

Understanding the User - Why, What and How ? @

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Abstract: Explains the need, importance, purposes and scope of user studies, discusses procedure for conducting sound user studies together with associated problems of research like selection of problem, formulation of hypothesis, design of study, sampling strategy, data collection methods, scaling techniques, pilot study, processing and analysis of data, testing of hypothesis, interpretation, drawing inferences, communication and dissemination of results and finally concludes by highlighting methodological flaws and gaps in Indian user studies.

Keywords: User studies; user research; research procedures; research methodology

1. INTRODUCTION

User studies are quite familiar to every one. Familiarity often leads to complacency and which in turn can cause retardation in further research. There is so much said about user studies that it becomes embarrassing to tell anything about the topic. An attempt is made here to present the significance and scope of user studies as well as the methods and techniques together with a step by step procedure for conducting sound user studies a simple and brief way.

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User studies, use studies, information-need studies, information transfer studies, communication behaviour studies, information dissemination and utilisation studies, user-research, etc., are all closely related and often not precisely defined. The terminology depends much on the approach and the angle from which one sees. There are several overlapping facets included in these studies. As such scope of user studies is enormous. User component will have bearing on almost all aspects of library and information system. For the purpose of this presentation let us assume that all such research inquiries about users (including non-user as well as potential users) with a view to understand their characteristic features, needs, preferences, practices opinions, attitudes, behaviour, evaluations, etc., with respect to library and information services that are offered or likely to be or need to be offered. The ultimate aim is to help designing, altering, evaluating and improving efficiency and effectiveness of library and information systems and their products/services in meeting their predetermined goals. It may be noted here that use (and non-use) as well as user (and non-user) are with respect to information as well as services, collection, and whole library/information system.

It is also necessary to note the limitations of use and user studies. Use studies may not reveal the spillover effects of use, indirect use of a library and many fruitful interactions of users with library. Further, use of a library and its utility to users are often quite different. A library may be used but it may not be useful; another may be useful but may not be used; a third may be neither useful nor used and ideal is one which is both used and useful.

For understanding the user, many approaches (or models) have been used as conceptual frame works. For example, constructivist model (Dervin) views information as something constructed by the user and says that individuals constantly strive to make sense of themselves and their environment

through continual adjustments. Another cognitive model (Belkin) emphasises the cognitive activity in individual user and explore the problem state and how information is sought and matched to solve the problem. Another model (Taylor) seeks to understand how specific environment including physical setting, nature of information and nature and characteristics of problems affect information seeking by users. Yet another (Kuhlthau) identifies stages of research where intervention on the part of information professionals can help users both identify and resolve their information needs.

2. NEED FOR USER STUDIES

'Use' is the key purpose and 'User' is the key and dynamic component of any library and information system. Customer oriented approach, design and evaluation are the founding pillars of any enterprise. As such use and user studies including non-use and non-user studies are required to be carried out as long as library and information systems are required and existing. Here, the use includes 'non-use' and user includes potential user, non-user, under-privileged, unserved, underserved and deprived users. A non-user could be an involuntary non-user who do not have a library to use or voluntary (willful) non-user. A voluntary non-user is one who has access to a library and lives in an information rich society and yet suffers from information malnutrition (Sridhar, 1994).

User studies are a must at the time of designing a system or service. The efficient and effective operation of a library system or service also calls for periodic user studies. The effectiveness of a library and information system depends on the extent to which the system characteristics correspond with the users and in how much the potential users are willing and able to make use of it. System designers, planners and managers of library and information systems have

to properly consider the role of human factors and their effect on acceptance and utilisation of information. Relating the system or product/service being designed to the perceived needs of those for whom it is intended as well as to guide the operation of the system by the knowledge about the user and to justify the existence of the system are essential. User studies can also stem from the efforts of evaluation of a system or service.

A systematic user study can also reveal some un-anticipated data about the dynamic component of user. It may also promote a new course of action hitherto not considered and hence helps efficient and effective operation of the library and information system. Further, as no system has the luxury of unlimited resources and funds, user studies are required to check whether intended goals are served by the system, if not, to alter the priorities and programmes so as to ensure judicious allocation of limited resources. User studies are also required not only to determine and confirm the general patterns of use of libraries but also to identify departures from the norms (in specific cases), even if it is only in small areas. User studies help improve public relations of a library with its users and explain what librarians have found out by more indirect means. User studies, like market research, provide effective ground for marketing service products of libraries. In nutshell, user studies is an area of continuous librarian-education about users than user-education about library and understanding users is a must.

3. WHAT TO UNDERSTAND ABOUT USERS

Though existing records, MIS and other indirect data can provide knowledge about use and users of a library, for many of above tasks direct contact with users is necessary. By observing or questioning users, a systematic user study helps to discover (i) characteristics, (ii) information requirements (needs), (iii) behaviour, attitudes, opinions,

priorities, preferences, and evaluations of users.

