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ABSTRACT

The purpose of the investigation is to identify an operationally viable research methodology for assessing the value derived from selected library services at Cranfield Institute (England) and to evaluate and comment on the costs of providing such value. Four population groups are critical in the development of the expected value of library services. These are the library policy makers, the library staff, the faculty, and the students. Field studies were carried out for students in management and mechanical engineering. The four populations were investigated by means of interviews and attitude surveys. Proposals for the continuation of this research are made. (WH)

Research in Marketing & Logistics

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Working Discussion Document 74/6-1

A LONGITUDINAL STUDY OF THE COSTS AND BENEFITS OF SELECTED LIBRARY SERVICES: Initial Exploration and Framework

Prepared by:

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5 July 1974

PREFACE

This Working Discussion Document (74/6-1) has been prepared for circulation to members of the British Library, Research and Development Department's Advisory Group on Library Management. It is for discussion at their Cranfield meeting on 24 July 1974.

We outline the research framework which has emerged in the first seven months, together with a description of the exploration undertaken by the British Library Senior Research Fellow, Miss Christine Oldman. The Principal Investigator for the study (reference S1/G/016) is Professor Gordon Wills. Professor Edwin Olson of the School of Library and Information Services at the University of Maryland, who is Visiting Professor at Cranfield during the 1973/74 session, has been consultant to the project. In addition, the advice of faculty members at Cranfield has been sought, most notably that of Mr Cyril Cleverdon, Dr Martin Christopher and Mrs Mary Tuck.

1. THE PURPOSE OF THE RESEARCH STUDY

The purpose of the investigation is to identify an operationally viable research methodology for assessing the value derived from selected library services at Cranfield Institute, and to evaluate and comment upon the costs of providing such value.

We are *not* concerned to adopt a measure of utilization as a surrogate for the value received. Rather we are specifically concerned with the obvious fact that different people may derive different value or benefit from the same information set, or that the same person may derive different value at different times. We are concerned, therefore, to explore and measure how the value afforded by a library service is judged by its recipients.

If this problem can be attacked with some degree of success, we believe we will be in a position to evaluate and comment upon the costs involved in provision of benefits and discern some guidelines for improved managerial effectiveness.

We are aware that the traditional direction of library management research in this area is to treat measures of utilization as measures of value achieved; for example: seat occupancy, book and journal service levels. Such work has contributed substantially to library management. We have no wish to deprecate it.

Our purpose, however, is different. We wish to seek ways of answering such questions as:

> *How much good does facilitated access to an information set do for a user in his own and/or his peers and/or his superior's estimation?*
>
> *How much harm does non-access or delayed access do to a user in his own and/or his peers and/or his superior's estimation?*

The specific situation in which our investigation is being conducted is two academic departments at Cranfield, viz: the School of Mechanical Engineering and the School of Management.

2. THE EMERGING RESEARCH FRAMEWORK

We have initially attempted to develop a total model of the process of deriving value from a library system. We have then run forward to an examination of the meaning in managerial terms both for (a) control of a fixed budget to gain a maximum value effect, and (b) the evaluation of the library value effect in comparison with other competing uses for the total institutional resources from which the library's budget is derived.

2.1 The Concept of Derived Value

It is our proposition in this investigation that the value derived from a library service is a matter of subjecti' assessment by an individual. A further postulate is that this subjective assessment will be a measure of the difference between what was expected of the library facility and what was perceived as *actually* happening. This is expressed simply in the equation:

$$DV = \frac{1 - (Exp - Per\ Act)}{Exp}$$

where DV = Derived Value
Exp = Expectation
Per Act = Perceived Actualisation

Whilst this formula may well serve for an individual contact with the library facility, the dynamic effect of repeated contact must also be examined. It is here that many of the most fascinating managerial implications begin to emerge. Frequent contact with the facility may either strengthen or reduce expectations, or may influence the perception of actuality. From a research point of view, however, it will be readily apparent that we must focus most closely on the derivation and dynamics of the individual's expectations as well as the actualisation of the library service offered, its utilization levels and the perceptions individuals have thereof.

