3362
Alert Service	Inform daily through notice board	0.0353	0.0525	0.0204	0.1476	0.0901
	Inform weekly through library bulletin	0.0000	0.0000	0.0000	0.0000	0.0000
	Inform through e-mail	0.1715	0.1599	0.1704	0.1886	0.2371
Assistance to Patrons	Individualized assistance	0.2657	0.3270	0.1309	0.4421	0.1894
	Group level assistance	0.0000	0.0000	0.0000	0.0000	0.0000
	No assistance service	-0.0626	-0.1777	-0.1386	-0.0477	-0.1520
Inter Library Loan	Provided only at local level	0.0298	0.0126	-0.0336	0.0852	-0.0579
	Provided at State level	0.0000	0.0000	0.0000	0.0000	0.0000
	Provided at National level	0.1437	0.1315	0.2768	0.0785	0.1683
Definitiveness	Accurate but not complete	-0.2239	-0.1925	-0.2387	-0.4468	-0.0327
	Possible answer	0.0000	0.0000	0.0000	0.0000	0.0000
	Accurate and complete answer	0.5199	0.5456	0.3553	0.3809	0.4797

Table 4-14: Relative Importance of attributes By Age Group

Attribute	Relative importance by Age Group (%)			
	Below 30	31-40	41-50	50+
Online Access	24.47	24.71	27.12	27.59
Hours of Library Services	23.38	22.20	24.84	21.52
Computer Application	14.55	14.43	13.73	13.79
Access to Collection	7.62	8.40	8.65	10.43
Alert Service	4.30	2.71	4.37	4.98
Assistance to Patrons	7.85	8.14	9.46	8.83
Inter Library Loan	3.74	2.05	3.66	2.48
Definitiveness	14.10	17.35	8.16	10.39
TOTAL	100.00	100.00	100.00	100.00

Table 4-14A: Utility Values by Age Group

Attributes	Attribute Level	Age Group			
		Below 30	31-40	41-50	50+
Online Access	Online access via Internet, Intranet etc.	1.1940	1.2767	1.2841	1.3967
	No Online access	0.0000	0.0000	0.0000	0.0000
Hours of Library Services	Any Time Library Open	0.5761	0.5513	0.4747	0.4169
	Specified Time Only	0.0000	0.0000	0.0000	0.0000
	By Appointment Only	-0.5647	-0.5956	-0.7015	-0.6723
Computer Application	Not computerized	-0.2853	-0.3026	-0.3293	-0.3237
	Partially computerised service	0.0000	0.0000	0.0000	0.0000
	Completely computerised	0.4247	0.4432	0.3209	0.3746
Access to Collection	Close access to all collection	-0.0514	-0.0178	-0.1635	0.0256
	Restricted access to special collection	0.0000	0.0000	0.0000	0.0000
	Open access to all collection	0.3205	0.4163	0.2462	0.5280
Alert Service	Inform daily through notice board	0.0581	0.1354	0.0347	0.1315
	Inform weekly through library bulletin	0.0000	0.0000	0.0000	0.0000
	Inform through e-mail	0.2097	0.1400	0.2069	0.2519
Assistance to Patrons	Individualized assistance	0.1877	0.3615	0.3652	0.2630
	Group level assistance	0.0000	0.0000	0.0000	0.0000
	No assistance service	-0.1955	-0.0593	-0.0824	-0.1839
Inter Library Loan	Provided only at local level	-0.0030	0.0167	0.0245	-0.0874
	Provided at State level	0.0000	0.0000	0.0000	0.0000
	Provided at National level	0.1795	0.1061	0.1731	0.0384
Definitiveness	Accurate but not complete	-0.2645	-0.3898	-0.0632	0.1227
	Possible answer	0.0000	0.0000	0.0000	0.0000
	Accurate and complete answer	0.4237	0.5069	0.3232	0.5257

Table 4-15: Relative importance of Attributes by Sex

Attribute	Relative importance by Sex	
	Male	Female
Online Access	24.83	27.07
Hours of Library Services	21.96	25.12
Computer Application	14.18	14.58
Access to Collection	8.38	8.90
Alert Service	3.83	5.14
Assistance to Patrons	10.00	4.99
Inter Library Loan	3.40	2.52
Definitiveness	13.41	11.68
Total	100.00	100.00

Table 4-15A: Utility Value by Sex

Attribute Level	Attributes	Utility value by Sex	
		Male	Female
Online Access	Online access via Internet, Intranet etc.	1.2268	1.3428
	No Online access	0.0000	0.0000
Hours of Library Services	Any Time Library Open	0.4662	0.6306
	Specified Time Only	0.0000	0.0000
	By Appointment Only	-0.6186	-0.6156
Computer Application	Not computerized	-0.3061	-0.3029
	Partially computerised service	0.0000	0.0000
	Completely computerised	0.3946	0.4204
Access to Collection	Close access to all collection	-0.0859	-0.0353
	Restricted access to special collection	0.0000	0.0000
	Open access to all collection	0.3280	0.4063
Alert Service	Inform daily through notice board	0.0792	0.0852
	Inform weekly through library bulletin	0.0000	0.0000
	Inform through e-mail	0.1893	0.2552
Assistance to Patrons	Individualized assistance	0.3366	0.1255
	Group level assistance	0.0000	0.0000
	No assistance service	-0.1575	-0.1218
Inter Library Loan	Provided only at local level	0.0160	-0.0413
	Provided at State level	0.0000	0.0000
	Provided at National level	0.1681	0.0839
Definitiveness	Accurate but not complete	-0.2509	-0.0502
	Possible answer	0.0000	0.0000
	Accurate and complete answer	0.4116	0.5292

Table 4-16: Relative Importance of attributes By Educational Qualification

Attribute	Relative importance by Education			
	Under Graduate	Graduate	Post Graduate	Ph.D.
Online Access	20.65	26.64	25.08	25.89
Hours of Library Services	23.19	23.13	23.37	23.44
Computer Application	16.92	14.34	14.28	12.15
Access to Collection	6.61	9.84	8.19	6.11
Alert Service	4.81	3.48	4.54	4.14
Assistance to Patrons	11.11	5.28	8.88	14.38
Inter Library Loan	6.79	3.30	2.52	3.87
Definitiveness	9.92	14.00	13.14	10.01
Total	100.00	100.00	100.00	100.00

Table 4-16 A: Utility values by Educational Qualification

Attributes	Attribute Level	Utility values by Education			
		Under Graduate	Graduate	Post Graduate	Ph.D.
Online Access	Online access via Internet, Intranet etc.	0.8829	1.2693	1.3030	1.2870
	No Online access	0.0000	0.0000	0.0000	0.0000
Hours of Library Services	Any Time Library Open	0.1989	0.4933	0.5776	0.5688
	Specified Time Only	0.0000	0.0000	0.0000	0.0000
	By Appointment Only	-0.7929	-0.6088	-0.6362	-0.5965
Computer Application	Not computerized	-0.2286	-0.2861	-0.3493	-0.3319
	Partially computerised service	0.0000	0.0000	0.0000	0.0000
	Completely computerised	0.4948	0.3970	0.3927	0.2719
Access to Collection	Close access to all collection	0.0636	-0.0679	-0.0556	-0.1874
	Restricted access to special collection	0.0000	0.0000	0.0000	0.0000
	Open access to all collection	0.2825	0.4007	0.3697	0.1164
Alert Service	Inform daily through notice board	0.1805	0.0708	0.0585	0.0623
	Inform weekly through library bulletin	0.0000	0.0000	0.0000	0.0000
	Inform through e-mail	0.2058	0.1656	0.2356	0.2058
Assistance to Patrons	Individualized assistance	0.3276	0.1576	0.3257	0.4294
	Group level assistance	0.0000	0.0000	0.0000	0.0000
	No assistance service	-0.1475	-0.0940	-0.1353	-0.2855
Inter Library Loan	Provided only at local level	0.0549	-0.0188	0.0246	0.0269
	Provided at State level	0.0000	0.0000	0.0000	0.0000
	Provided at National level	0.2904	0.1383	0.1310	0.1926
Definitiveness	Accurate but not complete	-0.0191	-0.2388	-0.2124	-0.1489
	Possible answer	0.0000	0.0000	0.0000	0.0000
	Accurateand complete answer	0.4052	0.4283	0.4701	0.3489