3.1 Characteristics of Users

No user-community of an information system is fully homogeneous. Though a majority of the users of a system would come together for a particular purpose and are comparable by one or two criteria, they are divided among themselves by many individual characteristics. As noted earlier, the knowledge of the population being served by an information system is an essential requirement for providing useful services. Just like understanding the user is half the battle in providing information-services, knowing the structure and composition of the user-community in terms of various characteristics by which they can be compared and contrasted is half the task in understanding the users.

The characteristics of users are innumerable and there are several ways of grouping them. Apart from identifying many characteristics of users as recipients of information the institutional environment and work activity (job) have major impact on information users. The three clusters of factors which affect user's utilisation of information are psychological factors, effectiveness of available services and characteristics of the user and his environment.

User-studies look for similarities and differences among the users in terms of their backgrounds like status, age, experience, education, specialisation, field of research, discipline, etc. When the analysis is at the organisation level (as against individual level) they look for differences in nature of organisations, and at the same time users were also grouped as theoreticians or fundamental research workers, experimentalists or applied research workers, technologists, technicians, practitioners, etc.

Most of the studies have adopted the individual as the unit

of analysis. However, occasionally analyses have been carried out at group, unit or organisation levels treating the organisation as a composite entity and drawing typical representatives. At this level, variations within the organisation are ignored and the nature, type and size of the organisation become variables.

In user studies with the individual as the unit of analysis, it is possible, and easy, to list many characteristics of individuals. Unless the relevance and the context of a user-characteristic are clearly established, it is likely that the results will be conflicting. "To attempt to isolate each environmental element seems hopeless, but awareness of the variety of environments may lead to potentially useful hypotheses" (Krikelas, 1983, p11). The number of systems to which each user belongs and the variety of roles he has to play are important in understanding the information-transfer process.

User-characteristics could be internal or external to the individual. They may also be classified as sociological, demographic, psychological, personality (work-related), organisational, professional, etc. Some specific characteristics of interest in user studies are age, experience, gender, educational level, performance, productivity, creativity, motivation, emotional stability, temperaments, interests, personal idiosyncrasies, productivity, communication, citation and other activities, nature of work or function, various roles, responsibilities, and status of users have also to be understood in user studies.

3.2 User Requirements

The deliberate use the term 'requirements' rather than the 'needs', 'wants' and 'demands' is because it represents all the three concepts. The information-requirements refer to a

lookout for a sort of relevance of information to a given user and to his areas of concern and interest, and likes. In the process it is to know the amount of irrelevant information he is prepared to tolerate. Relevance is not a simple property inherent in information, but varies with content, format, context, the variety of uses of information as well as user himself. "The selection and reception of the information will depend upon the individual's conception of his own needs; one man's information is another man's noise ..." (McGarry, 1975, p58).

It is extremely complex, varied and difficult-to-measure nature of information-need. While discussing the issue of information-needs, a natural assumption is to consider the needs as perceived by the users. But some are of the view that there is a need to create information-needs among users if they do not exist and that information-seekers may be ignorant of the information that would be useful to them.

Information-needs are affected by many factors. Range and knowledge of information-sources/facilities available, varieties of uses to which information will be put, the background, motivation, professional orientation, discipline, type and area of work and other individual-characteristics of the user, the social, political and economic system as well as the consequences of information-use. Due to this contingency nature, generalised one-time conclusions about information-needs of users is impracticable. Of all the factors influencing or determining the user-needs, two factors which may not always be congruent, are the corporate objectives of the organisation where the user is employed, and the needs of the individual user.

Studies relating to 'information-needs' categorise needs as 'perceived needs' and 'actual or idealised needs', 'immediate needs' and 'deferred needs', 'continuous needs' and 'discrete needs', 'regular' and 'irregular needs'. Further, information

needs could be unexpressed or expressed/ articulated, felt or unfelt, dormant or deliquescent. In addition, information-needs of users can be expressed in terms of time (i.e., urgency), content and amount or quantity of information. Accordingly, information-needs have been classified as needs for single facts or exhaustive information, up-to-date, historical or current information, technical or business information. However, information-needs are frequently determined in terms of kind of message i.e., nature and type of information, the types of document embodiments of information needed and the purpose of use. Very few studies have investigated and focused on the need for substance or nature of material in terms of characteristics of texts.

Some of the significant classifications, based on the nature and type of information sought by users, are personal, technical and task-related information, current, specific and exhaustive information, theoretical information, experimental results, data, methods and procedure information, educational information, methodical or how-to-do-it information and task-related information. In addition it is also possible to determine the amount or level of information required in core versus peripheral areas of interest of users as well as the non-technical information required, information requirements in new fields versus old fields. The profession and organisation-oriented, work-related information-needs are the main information-needs with which user studies are concerned apart from day-to-day personal needs, life-long learning or educational needs, and needs about the governing rules of the society around user.