2.2 The Nature and Dynamics of User Expectations

We have identified four principal groups of actors in the library system of a university or collegiate institution, who appear to play key and often interactive roles in the evolution of user expectations. These actors have been termed:

(a) *The legislators, e.g. Council, Senate, the Library Committee*

They set the budget relative to other competing uses within the total institutional framework; they determine building priorities and locations, staffing conditions of service, etc. As such they can condition in many significant ways the status and potential impact of a library service in the academic institution.

(b) *The librarians*

They interact with the legislators, and they *execute* the "legislation". Through their professional skills, training, background experience and personality characteristics, they play a significant role in influencing what is expected of the library service.

(c) *The academic staff (teaching and research)*

They will possess expectations of libraries. These expectations may affect the expectations of their students. The staff's expectations may be a derivative of their own personal academic interests and the methods they adopt as educators. They may accumulate personal libraries, or they may use the central facility. Of equal or perhaps greater importance for the formation of expectations, what view do teachers take of the education they provide for their students? Is it highly structured or open ended? The open ended search for information implicit in a Ph.D. programme of work requires a very different library facility to a Master of Business Administration Core Course in Economics.

(d) *The students*

They are perhaps the most considerable users of the library facility, but if they are pursuing a structured course their approach is dictated to some extent by their tutors and to a lesser extent by the librarians. Yet they are the major group of new entrants to the library system. They continually look afresh at it and have a far more crucial time-constrained relationship with it than most of the other actors. Their expectations, therefore, are of vital interest. They are the key groups with which our particular investigation will be undertaking fieldwork in Years 2 and 3.

It is submitted that expectations are likely to be dynamic over any period of observation and use of a system in the service of an educational programme. A student, a staff member or librarian, may well begin a ten-week programme expecting 'x' of the library, but as the course evolves, views will change. Teaching courses in particular are increasingly adaptive to the participants nowhere more so than in management education, on which we are focussing inter alia.

Accordingly, our measurement of the expectational side of our equation must be undertaken with their dynamic nature in mind. We must attempt to measure expectations in relation to each occasion of contact with the library system, as well as measuring expectations on a macro basis before and after a full course experience.

2.3 Perceived Actualisation

Perceived actualisation is what we have termed the consumption and post consumption stages in the information process. It embraces the full range of library facilities which confront the user, no matter of what actor group he is a member.

A particular library service may include literature searches on demand, computerised information retrieval, multiple copies of standard texts (offering a 90% service level), a photocopying service at 24 hours' notice for 20,000 periodicals.... If, however, on entering the library at lunchtime, a user is confronted by a "stock out" of request forms, or a long queue at the issue desk, or no tables to sit at, or a fracas between two other users and a librarian, the perception of actualisation capacity will be dented. Technically a library system is capable of providing an actualisation level against expectations, but in perceptual terms the system may fail. Some of the potential value which could have been derived may not be derived.

Hence, in the measurement of actualisation of expectations, we are concerned with whether the user deems his expectations to have been actualised rather than whether the library professionals know they could have been. The measure of loss of perceived actualisation from the theoretically technical capacity is, of course, a significant management ratio for library facilities.