Table 4-17: Relative Importance of attributes By Work Experience

Attribute	Relative importance by Experience				
	1-5	6-10	11-15	16-20	20+
Online Access	26.18	21.13	26.48	25.78	26.94
Hours of Library Services	24.09	21.70	24.94	22.77	21.39
Computer Application	14.06	14.52	13.83	15.53	13.93
Access to Collection	6.99	9.11	6.73	10.25	10.95
Alert Service	3.17	4.66	1.94	5.73	5.13
Assistance to Patrons	8.82	8.10	8.88	8.02	8.36
Inter Library Loan	2.84	3.10	2.61	3.59	3.22
Definitiveness	13.86	17.69	14.59	8.33	10.08
Total	100	100	100	100	99.99

Table 4-17 A: Utility values by Work Experience

Attributes	Attribute Level	Utility values by Experience				
		1-5	6-10	11-15	16-20	20+
Online Access	Online access via Internet, Intranet etc.	1.2914	1.1431	1.3670	1.2548	1.2569
	No Online access	0.0000	0.0000	0.0000	0.0000	0.0000
Hours of Library Services	Any Time Library Open	0.5601	0.5906	0.5253	0.5163	0.3322
	Specified Time Only	0.0000	0.0000	0.0000	0.0000	0.0000
	By Appointment Only	-0.6280	-0.5832	-0.7620	-0.5918	-0.6656
Computer Application	Not computerized	-0.2819	-0.3209	-0.3091	-0.3931	-0.2930
	Partially computerised service	0.0000	0.0000	0.0000	0.0000	0.0000
	Completely computerised	0.4117	0.4645	0.4046	0.3625	0.3567
Access to Collection	Close access to all collection	-0.0049	-0.1216	0.0300	-0.1876	-0.1079
	Restricted access to special collection	0.0000	0.0000	0.0000	0.0000	0.0000
	Open access to all collection	0.3400	0.3710	0.3475	0.3110	0.4030
Alert Service	Inform daily through notice board	0.0211	0.2520	-0.0216	0.1041	0.0941
	Inform weekly through library bulletin	0.0000	0.0000	0.0000	0.0000	0.0000
	Inform through e-mail	0.1566	0.2270	0.0787	0.2790	0.2394
Assistance to Patrons	Individualized assistance	0.2751	0.3239	0.3592	0.3106	0.2377
	Group level assistance	0.0000	0.0000	0.0000	0.0000	0.0000
	No assistance service	-0.1598	-0.1145	-0.0991	-0.0798	-0.1521
Inter Library Loan	Provided only at local level	-0.0034	0.0291	0.0522	0.0452	-0.0242
	Provided at State level	0.0000	0.0000	0.0000	0.0000	0.0000
	Provided at National level	0.1366	0.1679	0.1349	0.1747	0.1260
Definitiveness	Accurate but not complete	-0.2403	-0.4290	-0.2978	-0.0145	-0.0553
	Possible answer	0.0000	0.0000	0.0000	0.0000	0.0000
	Accurate and complete answer	0.4433	0.5278	0.4552	0.3908	0.4147

Table 4-18: Relative Importance of attributes By Position

Attribute	Relative importance by Position				
	Director/ GM	Manager/ lecturer	Scientist /Analyst	Executive	Student
Online Access	17.62	25.00	26.91	22.97	22.90
Hours of Library Services	11.38	23.64	22.92	21.56	23.23
Computer Application	7.86	13.53	13.09	16.64	15.45
Access to Collection	7.63	7.72	10.34	7.90	8.10
Alert Service	16.18	5.28	3.57	3.25	4.78
Assistance to Patrons	15.93	10.90	6.47	9.94	4.84
Inter Library Loan	4.75	3.01	3.67	3.12	5.36
Definitiveness	18.65	10.92	13.04	14.62	15.35
Total	100.00	100.00	100.00	100.00	100.00

Table 4-18A: Utility values by Position

Attributes	Attribute Level	Utility values by Position				
		Director/ GM	Manager/ lecturer	Scientist/ Analyst	Executive	Student
Online Access	Online access via Internet, Intranet etc.	1.9574	1.3182	1.3277	1.0810	1.1485
	No Online access	0.0000	0.0000	0.0000	0.0000	0.0000
Hours of Library Services	Any Time Library Open	0.3139	0.5501	0.5419	0.3901	0.4147
	Specified Time Only	0.0000	0.0000	0.0000	0.0000	0.0000
	By Appointment Only	-0.9500	-0.6963	-0.5891	-0.6249	-0.7502
Computer Application	Not computerized	-0.8732	-0.3231	-0.3113	-0.3461	-0.2165
	Partially computerised service	0.0000	0.0000	0.0000	0.0000	0.0000
	Completely computerised	-0.4005	0.3902	0.3345	0.4373	0.5582
Access to Collection	Close access to all collection	0.7667	-0.1421	-0.0971	-0.0500	0.1912
	Restricted access to special collection	0.0000	0.0000	0.0000	0.0000	0.0000
	Open access to all collection	0.8473	0.2649	0.4133	0.3220	0.4065
Alert Service	Inform daily through notice board	0.5667	0.1207	-0.0045	0.0650	0.1823
	Inform weekly through library bulletin	0.0000	0.0000	0.0000	0.0000	0.0000
	Inform through e-mail	1.7973	0.2782	0.1718	0.1528	0.2396
Assistance to Patrons	Individualized assistance	1.7694	0.4356	0.1908	0.3730	0.1831
	Group level assistance	0.0000	0.0000	0.0000	0.0000	0.0000
	No assistance service	0.5027	-0.1391	-0.1284	-0.0948	-0.0595
Inter Library Loan	Provided only at local level	0.1941	0.0692	-0.0098	0.0439	-0.2687
	Provided at State level	0.0000	0.0000	0.0000	0.0000	0.0000
	Provided at National level	0.5274	0.1588	0.1711	0.1466	-0.0938
Definitiveness	Accurate but not complete	-0.5505	-0.2974	-0.1302	-0.3309	-0.1558
	Possible answer	0.0000	0.0000	0.0000	0.0000	0.0000
	Accurate and complete answer	1.5207	0.2785	0.5132	0.3573	0.6140

4.5: Hypothesis

H (1) *There is no significant difference in the relative importance (part-worth utility range) that organisational members assign to the pre-determined set of attributes used in this study.*

Analysis of Variance was used to test this null hypothesis. Part-worth utility ranges were calculated for each attribute for all respondents. The range refers to the magnitude of the difference between the levels for each attribute that have the highest and lowest utility. For example, for the user assistance attribute levels (individualized assistance, group level assistance, no assistance service), the lowest utility was subtracted from the level with the highest utility to calculate the range for that attribute. This procedure was repeated to calculate a range for each attribute for all respondents. These data were used in an Analysis of Variance using MS_Excel program. While the relative importance of attributes (Table 4-10) are different (some attributes are more or less important than others), this analysis distinguished statistical significance at the .05 confidence level. The analysis of variance showed that the relative importance of the eight attributes was significantly different [F (7,4288=95.85857 > 2.011717(F-limit)]. This analysis allowed for rejection of the null hypothesis and acceptance of the hypothesis that the relative importance of attributes was significantly different. Results of the ANOVA are shown in Table 4-19.