3.3 Behaviour, Attitude, Priorities, Preferences, Opinions and Evaluations of Users

Behaviour is a broad concept. It involves attitudes and character traits of individuals as well as environmental determinants. Behaviour is considered to be a compromise and

a result of multiple forces to which individuals are subjected to. Attitude itself is a latent state of readiness to respond in particular ways. They are normally dormant most of the time but they represent what we are prepared to do. In other words, attitude is a tendency to act or react in a certain manner when confronted with certain stimuli. Attitudes are expressed in speech or behaviour when object is perceived. Like other components of behaviour, attitude is an abstraction and hence it is difficult to directly measure attitude. One has to infer attitude from overt behaviour. Attitudes are often related to feelings and emotions.

An individual's enduring persistent response pattern across a variety of situations is called personality. it comprises of relatively stable patterns of action, i.e., traits, dispositional tendencies, motivations, attitudes and beliefs, which are combined into an integrated self structure. 'Trait' is used to classify and describe certain persistent and fundamental human characteristics, both learned and original. In the increasingly enduring and deepening order we find beliefs followed by attitudes, values and personality in individuals.

There are many ways of looking at user behaviour in libraries and in relation to seeking, gathering, using and communicating information. For example, one may attempt to study motives and purposes of seeking information, nature and type of information required, ways and means of acquiring information, sources of bibliographic (reference) information used, delegation of information-gathering work, time spent on information-gathering activities, dependence on sources of information, tolerable delay in supplying information, satisfaction about existing sources of information, informal communication network and the communication behaviour, inter-personal information sharing, use of library and user interactions with the library, etc.

4. RESEARCH PROCEDURE FOR CONDUCTING USER STUDIES

The unhappy relationship between research and practice in librarianship has often been aired by many experts as they are not mutually nourishing each other. Same is the case with relationship between research in librarianship and other related fields of inquiry. The need for looking at research, practice and education for librarianship as an integrated learning system has to be emphasised for development of librarianship as an academic discipline and achievement of excellence in professional practice. "Unless appropriate and sufficient research is conducted, the library community will not be able to transform itself but will be absorbed by other groups that will take over the information function in society" (Maguire, 1986, p 3).

Having seen the importance and vast scope of user studies as well as the need for integrated approach to research in librarianship, let us see the scope of methods and techniques of user studies. Sound methods and techniques used in research serve as a barometer to measure the quality of research in that field. Tested methodology is very much required for research to enable researcher to objectively navigate through his research, to put him back in the right track in case he deviates from the path and to help him to achieve the objectives of his research without wasting his efforts.

User studies are basically concerned with people, their attitude, priorities, preferences and behaviours. Hence the methods and techniques used by social researchers particularly behaviour scientists and psychologists are quite relevant for user studies. It is neither feasible nor desirable to discuss in this presentation, the entire research methodology required for user studies. Some methods and techniques of research predominantly used or required to be used for sound user studies will be highlighted with

certain limitations and problems, if any. Lastly, the terms 'method' and 'technique' are often almost interchangeably used. Methods and techniques are those used in performing research operations. While 'technique' refers to behaviour and instruments used in research operations, 'method' refers to behaviour and instruments used in selecting and constructing technique (ie. methods are more general). On the other hand, research methodology is a science of studying how research is done scientifically. In other words, research methodology is a way to systematically solve the research problem by logically adopting various steps. Interestingly, research itself is a search for new knowledge through objective, systematic and scientific method of finding solution to a problem.

Following are the main steps for conducting user studies:

- (i) Selection and formulation of research problem and working hypothesis
- (ii) Literature survey
- (iii) Overall design or planning the strategy of the study
- (iv) Sampling and sampling strategy or plan
- (v) Data collection
- (vi) Measurement and scaling techniques
- (vii) Pilot study
- (viii) Processing and analysis of data
- (ix) Testing of hypotheses
- (x) Interpretation, generalisation and realisation of objectives
- (xi) Preparation, writing, presentation and dissemination of research results

The above steps are not exhaustive, nor mutually exclusive but represent a series of closely related, continuously overlapping and interdependent nonlinear actions.

Before discussing the process of user research as a step-by

step procedure, it may be desirable to briefly note the assumptions and qualities of good research. Good research relies on empirical evidence, utilises relevant concepts, presupposes ethical neutrality, is committed to only objective considerations, makes widely known the methodology for critical scrutiny and testing through replication, aims at probabilistic predictions as well as formulating most general axioms or scientific theories and most importantly encourages rigorous, impersonal mode of procedure dictated by the demands of logic and objective procedure. In other words, good research is systematic, logical, empirical and replicable. The scientific method employed ensures clearly defined purpose, explicit procedure which can be continued, open design leading to objective results, frankness (even reports flaws) adequate analysis of data with appropriate methods, validity and reliability of data conclusion confined to those justified by data and confidence, reputation, experience, honesty and integrity of researcher.