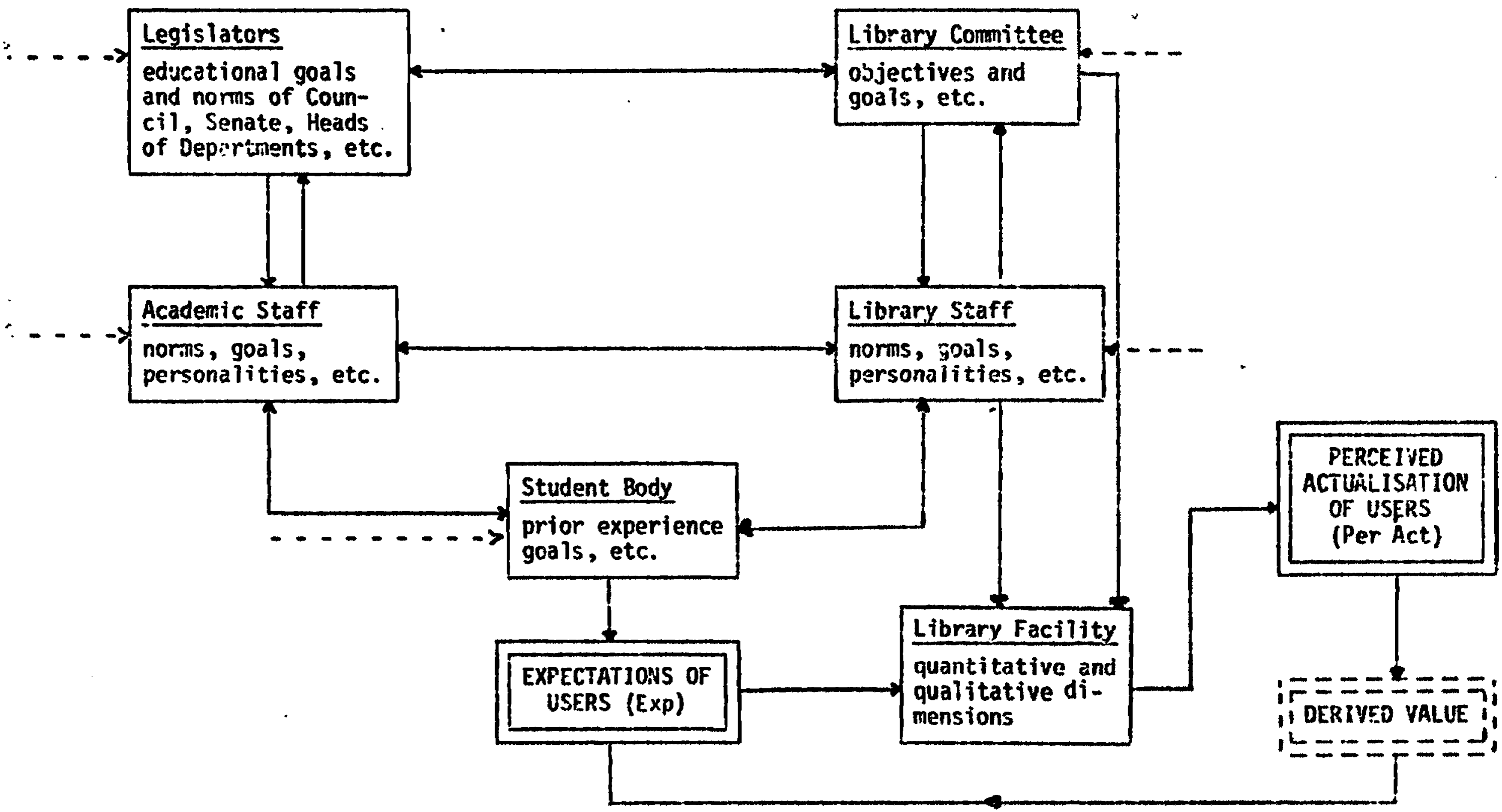
Finally, the phenomenon of "cognitive dissonance" must be included. One manifestation of this pattern of behaviour is that an imposed situation is accepted as satisfactory, even preferable to that which was originally desired. A library service may well not find all the references on a topic for an engineer, but he could well remark, "I've got enough; if I have anymore I shan't be able to cope". A little later he may describe his literature search as "selective" to a colleague, and later still as "having included all the important contributions in the field".

2.4 A Model of the Derivation of Value Process

Our concept of derived value and the expansion we have offered in Section 2.2 and 2.3 on its two main determinants, places our investigation in a general educational context. An exploration of the library system/educational system interface, we believe to be a valid approach.

Although we have discussed the roles of different actor groups, we are of course concerned in our investigation to study the process of the derivation of value from a library service of those who seek information from whichever actor group they come. Each person can play several educational roles, for example: member of Senate, academic staff, research worker, designer of courses. A person can be both information seeker and information giver. However, our specific empirical investigation is to be focussed upon three student groups, viz: M.Sc. students of Mechanical Engineering, MBA students in Management, and a group of Ph.D. candidates. Diagram I shows the relationship of the variables which are the components of the process of value being derived by the student body.