Table : 4-19 - ANOVA : single factor - Group conjoint Results.

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	313.6965	7	44.81379	95.85857	1.8E-130	2.011717
Within Groups	2004.636	4288	0.467499			
Total	2318.332	4295				

Table 4-20

SUMMARY - Group conjoint ANOVA single factor Results				
Groups	**Count**	**Sum**	**Average**	**Variance**
Online Access	537	708.7327	1.3198	0.564686
Hours of Library Services	537	737.9275	1.374167	0.467415
Computer Application	537	434.3001	0.808752	0.17561
Access to Collection	537	465.1397	0.866182	0.404395
Alert Service	537	385.5683	0.718004	0.207906
Assistance to Patrons	537	549.0327	1.022407	0.66126
Inter Library Loan	537	367.9584	0.685211	0.180142
Definitiveness	537	715.3438	1.332111	1.078578

H (2) There is no significant difference in the relative importance (part-worth utility ranges) that organisational members assign to the pre-determined set of attributes used in this study, for respondent segments that are distinguished on the basis of:

a) Sex of the respondent

b) Age group of respondent;

c) Educational qualification

d) Job position

e) Work experience

f) Familiarity in use of library services

g) Frequency of library visit

For each of the segmentation criteria noted above, analysis of variance was conducted to test the null hypothesis. Data used in this analysis was utility value for each respondent. Categories used for segmentation were consistent with those used by library in related studies. This allowed certain comparisons with previous studies, and provided a basis for confirming the represented activeness of the sample.

Results of the analysis of variance were used to evaluate the viability of the pre-determined segmentation criteria. For example, if a given segmentation criterion

(i.e., sex), resulted in significantly different preferences (.05 confidence level) that criterion could be used as a basis for segmentation strategy. Ultimately, marketing mix decisions could then be focused recognizing the specific preferences of a defined segment. In contrast, if the segmentation criterion did not result in significantly different preferences, it would not be logical to segment according to those criteria.

The analysis of variance (ANOVA) tests were performed on the utility scores to assess differences by organization, age groups of respondents, frequency of library visit, familiarity with library use. ANOVA tests were also done to determine differences by gender, educational qualification, position and work experience.

Analysis of variance tests showed no significant difference at .05 significance level between the respondents grouped by any segmentation. Therefore the study concluded to accept the hypothesis [H(2)] for the purpose of this study. There are, however, some significant differences in library use between certain groups. A summary of the statistically significant results is given in table 4-21.

Table 4 – 21: Summary of significant differences in Utility Scores

SL. No.	Groups	Attribute	Test	Results		
				F-test	***p*-Value**	**F-limit**
01	Sex	Group	ANOVA	0.0926	0.77117	5.9873
02		Definitiveness	F-test	0.92131	0.47952	0.05263
03		Assistance Service	F-test	0.24013	0.19363	0.05263
04	Visit	Group	ANOVA	0.010704	0.99977	2.45421
05		2 or more *vs.* once 2-3 week	F-test	1.629614	0.380284	19.00003
06		Once in a month *vs. once in* 2-3 week	F-test	0.24013	0.37405	0.05263
07		2 or more *vs.* once 2-3 week	F-test	1.679178	0.373249	19.00003
08	Organi -sation		ANOVA	0.067424	0.977074	2.708191

F-test for the attribute definitiveness indicated significance difference between male and female preferences over accurate and complete answer (level 3 of definitiveness) (F = 0.92131, p = 0.47952, F-critical = 0.05263). Male showed a small but significantly higher preference (utility score = 0.4116) for accurate and complete answer while female indicated a closeness (utility score = 0.0526) towards possible answer. An earlier study (Gregory A Crawford, 1994) reported that men showed interest on possible answers while female preferred on definite answer.

The only other significant difference revealed by gender based F-test showed that men report a higher mean utility score on level one (individualised assistance) of Assistance to Patrons (F-test = 0.24013, p = 0.19363, F-critical = 0.05263). The

mean utility score on this attribute level for men was 0.3366 and for female 0.1255. In general, utility scores show that men preferred more on individualised assistance while female still show interest on individualised assistance but very close to group level assistance (second level of the attribute).

F-tests result in the significant difference between the five groups of 2 or more visit per week and once in 2-3 week against the attribute definitiveness. The result reported significant difference as (F-test = 1.629614, *p*-value = 0.380284, F-limit = 19.00003). The mean utility score on this attribute level (utility score = 0.51989) shows that preference on accurate and complete answer of definitiveness is significantly desired by those visiting the library 2 or more times in a week (utility score = 0.380925). Difference between all other groups is more or less of the same significance.

Those who visit once in a month preferred more on individualised assistance service (utility score = 0.442114) while those who visit once in 2-3 weeks preferred towards group level assistance (utility score = 0.130894). Significant difference also exists between the respondent visiting once a quarter or less (utility score = 0.336172) and respondents visiting two or more time in a week (utility score = 0.419479) (f-test - 0.248909, p-value = 0.199301, F-critical = 0.052632). F-test between 2 or more times in a week and once in 2-3 weeks concluded that those who visit 2 or more times in a week preferred more on open access to collection while significant differences of once in 2-3 weeks visitors showed their preference closely

towards restricted access to collection (F-test = 1.679178, *p*-value = 0.373249, F-limit = 19.00003).

The analysis of variance tests showed no significant differences between the respondents grouped by organisations on any of the levels of the attributes (F-test = 0.067424, *p*-value = 0.977074, F-limit = 2.708191). There is however a significant difference in receiving alert service through e-mail among IISC and the rest of the organisations. HAL, ISRO and NAL (mean utility score = 0.2324) preferred on alert service while IISc (utility score = 0.0571) showed less preference on e-mail and very close to inform through library bulletin.

Chapter 5

SUMMARY OF FINDINGS AND SUGGESTIONS

Analysis of the background data provides an opportunity to develop a profile of library users of HAL, IISC, ISRO, and NAL. The data indicate that 70.95% of users were male and 33.89% were below 30 age group. A total of 42.27% had Graduate education and 33.14% positioned as Scientist/Analyst while 8.01% were students from IISC. Total work experience for 53.26% was between 1 to 5 years of experience. Maximum respondents were from HAL 30.73% ,while 27.38% represented from NAL, 23.64% from ISRO and 18.24% from IISC.

The majority (31.66%) indicated that the visits to the library were 2 or more times a week, while 40.41% were familiar with the use of library services.

5.1 Findings

The results of analysis indicate that Online access (online access via Internet or Intranet-25.61%) and Hours of Library services (any time library opens-23.12%) are the two major preferences, while computerisation (completely computerised service-14.35%) and definitiveness (providing complete and accurate answer-12.89%) are in third and fourth relative position of preferences respectively to attain a major share of relative importance (75.97%). As one might expect, the respondents prefer a definite answer to their queries from the time the library opens till it closes. And also prefer completely computerised service and entire database available through online access. Contrary to expectations, the alert service has little impact on preferences (4.06, 7^{th} Rank).