4.1 Selection and Formulation of Research Problem and Working Hypothesis

It is very important to note that research problem should not be borrowed. Every researcher has to find his own problem. Experts, guide, experience and literature (to know gaps) are only aids for selection and formulation of a research problem. One should try to ask right question in an unbiased, unattached and objective way without 'mother complex'. It is necessary to be uncommitted and have more than one problem to ponder and interact before final selection and settlement.

Avoid superficial, obvious, overdone and controversial subject as well as too narrow or too vague problems. The problem should not only suit researchers interest, competence and ability but also be novel, significant and useful to practitioners. Utility of expected findings be given adequate

importance. Lastly, it is better to carryout a preliminary or feasibility study to check availability of required data and cooperation of people.

Having selected the problem it is necessary to formulate the research problem and develop working hypothesis, if necessary and possible. The steps involved in this process are :

- (i) Stating problem in a general way
- (ii) Understanding the nature of the problem
- (iii) Survey of available literature and past studies
- (iv) Developing ideas through discussion (experience survey)
- (v) Rephrasing the problem with clear objective and/or hypothesis, title, terms and concepts, assumptions and postulates, significance and value of the study, suitability of the problem in terms of ability, time, money, data, etc., scope and limitations in terms of time and space coordinates, unit of analysis and environmental conditions.

4.2. Literature Survey

Literature survey is not a stage in the process of research but starts at the time of selection of a problem and ends, probably, after publishing and dissemination of results of research. As a continuous activity literature survey should ensure avoiding duplication of research, integration of new findings to the literature/knowledge of the discipline, prioritising research activities and incremental growth of theories.

4.3 Planning the Strategy or Overall Design of the Study

Research design is a tentative outline of proposed research work. If research is a journey with definite points of departure and arrival, then the design of it must project and predict in between sequences of activities like target,

geography, resources, means, plan, synopsis, time schedule and final plan to share the experience with others.

Proper research design provides firm foundation and allows smooth and efficient sailing of project yielding maximum information and reliability of results, helps organising ones ideas, gives chance to foresee flaws and inadequacies, incorporates by learning from others critical comments and evaluations. Like a successful journey research broadens researcher's mind, gives fascinating and exciting experience, insight into work around, provides opportunity to meet people, gives fun and rewards, but often research is also tedious and monotonous.

Design is a decision making process. Research design, as strategy, has to be comprehensive, flexible, appropriate, efficient, and economical. It is easy to suggest a problem but difficult to make a good research design. Each research work is unique and demands unique research design and unique combination of data collection methods. A good research design is half the battle. The process involves a series of steps including identification and delimiting of variables. There will always be a trade off of resources, cost, time and reliability of results with fruits expected of the study. If the design is for an experimental study which is proof oriented and requires substantial resources in terms of efforts and costs the results are likely to be more decisive. On the other hand ,if the design is for an exploratory study which is often insight-oriented with flexibility and is relatively cheaper and smaller, it may not lead to any definite conclusions. In research design one has to choose appropriate combinations of methods and techniques based on objectives, implications of results, environmental factors, resources, kind of data required, etc. What goes on in the design is creating the conceptual structure and blue print for collection, measurement and analysis of data. In other words, decisions regarding what, where, when, how much, by

what means concerning research are made in the design.

Broadly, there are three types of research designs. They are: (i) formulatory and exploratory design (ii) descriptive and diagnostic design and (iii) experimental design or hypothesis testing. Discussion of these designs is outside the scope of this presentation. However, it is very important to note that librarianship in general and user studies in particular have rarely adopted experimental design which has several advantages over the other designs. In designing a user study one has to be doubly cautious about the relation between two variables as well as differences between cause and effect.

4.4 Sampling and Sampling Strategy or Plan

Sampling is one of the important steps in user studies which is often over looked by stating that some random or non-random sample design has been adopted. Development of proper sampling frame and a definite plan for obtaining a sample from the sampling frame based on random sample design (rather than nonrandom design) is necessary. A good sampling design should be economically viable, able to control systematic bias, lead to optimum size of sample but small sampling error, enable results be applied to the universe in general with a reasonable level of confidence (ie., reliability) and the resulting sample should be adequate, truly representative and similar to population.

In practice many researchers overlook the appropriate probability random design for choosing sample and determination of sample size. Non-probability sampling like convenience sampling and purposive sampling should not be thought of unless it is for a qualitative research. Right type of simple or complex random design has to be chosen for sampling. The sample size depends on nature of units, population and study, number of variables, groups and sub-groups to be studied, intended depth of analysis, precision

and reliability of results required, level of expected non-response, size of questionnaire and population and available resources. It should be noted that the size of sample is more important than the proportion of the population represented by sample. There are well established statistical techniques to determine the sample size.