DIAGRAM I: The Derivation of Value from a Library System by a Student



3. THE EMPIRICAL EXPLORATION TO DATE

Our empirical exploration within the framework of our research design has been concerned thus far with a series of fieldwork studies.

3.1 The Population for Study

The first stage of the project is being carried out at one academic institution, Cranfield Institute of Technology, which is perhaps an atypical academic environment. It is a post aduate university with a somewhat distinctive relationship with t.e outside world. Its charter requires that its activities should be orientated towards the practical problems of both the private and public sectors of economic life. A decision was made to conduct the exploratory fieldwork in two departments, viz: the School of Management and the School of Mechanical Engineering. The two structural variables that might "cause" different absolute levels of derived valuation of a library are the nature of the discipline and the organisation of the course. The School of Management offers a one-year taught course - Master of Administration. In addition there are a number of students studying for Ph.D.s. The School of Mechanical Engineering offers a one-year M.Sc. degree. It has both taught and thesis elements. The Management School has its own sub-library.

There is no reason why fieldwork should be limited to just one institution, or to the two selected courses in Years 2 and 3. For convenience at the exploratory phase, however, we have decided to work close at hand. An original plan to conduct the project jointly with the University of Bradford Library has, however, fallen through. It is felt if a second institution is to be involved, it should be convenient geographically.

3.2 A User Orientation

Some discussion is necessary to explain the spirit in which the fieldwork was conducted. The discipline of marketing adopts and adapts from the social sciences that which will help us to understand, predict and perhaps control consumer behaviour. There does exist the potential for a marketing approach to libraries. Libraries are now increasingly user-orientated. This project has attempted to examine carefully the literature of consumer research, to see if its findings are appropriate to the study of the information consumer.

Market research has a valuable contribution to make to information research. Marketing researchers have studied the social psychologists' attempts to understand the relationship between attitudes and behaviour. It seems important, therefore, that the library manager should come to understand the relationship between a user's perceptions and expectations and his actual behaviour and the feedback process which impinges on such perceptions and expectations.

We have employed the insights of one particular theory of attitude, that of social psychologist Martin Fishbein of Illinois University (1). Fishbein's theory has been applied to various commercial situations where the object has been to identify and measure rigorously the dimensions by which actual and potential consumers value tangible, relatively homogeneous products. Fishbein's is a powerful construct for understanding the attitude-behaviour relationship. At the risk of oversimplification, the main elements of the theory are:

(a) Respondents, for sheer information handling reasons, can only hold a limited number of beliefs about an object at any one time. These are top-of-the-head beliefs.

(b) Beliefs are the components of an attitude. The researcher must measure the extent to which the respondent is certain or uncertain about a belief, e.g. "the library does not buy multi-copies of individual titles". The researcher must also measure the extent to which the respondent thinks the statement is a good or bad thing - the evaluative measure.

(c) The link between attitude and behaviour is better monitored if one elicits beliefs towards *using* the object, i.e. behavioural intention. In our context we would elicit beliefs about *using* the library rather than beliefs about the library.

(d) Behaviour does not depend on attitude only but also on norms - what the respondent believes others think he should do, e.g. "using the library is something my tutor expects me to do".

Fishbein's approach is especially valuable when we seek the dimensions of value which form the basic of statements in structured questionnaires. One alternative is that the researcher himself produces them as part of his desk research. We have favoured eliciting the statements from the user groups in a free response situation. In this way we perhaps avoid the pre-conceptions of the researcher clouding the findings.

We can illustrate how perceived actualisation differs from actual technicality, as follows:

User: *"The library has a computer for telling you everything that has been published in engineering".*

Librarian: *"The library has an on-line retrieval system that searches a data base of one year in the discipline of computer science".*

Respondents' perceptions will affect their library behaviour to a greater or lesser extent. It is not unimportant that a belief may be false. It will not be simple to determine whether a belief is true or false in all circumstances. In the above example it was simple. However, until we understand perceptions we cannot effectively work with them.