Men and women express similar preferences on most levels of attributes as indicated by their utility score. Only two statically significant differences emerged in the analysis. While men overwhelmingly desire user assistance services (10%), women's desire level is as low as 4.99%. This happened because of men opted for individualised assistance (utility value = +0.3360) than women (utility value = +0.1255). Men also expressed a small variation in favour of definitiveness (13.41%) than Women (11.68%). This is because men showed more preference on

accurate and complete answer (utility value = 0.5292) while female showed closeness towards possible answer (utility value = 0.4116).

Contrary to expectations, there are no significant differences in utility scores of any levels of any attributes among the various organisational respondents. However, definitiveness is more desired than computerisation by respondents from IISc, while all other organisations preferred more on computerisation than definitiveness. A significant difference did emerge in the amount of library use more significantly by IISC (mostly students) than other respondents. It is most significant among regular visitors of the library (2 or more times in a week) in the sense that their preference on open access to collection is more when compared to those who visit less. In case of alert services, IISc respondents showed a small significant difference (2.09%) when compared to the rest of the organisations.

Analysis by age categories also failed to show any significant differences. However, the significant difference is discovered between those aged 31-40 and the rest age groups. The age group 31-40 showed more preference on definitiveness (17.35%) than computerization (14.43%) Alert service through e-mail is preferred more by 50+ age group respondents (4.98%, utility score = +0.2513) while 31-40 age group preferred it at low level (2.71%; utility score = +0.1400).

The following significant differences were found on the amount of library use by respondents. Those who used the library heavily (i.e. two ore times in a week), gave a very low preference for a possible answer when compared to those who used the library very few times (i.e. less that once a week). This may be due to the fact that the frequent users of the library directly access the collection and browse without much assistance service and they are more aware of the variety of sources in which to find their answers.

A lone DGM showed increased preference on definitive answer (Rank 1; 18.65%), online access (Rank 2 ;17.62%) and individualised assistance (Rank 3; 15.93%). Among the rest, students preferred more on accurate and complete answer and reported high priority on hours of library services (Rank 1; 23.23%) than online access, where as all scientist/analyst preferred more on access to collection, open access (utility score = 0.4133).

Respondents belonging to 6-10 years experience segment slightly different from the most of the respondents by and indicating more preference on hours of the library services than online access.

Graduate respondents preferred more on definitiveness and open access among all, while undergraduate preferred more on individualised

assistance service than definite answers. Ph.D. holders showed preferences more towards individualised assistance than computerisation.

Overall, the results of this study indicated a fairly stable pattern of preferences for library services among the respondents of the four organisations.

5.2 Suggestions

Conjoint analysis provides a method to determine patron preference to guide librarians in structuring reference services in the special library. While individual respondents will vary on their preferences for specific services, the means of the utility scores derived from the stated preferences of these individuals reveal which aspect of existing services should be emphasized or de-emphasized.

Latest trends show a considerable increase in the application of conjoint analysis in service sectors. It may not be out of place to mention here that development of various conjoint analysis models suitable for the study design, modified approaches to conjoint analysis for obtaining stable results for problems involving large number of attributes and standardised microcomputer packages have reduced the complexity of the Conjoint analysis. If these technological potentialities are not exploited

by the LIS professionals, the field of user preferences and user studies will remain devoid of valid and reliable research finding.

It is hoped that the results of this study may provide some direction to further research. For example, similar research can be done by using Hybrid Conjoint Analysis, or Adaptive Conjoint Analysis (ACA) to determined the preferences on more number of attributes and levels for effective and reliable design of library services for different library communities.

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Appendix : 1

PRE-TEST STUDY

A pre-test study was conducted to provide guidelines for the final design of the experiment in terms of importance of attributes and thus to reduce the number of attributes according to the preference ratings. The questionnaire used for the pre-test is provided in the appendix : 2.

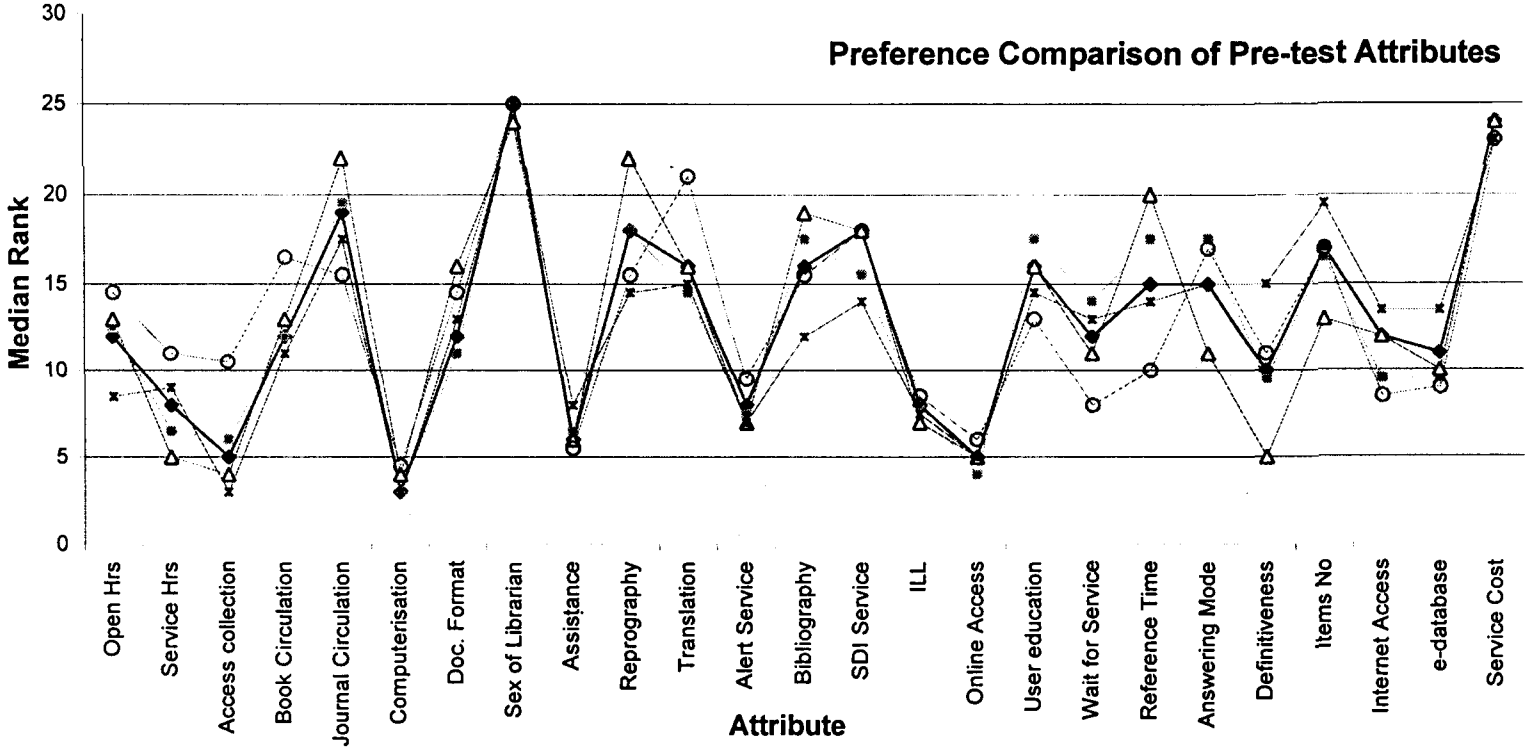
The pre-test survey was conducted to elicit stated importance of 25 attributes among respondents selected from four targeted organizations i.e. HAL, IISc, ISRO, NAL. With the purpose to narrow down the size of attributes from 25 to 8, 20 respondents from each organization were asked to rank attributes from 1 to 25 listed in the pre-test questionnaire in order of preference. Each attribute was limited to two (2) or three (3) levels, which are considered to be a good balance between demands. Respondents were also asked to give their background information for a comparison of nature of respondent's ranking style.