4.5 Data Collection

There is a wide array of methods and techniques for data collection as far as user studies are concerned. Judicious selection of one or more methods (preferably a combination of methods) with trade off amongst factors like suitability to problem, available resources, competence of researcher, kind of data required to be produced and the level of precision required is necessary. It is often said that the common sense is the chief requisite and experience the chief teacher in deciding on data collection method.

Use existing (secondary) data already collected by some one else for general or different purpose with sufficient scrutiny about their reliability, suitability and adequacy. Often historical method, bibliometric studies, use studies, meta analysis, content analysis, etc. depend on secondary data. For primary data, which is more important and reliable than secondary data, one has to resort to standard methods like observation, interview, questionnaire, interview schedule, panel study, mechanical devices, projective techniques, sociometry, depth interview, etc. In such cases researcher collects original (primary) data afresh by either experimenting, examining and observing the subjects and records or by asking or questioning orally or in writing the concerned people like subjects (users), experts and others who know subjects.

While asking people, problems may emanate either from those who answer (respondents) because of awareness, irrationally,

inadmissibility, self incrimination and politeness or from those asking because of very presence and disclosure of identity and background of research and/or respondents or from the ways of asking/questioning people like the language and tone of questions, length of questionnaire, time required to answer the question, ambiguities, embarrassing question, illogical sequence, leading questions, loaded word or phrase, inbuilt coercion, unspoken assumptions, etc. In addition, non-response, disinterestedness, carelessness, prejudices, prestige bias, ignorance, misunderstanding, halo effect and response sets on the part of respondents are other problems to be taken care in questioning people. There are many practical hints like coding, provision for neither agree nor disagree type of responses, avoiding double negatives, hypothetical and double (complex) questions, etc.

There are other more appropriate methods of data collection for user studies like panel studies including diaries, report of summary of activities, solution development records, Projective techniques (including word projection tests, pictorial and play techniques), snowball techniques, network analysis and use of mechanical devices like eye cameras, audio meters, random alarm mechanism, etc. which are almost never used in library research in India. Methods like critical incidence technique, longitudinal design, etc. are more like normative principles which are very useful in data collection by any of the above methods.

Lastly, case studies and evaluative studies are two important ways of carrying out user studies, discussion about them is beyond the scope of this presentation.

4.6 Measurement and Scaling Techniques

Another important aspect often overlooked in library research in India is measurement and scaling of data collection instruments. Sound measurement must be precise, unambiguous,

free from errors, valid, reliable and practicable. As mentioned earlier errors may crop up from respondent, situation, measurer or instrument. To test the soundness of the measuring instrument, the validity of the tool (in terms of content validity, criterion-related validity and construct validity), reliability (in terms of stability and equivalence) and practicality (i.e., economy, convenience and interpretability) have to be examined. Appropriate scaling techniques have to be used in case of measuring attitude, behaviour and personality and other qualitative and abstract concepts. Scaling is a method which changes attributes (a series of qualitative facts) into variables (a quantitative series). In other words, scaling is a procedure for assignment of numbers or symbols to (ie. quantitative measures of) subjective abstract concepts (or property of objects). There are scaling techniques like rating scales and ranking scales, scale construction approach like consensus, item analysis, cumulative scale and factor analysis approaches and already developed scales like differential, summated, cumulative and factor scales which are rarely heard in librarianship.

4.7 Pilot Study

Like trial of a dress maker, it is desirable to tryout methods and techniques chosen for main data collection in a pilot study, which helps in estimating time required, detecting flaws, weaknesses and ambiguities, using pre-formulated questions and/or responses (instead of open end question), knowing in advance the kind of data likely to result, the kind of analysis required, expertise available for analysis, computer facility required, estimating the resources required and finally gaining access to and cooperation of respondents.

4.8 Processing and Analysis of Data

The processing and analysis of data collected is an important step in user studies. Often researchers either under process or over interpret the data. The processing and analysis of qualitative data differ substantially from that of quantitative data except where scaling techniques are used to convert qualitative data into quantitative data. Qualitative data involves subjectivity, feel and flavour of the situation and hence consumes more time and efforts for collection as well as processing. As it is not amenable for statistical manipulation, extrapolation of finding is difficult. Qualitative data calls for sensitive interpretation and creative presentation.

Levels of measurement (i.e., nominal, ordinal, interval and ratio) determine the kind of statistical technique to be used for processing data. The processing involves editing, coding, classification and tabulation of data in order to achieve data reduction and presentation. The analysis of data (both descriptive and inferential or statistical) involve exploratory analysis, computation of certain indexes or measures, searching for certain patterns of relationships and trends, estimating values of unknown parameters, testing of hypothesis for inferences, and graphical presentation.