3.3 Exploratory Phase

(a) *Sources of Information Discussion*

Depth interview techniques of a non-random sample were employed to explore the total information world of the students in the two departments. The respondents were aware only that the research was concerned with information. We were not seen as being propagandists for the library. The responses were taken down verbatim and "content analysed".

The sources of information mentioned were pretty uniform and limited: prescribed readings, lectures, tutorials, handouts, (summary of lecture notes *and* xerox copies of articles), journals, study groups and/or informal interaction, case studies, and the library. The latter was mentioned last particularly by the students on the more structured course, the Master of Business Administration. Previous background, gaming and computer terminals were occasionally mentioned as sources of information.

Common salient beliefs can be summarised:

Books: "One cannot interrogate a book"; difficulty of obtaining books both for purchase or for loan; too discursive; "can have an equable relationship with a book"; too superficial - prevents stimulation of ideas; problem-solving orientations preferred rather than scholarly presentation; American texts not applicable to English situation.

Tutorials: "Can specify needs easily".

Journals: Insufficient number of copies; some too "prosy".

Handouts: Sometimes too theoretical; some very good, poor photocopying.

Case Studies: Overdone, but blend theory and practice.

Study Groups: Unlocking of ideas; uninhibited; instant feedback; learn social skills.

Lectures: More provocative, more useful; more unbiased, the more useful; some lecturers give too much information.

Library: Too few copies of books; out-of-date books not relevant to course; restricted hours of opening; "homely place to work"; noisy place to work; limited means of entry to literature; not enough guidance; "useful for temperature taking".

Respondents' general comments on information: One's ignorance gives one few options for information gathering; time is the constraint which decides relevance; information gives confidence but paradoxically can increase uncertainty; if one comes on a course to re-orientate, there is more motivation to seek information; oral information transfer preferred to the written - a good lecture better than five books; (on the management course, oral skills stressed); gambling process involved - would it be more profitable to go to a tutorial or read a book?; convenience and economy stressed rather than depth by the management students.

These discussions were useful for putting the library into its educational setting. They set the scene. A structured course implicitly precludes choice. The student's valuation of information is partly a function of his teacher's valuation. He is obliged to delegate his information seeking to his mentors. This led us to suppose that perceptions of library value will to some extent be related to the prevailing educational norms. The engineering students on a less structured course than the management students, had more of a problem deciding what information they needed. "Tackling a thesis is like tackling a job in industry; you have to decide what resources you have". Students spontaneously commented on both the technical and intellectual aspects of the valuation of information. The students were articulate about information.

Outline of the question sequence employed: We employed a brief checklist/sequence in developing these discussions, as follows:

"We are carrying out a small study of the way in which Cranfield students carry out their work.

(i) I believe you are a ...... student in your ..... term. Thinking of the subjects you personally have been studying this term as part of your course, could you tell me from what sources you have gained information about these subjects?

(Pause; if necessary, use re-statement below)

You must have been gathering quite a lot of new information. People do when they study in a structured way. What I am interested in is *where* the information came from.

Try to think of all the sources you can of information you have gathered since the beginning of term, which is relevant to your course.

(ii) Now I want you to think about these sources of information one by one. Take ..... (name first source from Q.1) for instance. Can you tell me what you think of .... as a source of information relevant to your course".

(Repeat process).

(b) *Elicitation Interviews on Libraries with Students, Staff and Librarians*

We discussed with our respondents what they felt libraries ought to be doing and what they felt the library at Cranfield was doing. There are of course precedents for considering the value judgements of librarians; for example, Wessel's utility analysis (2). The responses we have collected - the salient beliefs - have become the item statements for the structured questionnaires employed in the panel study and the attitude survey.