There were 70% responses, 53 were useful responses and 12 responses were incomplete so that can't be used, received from a total 80 samples which are entered in MS Excel Program for the analysis. Median Rank is calculated for entire responses and selected least 8 Median Ranks, 10 or below, attributes for the final study. A comparative study was also done to identify the nature of preference while ranking the attributes on the basis of library familiarities and frequency of visit.

Sl. No.	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	Org.	Response
1	9	8	2	24	23	3	11	25	6	5	10	7	19	12	1	4	22	14	13	18	15	16	20	17	21	HAL	
2	22	23	11	12	10	2	1	25	9	13	14	3	21	15	16	6	7	8	17	18	19	20	4	5	24	HAL	
3	24	13	12	21	22	11	23	20	14	25	10	15	16	9	8	7	6	19	18	5	4	3	2	1	17	HAL	
4	6	5	7	8	19	1	9	24	10	11	23	12	22	21	20	2	13	14	15	19	16	17	3	4	25	HAL	
5	19	2	8	4	12	1	18	23	3	6	14	10	13	20	9	21	11	5	16	24	15	17	25	7	22	HAL	
6	12	4	13	5	20	1	6	2	22	7	18	8	14	16	15	3	19	9	10	17	11	25	23	2	24	HAL	
7	10	9	7	19	12	4	11	25	6	18	22	5	14	3	8	2	1	13	15	24	20	16	17	21	23	HAL	
8	18	16	4	11	10	3	2	15	1	20	23	9	14	22	17	13	12	16	5	24	6	19	7	8	25	HAL	70%
9	12	6	7	8	20	1	2	25	9	11	14	10	13	15	16	5	17	19	18	23	21	22	4	3	24	HAL	
10	13	7	4	12	23	5	11	25	1	18	10	22	19	3	6	2	20	16	21	9	8	14	17	15	24	HAL	
11	11	5	2	14	22	3	10	25	7	23	13	4	21	24	6	8	18	12	19	9	1	17	15	16	20	HAL	
12	14	8	2	11	18	5	13	25	3	23	17	7	22	20	4	1	19	12	21	10	6	15	9	16	24	HAL	
13	10	6	5	16	23	3	12	25	7	19	15	4	20	22	8	1	21	14	18	17	2	13	9	11	24	HAL	
14	13	5	2	12	19	3	14	25	6	18	17	7	16	15	8	4	21	20	23	11	1	9	10	22	24	HAL	
Meadian Rank (HAL)	12.5	6.5	6	12	19.5	3	11	25	6.5	18	14.5	7.5	17.5	15.5	8	4	17.5	14	17.5	17.5	9.5	16.5	9.5	9.5	24		
1	3	2	1	16	23	4	17	25	5	22	20	6	18	19	21	7	8	9	10	11	12	13	14	15	24	IISC	
2	11	12	7	13	5	3	6	20	23	15	22	9	11	3	10	5	3	2	15	10	1	8	2	3	19	IISC	
3	24	25	1	2	6	22	23	15	19	20	21	8	17	18	16	12	11	14	13	10	7	9	3	4	5	IISC	
4	16	4	8	11	23	7	13	25	1	24	14	19	18	5	2	3	21	10	20	9	6	12	17	15	22	IISC	
5	15	6	4	9	23	7	16	25	2	22	10	8	20	18	3	1	19	11	21	17	5	12	14	13	24	IISC	
6	12	3	8	14	23	5	10	25	2	22	16	7	17	20	4	6	19	15	21	11	1	18	13	9	24	IISC	55%
7	12	4	8	17	20	2	16	24	6	22	10	1	19	18	5	7	21	13	23	9	3	15	11	14	25	IISC	
8	15	5	3	10	22	1	11	24	4	23	9	6	19	18	7	2	20	16	21	12	8	13	14	17	25	IISC	
9	13	2	8	11	23	1	14	25	6	22	20	15	19	7	4	3	16	10	21	18	5	17	12	9	24	IISC	
10	14	7	3	17	20	1	18	24	8	21	16	4	19	12	9	5	13	11	15	22	2	23	10	6	25	IISC	
11	11	5	2	15	18	4	17	24	7	19	16	3	20	23	8	6	14	12	13	21	1	22	9	10	25	IISC	
Meadian Rank (IISC)	13	5	4	13	22	4	16	24	6	22	16	7	19	18	7	5	16	11	20	11	5	13	12	10	24		