Appropriate statistical techniques depending on number and type of variables have to be employed for processing and analysis. It is very important to understand the merits and limitations of various bivariate and multivariate measures as well as differences among measures of association, correlation, and cause and effect. Important techniques like chi-square test, coefficients of regression, multiple and partial correlations, index numbers, time series analysis, ANOVA, ANOCOVA, discriminate analysis, factor analysis and cluster analysis are largely untouched in Indian library research including user studies.

4.9 Testing of Hypothesis

As mentioned earlier, it is very unfortunate that research in librarianship has very rarely resorted to experimental design and testing of hypothesis. A hypothesis as a tentative hunch explains the situation under observation so as to design the study to prove or disprove it. What a researcher is looking for is a working or positive hypothesis. It is very difficult, laborious and time consuming to make adequate discriminations in the complex interplay of facts without hypothesis. It gives definite point and direction to the study, prevents blind search and indiscriminate gathering of data and helps to delimit the field of inquiry. Absence of a clear theoretical framework and lack of ability to logically utilise it and failure to be acquainted with the available research techniques are the main reasons for not resorting to formulation and testing of hypothesis. It is also equally important that the researcher should not start out to prove or disprove hypothesis nor try to defend his hypothesis.

A good and usable hypothesis should be precise, simple but not obvious, conceptually clear, have empirical referents, specific and limited in scope, consistent with most known facts, state relationship between variables and related to available techniques and body of theory. A statistical hypothesis is a predictive statement (usually put in the form of a null hypothesis and an alternate hypothesis) capable of being tested by scientific methods and that relates an independent variable to some dependent variables. What a researcher bets in advance of his experiment that the results will agree with his theory and cannot be accounted for by the chance variation involved in sampling is hypothesis testing. In other words, hypothesis testing is a procedure which enables researcher to decide whether to accept or reject hypothesis.

There are many concepts like Type-I and Type-II errors, one-

tailed and two-tailed tests, significance test, important parametric tests like Z-test, t-test, F-test and non-parametric tests like Kolmogorov-Smirnov one sample test, Runs test for randomness, sign tests, Fisher-Irwin test, Mc Nemer test, median tests, Chi-square test, Wilcoxin - Mann - Whitney U-test, Wilcoxin matched pair or signed rank test, Kruskal-Wallis or H test, Kendall's co-efficient of concordance etc. which are yet to be employed in library research. What is surprising is that user research is market research in librarianship but user research has not even adopted a fraction of methodology adopted in market research.

4.10 Interpretation, Drawing Inferences, Generalisation and Realisation of Objectives

Immediately followed by processing and analysis of data, interpreting the results and drawing inferences have to be carried out. In this crucial step, the complex task/theme is divided into sub-themes and arranged in a logical order. The activities involved are explaining summarised data through tables, charts and diagrams, identifying extreme cases and tendencies, drawing inferences with conditions, if any, enumerating qualitative and extraneous data in support of inferences and tendencies, comparing the results with theory and results of earlier studies, summarising and generalising the findings/results, realisation of objectives, discussion of implications of results and findings and suggesting topics for further research.

The purpose of interpretation is to draw inferences from data, expounding relationships and processes underlying the findings, searching for broader meaning of research findings, understanding and explaining what has been observed in the study, providing theoretical conceptions to serve as a guide for further research, for better appreciation of findings and make others to understand the real significance of findings, to understand the abstract principles that work beneath

finding, linking the results with that of others, arriving at generalisation after repeated testing of hypothesis, to take decisions based on implications of results, to predict concrete world of events and to maintain continuity of research.

Interpretation is an art and requires great skill and dexterity. It is necessary to make optimum use of data and techniques and avoid over, under, mis-, wrong/incorrect and out of the context interpretations. One should be impartial and have patience and proper perspective and look for relevance and generalisation and not false or broader generalisations. While interpreting research findings one has to take care of representativeness of data, nature of questions, type of responses, handling 'don't know' type of responses, ways of representing data (percentage, mean, standard deviation, chi-square and hypothesis test, correlation co-efficients, etc.) and elaboration of results. Proper care should be taken to avoid spurious explanations and study the deviant cases thoroughly before interpretation.

4.11 Preparation, Writing, Presentation and Dissemination of Research Results

Communication is utmost important in research and naturally in user studies. Research as a means to an end/ change depends substantially on effective communication. Communication both within methods, tools and techniques like questionnaires as well as two way communication both with participants/respondents and those who sponsor the research have to be clear. Communication should take place throughout the research work. Excellent research is wasteful if not communicated appropriately. Communication is, like sharing the experience of journey, an obligation of research to those who participated, cooperated and interested in it. Dissemination of research results ensures integrating it with the existing body of knowledge and avoiding duplication of

work, others to learn from one's mistakes, anybody to replicate the study, bring in improvements to methodology and clears doubts and suspicion, if any, in the minds of people.