(i) *Students*: Individual interviews were conducted with a different group of students from those we talked to in the first place. The interviews were also conducted at a different time period. In the case of the School of Management, there had been a change in the organisation of the course. The common response from those on a structured course was that if a student wanted to go beyond the basic requirement of a course, the library was useful. Many felt that if one was ignorant of a subject altogether, one was motivated to use the library. Sample beliefs were:

* "The catalogue cards are too tightly packed"
* "The loan period is too long"
* "One can only browse during the vacations"
* "The library is too specialised"

(ii) *Academic Staff*: The academic staff's perceptions of 'libraries' and the 'library' varied amongst other reasons according to the level of satisfaction they had with the educational philosophy prevailing in their department. For example, some of the management teachers felt that the deliberate confining of their students' information input was the "best" learning process. "Books are not optimal in a situation when one has only one year". However, some felt that the library gave the students additional intellectual weapons - a chance to get off the tight framework of the course. Many respondents described themselves as being overwhelmed with information, and put themselves into an "I don't want to know anymore" category. The senior academics, those who are likely to have some influence on library budgets, responded in a different way than the active information seekers. The former, who are involved more in administration than teaching, had a limited set of belief statements. The "saving time" and "delay" syndrome was frequently touched upon. Interpretations of the value of time varied. Cranfield was not felt to be a "self-contained" information universe, nor was it expected to be by most. Time spent seeking information either from other formal information systems or from other sources was not always regarded as a waste. Sample statements included:

* "Weakness of the library results in weakness of academic work"
* "A library should be like a bookshop - one can wonder around and browse"
* "The library is not open at 3 a.m."
* "I cannot scribble in library books"
* "The library should initiate more"
* "The human element in libraries is important"

(iii) *Librarians*: There was a great deal of inconclusive discussion on the difference between a library function and an information function. Interestingly, the librarians stressed the reverse side of the value coin and cited many instances when loss of value occurred.

Examples:

* reader failure at the catalogue
* tutor tells a student not to go to the library because there is no appropriate literature; there is
* an enquiry is phrased ambiguously
* tutors place demands for course literature too late
* student given an item by a tutor which is inferior to something held by the library
* student begins thesis writing before he has conducted a literature search

3.4 Expansion of Explanatory Stage

(a) *Panel Study: A pilot investigation to measure the extent to which expectations are realised*

In setting up this study, we have been influenced by the work sponsored by the National Science Foundation at Hameline University, Minnesota (3). The Hameline project assumed and to some extent tested the assumption that the library at Hameline was performing sub-optimally. An experimentation phase was conducted to integrate the library into the educational activities of the institution. (Professor Kidd, who instituted the Hameline project will be Visiting Professor at Cranfield from August 1974 - July 1975).

A library is potentially a facility to support *preparation* and *conduct* of courses. It is, of course, only one source of information available to educators and the educated. Through the panel we are studying intensively the library behaviour of the students studying three courses offered in the final term of the academic year in the School of Management. We are looking at three different courses: one is a research project; one is semi-structured; and one is tightly structured and information has already been filtered by the tutor. We are looking at three distinct disciplines and three different learning processes. The investigation taking place in Term 4, has been set up as a pilot longitudinal study. We are not studying library use per se, but relating it to educational task. Longitudinal studies have distinct advantages over ad hoc surveys. The disadvantages, however, of panel conditioning and panel mortality are known to us. The students on the course are being asked to record and comment on every information input to their course, regardless of whether the source is the library or not.

One of the objects of requiring the diarists to record their total information input, is to modify the effects of panel conditioning, i.e. an abnormal use of the library on the part of the diarists. In this study we are measuring value derived from a library by measuring the extent to which the individual perceives his expectations to have been met. In the pilot stage the panel will be an imprecise, semi-structured tool. The ultimate aim is to refine the tool so that both the expectations and successes can be reduced to a metric for our work in Years 2 and 3.

The panel study consists of four main stages:

(i) Identification of the tutor's educational objective, measurement of the tutor's own "expectations" of sources of information, measurement of the tutor's assessment of the student's expectations

(What is the tutor trying to achieve, and how does he propose to achieve it?)

(ii) Measurement of students' expectations of the library. We have suggested that in order to understand and then subsequently affect both use and non-use of libraries, it is necessary to measure overall attitudes to libraries and the components of these attitudes. The tool that has been employed is a structured questionnaire.