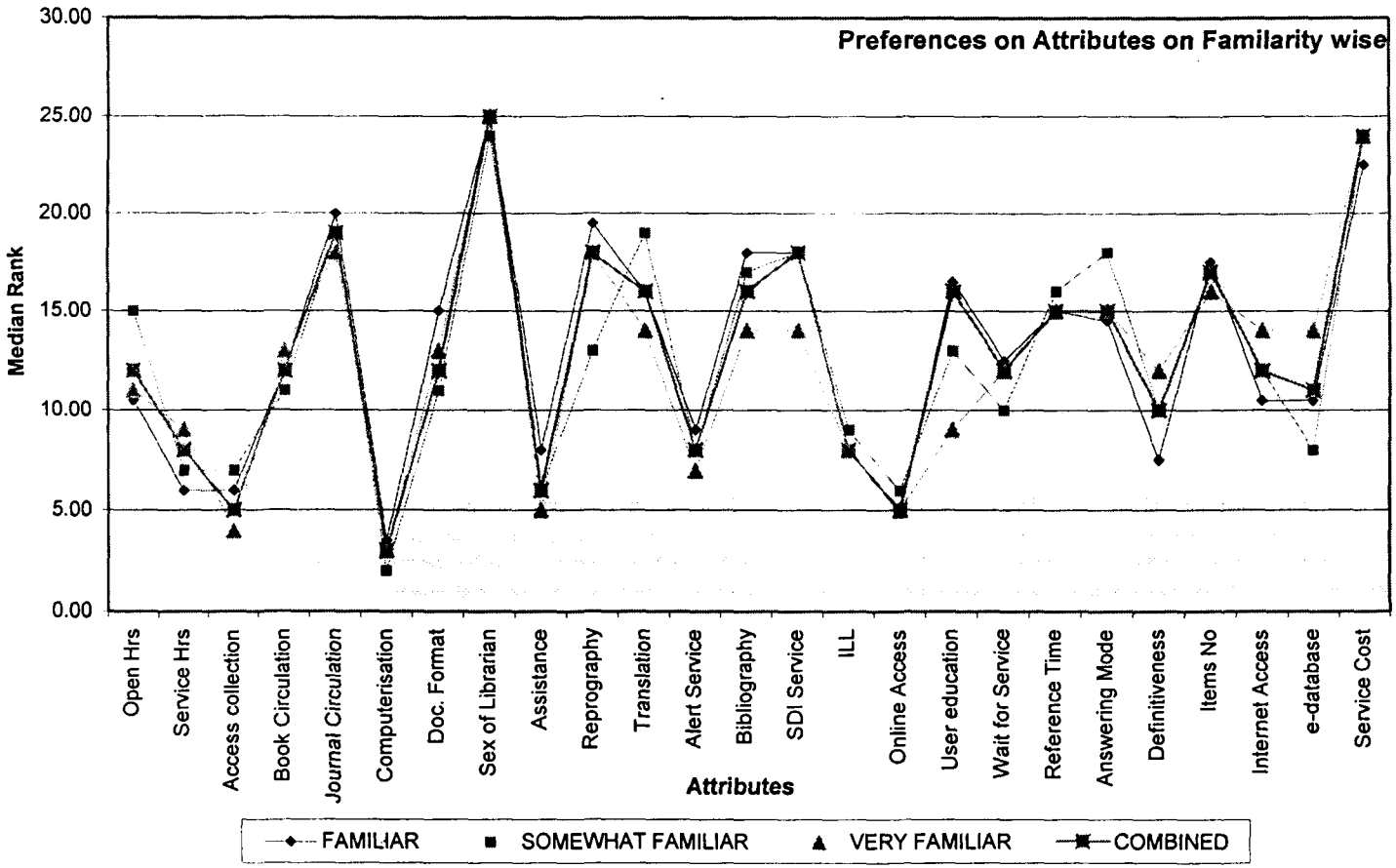
Sl. No.	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	Org.	Response
1	5	6	8	23	7	4	9	25	18	24	20	10	11	21	12	3	17	22	15	14	13	19	1	2	16	ISRO	
2	21	17	14	2	13	1	19	20	5	10	25	15	24	18	11	6	16	4	8	9	12	23	7	3	22	ISRO	
3	12	11	10	13	14	1	23	24	9	8	25	7	15	20	6	5	4	16	17	18	19	21	2	3	22	ISRO	
4	20	19	18	17	16	15	14	25	13	21	22	12	11	10	9	8	7	6	5	23	4	2	1	3	24	ISRO	
5	21	23	19	20	22	10	1	25	4	11	24	12	13	18	9	17	14	3	2	5	15	6	7	8	16	ISRO	
6	19	23	1	20	22	21	17	25	2	3	15	4	9	18	5	6	8	7	14	16	10	13	12	11	24	ISRO	
7	5	6	4	11	15	3	1	25	7	8	19	9	20	10	12	13	16	14	17	23	2	21	22	24	18	ISRO	60%
8	1	11	2	21	15	5	3	22	6	20	23	4	16	19	8	7	12	9	10	18	17	13	24	14	25	ISRO	
9	16	17	22	1	18	20	19	24	11	10	23	13	12	14	3	21	2	4	5	6	7	8	15	9	25	ISRO	
10	9	8	11	5	12	13	1	25	2	20	19	14	24	21	15	3	4	6	7	23	16	17	18	22	10	ISRO	
11	13	6	8	16	22	1	15	25	4	21	10	7	19	18	2	5	23	12	20	11	3	17	9	14	24	ISRO	
12	16	7	12	23	18	2	20	25	5	22	14	4	17	13	6	1	15	11	10	19	3	21	8	9	24	ISRO	
Meadian Rank (ISRO)	14.5	11	10.5	16.5	15.5	4.5	14.5	25	5.5	15.5	21	9.5	15.5	18	8.5	6	13	8	10	17	11	17	8.5	9	23		
1	8	7	11	24	12	1	19	18	5	22	21	7	9	10	20	4	6	14	15	13	17	16	2	3	23	NAL	
2	9	10	13	11	12	1	14	25	5	15	16	7	8	17	18	4	6	23	22	19	20	21	2	3	24	NAL	
3	22	23	3	13	12	11	1	24	2	14	10	15	9	8	7	5	4	16	17	18	19	20	6	25	21	NAL	
4	7	5	1	10	11	18	2	25	15	12	16	8	3	6	7	4	13	19	14	21	20	23	2	24	22	NAL	
5	4	9	2	1	10	3	4	24	5	7	8	6	11	23	12	19	17	15	13	18	14	22	21	20	25	NAL	
6	5	11	1	2	10	3	4	25	8	7	12	6	20	24	13	19	9	22	14	15	16	17	18	21	23	NAL	
7	25	24	1	23	19	18	17	16	15	6	7	5	13	14	12	2	3	11	4	10	20	21	8	9	22	NAL	
8	2	9	11	10	16	1	24	25	17	3	23	22	13	4	5	12	8	7	14	15	18	19	21	6	20	NAL	
9	3	8	1	9	19	14	20	25	10	2	24	17	21	18	4	5	16	6	7	22	11	23	13	15	12	NAL	80%
10	4	2	3	1	21	20	12	25	10	24	23	11	13	14	22	19	18	5	6	7	8	9	17	16	15	NAL	
11	11	12	1	2	13	3	4	24	5	14	17	15	6	7	8	22	16	9	18	21	19	20	23	10	25	NAL	
12	19	16	20	24	23	3	1	25	15	18	14	17	4	5	7	6	8	12	9	13	10	11	22	2	21	NAL	
13	9	7	3	13	22	1	15	25	8	18	10	6	24	19	5	2	20	16	21	12	4	17	11	14	23	NAL	
14	10	2	4	12	24	1	17	25	8	22	13	5	20	18	6	3	21	14	19	9	7	11	16	15	23	NAL	
15	9	6	5	11	21	4	16	25	8	23	12	1	22	18	7	2	19	10	20	17	3	15	14	13	24	NAL	
16	5	18	19	20	21	15	2	25	6	17	23	1	7	14	8	9	16	10	11	12	3	22	4	13	24	NAL	
Meadian Rank (NAL)	8.5	9	3	11	17.5	3	13	25	8	14.5	15	7	12	14	7.5	5	14.5	13	14	15	15	19.5	13.5	13.5	23		
Meadian Rank (Combined)	12	8	5	12	19	3	12	25	6	18	16	8	16	18	8	5	16	12	15	15	10	17	12	11	24		

Fig. A1-1 : A comparison chart of Preference measurement of HAL, NAL, ISRO, IISc against the combination of all four.



COMBINED	12	8	5	12	19	3	12	25	6	18	16	8	16	18	8	5	16	12	15	15	10	17	12	11	24
HAL	12.5	6.5	6	12	19.5	3	11	25	6.5	18	14.5	7.5	17.5	15.5	8	4	17.5	14	17.5	17.5	9.5	16.5	9.5	9.5	24
IISC	13	5	4	13	22	4	16	24	6	22	16	7	19	18	7	5	16	11	20	11	5	13	12	10	24
ISRO	14.5	11	10.5	16.5	15.5	4.5	14.5	25	5.5	15.5	21	9.5	15.5	18	8.5	6	13	8	10	17	11	17	8.5	9	23
NAL	3.5	9	3	11	17.5	3	13	25	8	14.5	15	7	12	14	7.5	5	14.5	13	14	15	15	19.5	13.5	13.5	23

Fig. A1-1 : A comparison chart of Preference measurement by familiarity of Library use.



Appendix : 02

A PRE-TEST SURVEY OF LIBRARY SERVICE PREFEENCES.

Rank of Attributes

Assume that you have a total of 25 ranks to distribute among the 25 attributes listed below. Please distribute the ranks according to the relative importance of these attributes to you when choosing library services. The highest rank (1st Rank) should be assigned to the most important factor and the lowest rank (25th Rank) should be assigned to the least important factor. You may use all the numbers from 1 to 25, but shall not leave any line blank.