Communication of research has to be necessarily written and widely published in addition to oral presentation, if possible. As far as substance of the report is concerned adhering to the objectives, knowing the audience, starting with sentence outline rather than topical outline, use of right language and time as well as uniform style and making it short and attractive in appearance are very important. As far as formats and aids of writing research report are concerned, use of headings, sub-heading, quotations, footnotes, exhibits, etc., as well as standard procedure regarding preliminaries, main text and end parts of the report are explained in many written sources. Care should also be taken regarding uniformity in presenting appendices, bibliography, glossary, index as well as typing instructions and proof reading of the text.

5. CONCLUSION

Even though there is a subtle dichotomy in the use of methods and purposes of user studies, most of the user studies are imitative than imaginative, exploratory rather than experimental and descriptive rather than decisive. Majority of them have adopted survey and case study methods rather than controlled or quasi-controlled experimental methods (with questionnaire technique rather than observation technique for pseudo-objective and quantitative research rather than objective and qualitative research with the dubious purpose of generalisation of findings beyond the population concerned. They often dealt with more of 'what' than 'why'. In other words, the basic research aspect of why the user behaves as does is rarely attempted. As a result the numbers and opinions have become predominant in user studies. Unfortunately what majority users say has become

the ultimate truth forgetting the fact that what a user say is not always what he needs or does.

Asking people (through questionnaire, interview, discussion or diaries), observing users and their activities, content analysis (of records), semi-controlled experiments on subjects and a host of indirect methods could be employed more fruitfully in understanding users. While choosing appropriate methods, choice has to be made between qualitative and quantitative approach, survey / case study and experimental method, cross sectional design and longitudinal experimental design, depending on problem, available resources, competence of the staff and the kind of data desired. In the process of collecting data, number of problems like non-response, disinterestedness and carelessness, bias, prejudices, ignorance, misunderstanding, 'hallo effect' and response sets of respondents have to be faced and suitably resolved.

The general picture of the findings like 'average user of an average library' is less useful to practical situations. Use of holistic qualitative methods are badly needed in this area of research. Over concentration on how users obtain information rather than what they want, why they want it and what they do with it as well as on formal communications (documents) than informal (interpersonal) communications are increasingly making the results more useful to sociologists of science than information professionals.

In the same instance, user studies have totally ignored the study of non-users as they either keep themselves away and mum or pretend and say as users. It is extremely difficult to conduct a non-user study and hence the number of non-user studies are too few compared to large number of user studies reported. There are no systematic attempts to study non-users, under-privileged, un-served, under-served and deprived users and their problems of information malnutrition. Non-

user studies require costly and refined methods and techniques (Sridhar, 1994). The ratio of actual users to potential users of a library by itself is a rough measure of the impact of the library and its market penetration capability. At the same time we need to be cautious about limitations of user studies and note that often use of a library by its users and its utility to its users are quite different.

There are many methods and techniques of social research particularly those used in psychology and sociology which need to be tried for user studies. For example, the projective techniques and multiple complimentary methods of data collection (triangulation techniques) would be more appropriate to user studies than traditional questionnaires.

Irrespective of excellent methods and techniques adopted, the findings of most of the user studies (and even so in respect of findings of many social research) are often subjected to cynicism and criticism if they are of extreme in nature ie. either too simple, common, obvious and expected or totally unbelievable / unexpected. To support such findings, one has to have foolproof research design, hard and reliable data with systematic and accurate analysis and interpretation. Further, user studies demand a mixture of common sense and technical expertise.

REFERENCES

Bawden, David. User-oriented evaluation and information systems. England: Gower, 1990.

Boyd, Harper W. Jr. et.al. Marketing Research: text and cases 6 ed. Delhi: All India Traveler Bookseller, 1985.

Goode, William J and Hatt Paul .K. Method in social research. London : Mc Graw Hill, 1981.

Gopal M.H. An introduction to research procedures in social science. Bombay: Asia Publishing House, 1970

Koosis, Donald J. Business statistics. New York: John

Wiley 1972.

Koosis, Donald .J. Business statistics, New York: John Wiley, 1972

Kothari C.R. Research methodology: methods and techniques: 2nd ed. New Delhi: Vishwaprakashan, 1990.

Krikelas, James. "Information-seeking behaviour : patterns and concepts." Drexel Library Quarterly 19(2) Spring 1983: 5-20.

Line, Maurice B. Library surveys: an introduction to the use planning procedure and presentation of surveys. 2nd ed. London: Clive Bingley, 1992.

Maguire, Carmel, "What qualifies as research in librarianship". In: Allen, G.G. and Exon, F.C.A. edition: Research and the practice of librarianship an international symposium. Perth: The Library, Western Australian Institute of Technology, 1986, P.1-10

McGarry, Kevin. "Communication, Knowledge and the Librarian" London : Clive Bingley, 1975.

Morris, Ruth C.T. "Toward a user-centered information service". Journal of the American Society for Information Science, 45(1) 1994:20-30.