Sl. No.	Attributes	Rank
01	Number of Hours library opens on different days.	.....
02	Period of time at which library service is available on various days.	.....
03	Whether books and Journals are issued to clients ?	.....
04	Number of books issued to its clients and number of days.	.....
05	How Journals are circulated among patrons ?	.....
06	Whether library is computerised and what extent ?	.....
07	Whether the client's requirement will be met through different publication formats(Books, Journals etc) ?	.....
08	Sex of Librarian.	.....
09	Whether library will allow its clients to access the collection ?	.....
10	Whether the library staff will reproduce the required materials of various kinds ?	.....
11	Whether the library staff will translate foreign documents ?	.....
12	Whether the patrons will be informed about various activities and services without delay through different modes ?	.....
13	Whether the library staff will compile bibliographies or list of sources about your topic ?	.....
14	Whether the library will offer a highly personalised document match services?	.....
15	Whether the library will get materials not owned from other library situated at various places ?	.....
16	Availability of assistance from library staff	.....
17	Whether librarian will assist you in finding materials ?	.....
18	Amount of time spent waiting for a library services	.....
19	Time required by librarian to provide services to a reference query.	.....
20	The mode through which a reference query is answered by the librarian.	.....
21	Amount of accuracy of answer to your reference question.	.....
22	Number of items provided by librarian to a reference question.	.....
23	Whether internet access open to all the members ?	.....
24	Whether library will provide electronic Database services ?	.....
25	Whether all services of the library will be charged ?	.....
23	Whether internet access open to all the members ?	.....
24	Whether library will provide electronic Database services ?	.....
25	Whether all services of the library will be charged ?	.....

N.B. :

Would you consider any other characteristic apart from those listed above when considering the use of library services ? If any, please list below.

1) .....

2) .....

3) .....

Thanking you very much for your evaluation

Reply to :

To

Varghese Joseph
Information Officer
Central & Technical Data information Centre
A R D C, H A L
Vimanapura Post, Bangalore - 560 017

..... SECOND FOLD .....

..... FIRST FOLD .....

Please Tick ☐ Boxes as Appropriate

Tel. ..... **Fax** ..... **E-mail** .....

Age Group (years) :
☐ Below 30 ☐ 31-40 ☐ 41-50 ☐ 50+

Gender :
☐ Male ☐ Female

Educational qualification :
☐ Under Graduate ☐ Graduate ☐ Post-Graduate ☐ Any Other (specify) .....

Position :
☐ MD/CEO ☐ Director/VP/GM ☐ Manager/Lecturer ☐ Scientist/Analyst ☐ Executive ☐ Any other .....

Job Function :
☐ Corporate Affairs ☐ Commercial ☐ Finance/Accounting ☐ Consultant/Academic ☐ Professional/Service
☐ Technology/Manufacturing ☐ Others (specify) .....

Work Experience (years) :
☐ 1-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ 20+

How <u>often</u> do you use the Library ?
☐ 2 or more times a week ☐ Once a week ☐ Once every 2 to 3 week ☐ Once a month ☐ Once a quarter or less

How <u>familiar</u> do you consider yourself with use of Library Services ?
☐ Very familiar ☐ Somewhat familiar ☐ Familiar ☐ Not familiar at all ☐ can't say

THANK YOU FOR TAKING YOUR VALUABLE TIME TO ANSWER THIS PRE-TEST SURVEY

ID No.

A SURVEY OF CONJOINT ANALYSIS FOR MEASURING PREFERENCES ON LIBRARY SERVICES

By

VARGHESE JOSEPH
Deputy Manager

Central & Technical Data Information Centre
Hindustan Aeronautics Limited
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Off : 5226398, Res : 3451106
E-Mail : vj_panakalam@hotmail.com

LIBRARY PREFERENCE STUDY

Data solicited with this questionnaire is for the sole purpose of research in Library Service Preferences and choice behaviour of user. Participation is completely voluntary. Your response will be valuable and assure you that all data collected will be kept confidential.

In the following questionnaire you are asked to provide information about Library Services which you might prefer.

The questionnaire is conducted in three phases. In phase I, you are provided with description of service attributes for your reference while evaluating the questionnaire.

In phase II, you are asked to rate Eighteen (18) generic Service Profiles on a zero to one hundred likelyhood usage of service package.

At the end, you are asked to provide information about yourself.

Please answer each section of the questionnaire thoughtfully, as though you actually **were** in the situation depicted by the various scenarios. Please make sure all sections are completed.

THANKS VERY MUCH !

PHASE - 1

ATTRIBUTES FOR LIBRARY SERVICES

1.	Hours of Service	:	Describes the time during which a Librarian or Library Staff is available to assist patrons.
2.	Computer Application	:	Well-desinged computer systems and software are used to carryout information services and retrieval activities in an effective way.
3.	Access to Collection	:	The degree to which the library allows its patrons to access types of its collection.
4.	Inter Library Loan (ILL)	:	ILL refers to Borrowing documents, which are not avail lable in the Library, from other libraries especially those in the same town.
5.	Alert Service	:	Refers to a service which permits the user to register one or more search terms or combination of terms. Library will run a search against new records when ever the database is updated and resulting list are send to the user by e-mail or Fax etc.

6.	Assistance to Patrons	:	Indicates that help or assistance con be provided by a Librarian or a Library Staff to a patron in order to answer queries or to make familiar with information search procedure.
7.	Definitiveness	:	Refers to the likelyhood that an answer to a question can be found in materials given to a patron by a Librarian or a reference service staff.
8.	Online Access	:	Online access permit the users to access database of the library through their own computer systems linked by Networks, Internet etc.

PHASE - 2

SERVICE PACKAGE EVALUATION

In this section of the questionnaire you are asked to rate Eighteen (18) generic service profile on a zero to 100 scale. Each profile description will be composed of some level of each of the attributes you evaluated earlier.

Please look at the 18 service profiles before rating the first Profile. It is important that you take your time for each profile description (minimum of about one minute each). Please, rate a profile on a preference or likelyhood-of-use scale ranging from zero (0 = which means you definitely would not consider the service package) to one hundred (100 = which means you definitely would consider than any other service available).

PROFILE - 1

Online Access :
Online access via Internet, intranet etc.,

Hours of Library Services :
Any time Library open

Computer Application :
Not Computerised Service

Access to Collection :
Close Access to all Collection

Alert Service :
Inform through notice board

Assistance to Patrons :
Individualised Assistance

Inter Library Loan :
Provided one at local Level

Definitiveness :
Possible Answer

RATE : _____

PROFILE - 2

Online Access :
Online access via Internet, intranet etc.,

Hours of Library Services :
Any time Library open

Computer Application :
Partially Computerised Service

Access to Collection :
Restricted access to special collection

Alert Service :
Inform weekly through library bulletin

Assistance to Patrons :
Group Level Assistance

Inter Library Loan :
Provided at State Level

Definitiveness :
Accurate but not Complete Answer

RATE : _____

PROFILE - 3

Online Access :
Online Acess via Internet, Intranet etc.,

Hours of Library Services :
Any time Library open

Computer Application :
Completely Computerised Service

Access to Collection :
Open Access to all Collection

Alert Service :
Inform through e-mail

Assistance to Patrons :
No Assistance Service

Inter Library Loan :
Provided at National Level

Definitiveness :
Accurate and Complete Answer

RATE : _____

PROFILE - 4

Online Access :
Online Acess via Internet, Intranet etc.,

Hours of Library Services :
Specified time Only

Computer Application :
Not Computerised Service

Access to Collection :
Close Access to all Collection

Alert Service :
Inform weekly through Library bulletin

Assistance to Patrons :
Group Level Assistance

Inter Library Loan :
Provided at National Level

Definitiveness :
Accurate and Complete Answer

RATE : _____

PROFILE - 5

Online Access :
Online access via Internet, Intranet etc.,

Hours of Library Services :
Specified time Only

Computer Application :
Partially Computerised Service

Access to Collection :
Restricted access to Special collection

Alert Service :
Inform through e-mail

Assistance to Patrons :
No assistance service

Inter Library Loan :
Provided only at local level

Definitiveness :
Possibel Answer

RATE : _____

PROFILE - 6

Online Access :
Online acess via Internet, Intranet etc.,

Hours of Library Services :
Specified time Only

Computer Application :
Completely Computerised Service

Access to Collection :
Open Access to all Collection

Alert Service :
Inform through notice board

Assistance to Patrons :
Individulised Assistance

Inter Library Loan :
Provided State level

Definitiveness :
Accurate but not Complete Answer

RATE : _____

PROFILE - 7

Online Access :
Online Access via Internet, Intranet etc.,

Hours of Library Services :
By Appointment Only

Computer Application :
Not Computerised Service

Access to Collection :
Restricted Access to all Collection

Alert Service :
Inform through notice board

Assistance to Patrons :
No assistance service

Inter Library Loan :
Provided at State Level

Definitiveness :
Accurate and Complete Answer

RATE : _____

PROFILE - 8

Online Access :
Online Access via Internet, Intranet etc.,

Hours of Library Services :
By Appointment Only

Computer Application :
Partially Computerised Service

Access to Collection :
Open Access to all Collection

Alert Service :
Inform weekly through Library bulletin

Assistance to Patrons :
Individualised Assistance

Inter Library Loan :
Provided at National Level

Definitiveness :
Possible Answer

RATE : _____

PROFILE - 9

Online Access :
Online Access via Internet, intranet etc.,

Hours of Library Services :
By Appointment Only

Computer Application :
Completely Computerised Service

Access to Collection :
Close Access to all Collection

Alert Service :
Inform through e-mail

Assistance to Patrons :
Group level Assistance

Inter Library Loan :
Provided only at local Level

Definitiveness :
Accurate and Complete Answer

RATE : _____

PROFILE - 10

Online Access :
No Online Access

Hours of Library Services :
Any time Library open

Computer Application :
Not Computerised Service

Access to Collection :
Open Access to all Collection

Alert Service :
Inform through e-mail

Assistance to Patrons :
Group level Assistance

Inter Library Loan :
Provided at State Level

Definitiveness :
Possible Answer

RATE : _____

PROFILE - 11

Online Access :
No Online Access

Hours of Library Services :
Any Time Livbrary Open

Computer Application :
Partially Computerised Service

Access to Collection :
Close Access to all Collection

Alert Service :
Inform through notice board

Assistance to Patrons :
No assistance service

Inter Library Loan :
Provided at National Level

Definitiveness :
Accurate but not Complete

RATE : _____

PROFILE - 12

Online Access :
No Online Access

Hours of Library Services :
Any time library open

Computer Application :
Complete Computerised Service

Access to Collection :
Restricted access to special Collection

Alert Service :
Inform weekly through Libraby bulletin

Assistance to Patrons :
Individualised Assistance

Inter Library Loan :
Provided only at local level

Definitiveness :
Accurate and Complete Answer

RATE : _____

PROFILE - 13

Online Access :
No Online Access

Hours of Library Services :
By Appointment Only

Computer Application :
Partially Computerised Service

Access to Collection :
Close Access to all Collection

Alert Service :
Inform through e-mail

Assistance to Patrons :
Individualised Assistance

Inter Library Loan :
Provided at State Level

Definitiveness :
Accurate and Complete Answer

RATE : _____

PROFILE - 14

Online Access :
No Online Access

Hours of Library Services :
By Appointment Only

Computer Application :
Partially Computerised Service

Access to Collection :
Close Access to all Collection

Alert Service :
Inform through e-mail

Assistance to Patrons :
Individualised Assistance

Inter Library Loan :
Provided at State Level

Definitiveness :
Accurate and Complete Answer

RATE : _____

PROFILE - 15

Online Access :
No Online Access

Hours of Library Services :
Specified time Only

Computer Application :
Completely Computerised Service

Access to Collection :
Close Access to all Collection

Alert Service :
Inform through Library bulletin

Assistance to Patrons :
No assistance service

Inter Library Loan :
Provided at State Level

Definitiveness :
Possibel Answer

RATE : _____

PROFILE - 16

Online Access :
No Online Access

Hours of Library Services :
By Appointment Only

Computer Application :
Not Computerised Service

Access to Collection :
Open Access to all Collection

Alert Service :
Inform weekly through library bulletin

Assistance to Patrons :
No assistance service

Inter Library Loan :
Provided only at local level

Definitiveness :
Accurate but not Complete Answer

RATE : _____

PROFILE - 17

Online Access :
No Online Access

Hours of Library Services :
By Appointment Only

Computer Application :
Partially Computerised Service

Access to Collection :
Close Access to all Collection

Alert Service :
Inform through e-mail

Assistance to Patrons :
Individualised Assistance

Inter Library Loan :
Provided at State Level

Definitiveness :
Accurate and Complete Answer

RATE : _____

PROFILE - 18

Online Access :
No Online Access

Hours of Library Services :
By Appointment Only

Computer Application :
Completely Computerised Service

Access to Collection :
Restricted Access to all Collection

Alert Service :
Inform through notice board

Assistance to Patrons :
Group Level Assistance

Inter Library Loan :
Provided at National Level

Definitiveness :
Possible Answer

RATE : _____

TELL ABOUT YOURSELF PERSONALLY

PLEASE TICK ☐ BOXES AS APPROPRIATE

Tel. : ..... E-mail : .....Time taken to fill this Questionnaire .....

Age Group (years) :
☐ Below 30 ☐ 31-40 ☐ 41-50 ☐ 50+

Gender :
☐ Male ☐ Female

Educational Qualification :
☐ Under Graduate ☐ Graduate ☐ Post- Graduate ☐ Any Other (Specify).....

Position :
☐ MD / CEO ☐ Director/VP/GM ☐ Manager/Lecturer ☐ Scientist/Analyst
☐ Executive ☐ Any other .....

Work Experience (Years) :
☐ 1-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ 20+

Organization to which you belong :
☐ HAL ☐ IISc ☐ ISRO ☐ NAL

How <u>often</u> do you use the Library ?
☐ 2 or more times a week ☐ Once a week ☐ Once every 2 to 3 week
☐ Once a Month ☐ Once a Quarter or less

How <u>familiar</u> do you consider yourself with use of Library Services ?
☐ Very familiar ☐ Familiar ☐ Somewhat familiar ☐ Not familiar at all ☐ Con't say

THANK YOU VERY MUCH FOR YOUR KIND CO-OPERATION

THE NORTH-EASTERN HILL UNIVERSITY
SCHOOL OF ECONOMICS, MANAGEMENT AND INFORMATION SCIENCE

PARTICULARS OF THE CANDIDATE

1.	NAME	: VARGHESE J. MANATHRACHIRA
2.	DEGREE	: DOCTOR OF PHILOSOPHY
3.	DEPARTMENT	: LIBRARY AND INFORMATION SCIENCE
4.	TITLE OF DISSERTATION	: CONJOINT ANALYSIS OF USER PREFERENCES FOR LIBRARY SERVICES
5.	APPROVAL OF RESEARCH PROPOSAL :	
	1. BPGS	: 28TH SEPTEMBER 1995
	2. SCHOOL BOARD	: 10TH OCTOBER 1995
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23/09/02

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