Rodger, Leslie W. Statistics for marketing. London: Mc Graw Hill, 1984.

Simpson I.S. How to interpret statistical data: A guide for librarians and information scientists. London: Library Association, 1990.

Slater. Margaret ed. Research method in library and information studies. London: Library Association 1990.

Spiegel, Murray.R. Schaums outline of theory and problems of statistics in SI units. Singapore: Mc Graw Hill, 1981.

Sridhar, M. S. "A study of library visits and in-house use of library documents by Indian space technologists." Journal of Library and Information Science 7 (2) December 1982: 146-158.

----- . "User participation in collection building in a special library : a case study." IASLIC Bulletin 28 (3) September 1983: 117-122.

----- . "Document reservation pattern in a special library : a case study." Library Science with a slant to Documentation 20 (1) March 1983: 39-48.

- . "Are demand forecasting techniques applicable to libraries?" Library Herald 23 (2 & 3) July-October 1984: 84-89.
- . "Use of technical reports and standards." IASLIC Bulletin 29 (3) September 1984: 99-106.
- . "A case study of lent out use of a special library." Library Science with a slant to Documentation 22 (1) March 1985: 19-34.
- . "A study of co-authorship and collaborative research among Indian space technologists." R&D Management 15 (3) July 1985: 243-249.
- . "Citing patterns of Indian space technologists." International Library Review 17 (3) July 1985: 259-274.
- . "Book procurement delay : a demotivator to user participation in collection development". In : Building Library Collections and National Policy for Library and Information Services : Seminar Papers presented in XXX All India Library Conference, Rajasthan University, Jaipur, 28-31 January 1985. ed. by P.B.Mangala. Delhi: ILA, 1985. 329-334.
- . "Subject and longitudinal use of books by Indian space technologists." Collection Management 8 (1) Spring 1986: 101-115.
- . "Use of current journals by Indian space technologists." The Serials Librarian 10 (3) Spring 1986: 77-93.
- . "Pattern of card catalogue consultation in a special library." IASLIC Bulletin 31 (1) March 1986: 9-16.
- . "Information and communication behaviour of women space technologists." R&D Management 17 (4) October 1987: 301-309.
- . A Study of Information Seeking Behaviour of Space Technologists with emphasis on correlating User-characteristics with such behaviour. PhD Thesis. Mysore: University of Mysore, 1987.
- . "Is cost benefit analysis applicable to journal-use in a special library." The Serials Librarian 15 (1/2) 1988 : 137-153.
- . "Sociometric analysis of informal communication among Indian satellite technologists." Library Science with a slant to Documentation and Information Studies 25 (2) June 1988 : 78-111.
- . "Customer-characteristics as criteria for

market-segmentation in libraries". In: Marketing of library and information services in India : Papers presented at the 13th National Seminar of IASLIC, Calcutta, December 20 - 23 , 1988, ed. by S.K.Kapoor and Amitabh Chatterjee. IASLIC Special Publication No. 28. Calcutta : IASLIC, 1988, p43-52.

----- . "Library-use index and library-interaction index as measures of effectiveness of a special library: a case study." In : Proceedings of XXXIV All India Library Conference on Library and Information Services : Assessment and Effectiveness. Calcutta : ILA, 1988 : 449-465.

----- . "Information-seeking behaviour of the Indian space technologists." Library Science with a slant to Documentation and Information Studies 26(2)June 1989:127-165.

----- . "Patterns of user-visit, movement and length of stay in a special library:a case study." Annals of Library Science and Documentation 36(4)1989:134-138.

----- . "Studies on use of library collections by scientists, engineers and technicians" AGLIS Journal 7(4)Dec 1989:9-17.

----- . "A study of correlation of use, citation and publishing of journal papers by Indian space technologists". Collection Management 12 (112) 1990 : 147-152.

----- . "User-research: A Review of Information-behaviour Studies in Science and Tecnology". Bangalore: BIBLIO INFON Service, 1990.

----- . "Information requirements of the Indian space technologists." Library Herald 29(3-4) October 1990-January 1991: 125-136.

----- . "Review of Indian user studies in science and technology". In: Sharma, CD and Ojha, DC eds. Advances in Library and information science v.3. Information systems: science and technology, Jodhpur: Scientific Publishers, 1992. Chapter 3, p31-55.

----- . "Non-users and non-use of libraries". Library Science with a slant to Documentation and Information Studies, 31 (3) September 1994, 115-128.

----- . "Information behaviour of scientists and engineers" . New Delhi: Concept Publishing Company, In press.

Stone, Sue and Harris, Colin. Crus guide. 1. Designing a user study: general research design. Sheffield: British Library Board, 1984.

Young, Pauline V. Scientific social surveys and research. New

Delhi: Prentice-Hall of India Ltd, 1984.

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