(iii) *The diary*: We are trying to determine:

* *what* information did each respondent use?
* why did he choose to use it?
* how did he obtain it - from what source?
* if from the library, with what success?
* evaluation

The diary is semi-structured, in two main sections:

SECTION I: Educational segment (i.e. class or module) and educational task; information used to achieve educational task; source of information and source of knowledge of information; evaluation - rank information types in order of usefulness, open-ended comment on usefulness of information input, open-ended comment on usefulness of educational segment.

SECTION II: The library; frequency of visit; intent of visits in terms of educational task; library behaviour - was purpose achieved and how?; subsequent behaviour during visit - is there a substitution effect?

(iv) Expectations will be measured again at the end of the courses.

(b) *The Attitude Survey*

This is a self-completion questionnaire for all members of faculty and for all members of the student body in the School of Management. Its object is: (i) to expand in a systematic way the supposition that was explored in the qualitative stages of the research, i.e. different user groups will hold different salient beliefs about the library; and (ii) to relate attitudes to behaviour or use, e.g. to what extent are the perceptions of the heavy library user different from those of the occasional user? (In this survey we are employing no "objective" measure of behaviour, but instead we are asking our respondents to record for us their own usage pattern of the library); and (iii) to explore the use and limitations of an attitudinal survey as a management tool for library planning decisions.

We have been eclectic in the attitudinal techniques we have employed.

(i) The majority of the statements are a derivative of the Likert method of scaling.

(ii) Behavioural or "factual" questions on use behaviour from which attitude can be inferred. Some ranking questions.

(iii) A limited number of open-ended questions.

3.5 Benefit Segmentation

We have frequently alluded in this Working Paper to the educational organisation and structure of differing courses which the student body may pursue. It seems useful to pull together an analysis of degrees of structuring in particular courses, in relation to the benefits the elicitation techniques indicated were sought.

In Diagram II, we have attempted this relating process. For instance, in the first and second terms of the MBA course, four main benefits are identified as being potentially offered by the library: a place to study, time related access to information, the sense of assurance given by the knowledge a library is to hand, and the maintenance of contact with the outside world. Incidentally, this latter benefit is more or less unique in our matrix to the MBA student. He is in the position, as a mature student, of being very conscious of the business world he left behind and the world he is shortly to rejoin.

The elicitation studies showed little disposition amongst MBA students to regard the library as a source of ideas. However, the M.Sc. (Mech.Eng.) and more pronouncedly the Ph.D. students do, of course, look for such a benefit.

What is most noticeable, of course, is that most benefits are anticipated in common by each cell but, of course, in different rank orders. We shall of necessity seek a cardinal ordering if we are to proceed successfully with our studies.

DIAGRAM II: Benefit Segmentation

	MBA	M.Sc.	Ph.D.
High Structure Course	Terms 1 and 2 Place to study Time related access Assurance Maintain contact with outside world	Taught Courses Place to study Time related access Assurance	
Medium Structure	Place to study Time related access Search facilitation Maintain contact with outside world		Guided Studies Time related access Assurance
Low Structure		Dissertation Place to study Time related access Assurance	Thesis Time related access Assurance Search facilitation Source of ideas

4. OUTLINE OF EMPIRICAL STUDIES FOR YEARS 2 AND 3

Our original research proposal to OSTI in July 1972, envisaged that Year 2 would be mainly spent in the conduct of a major panel investigation with the student body. We have encountered no problems, thus far, to persuade us to change that intention. We do, however, propose to extend our canvas within the student body to include three major groups rather than two, viz:

* M.Sc. in Mechanical Engineering
* MBA Management
* Ph.D. in both the Management and Technology Faculties

We further intend to conduct all fieldwork during Year 2 at Cranfield for reasons of control, but we shall use Year 3 to replicate the diary experiments in a second institution.

The precise research instruments to be administered during Year 2 are accordingly:

4.1 Initial Expectations Studies

All legislators, librarians, academic staff and students involved in or with the 1974/75 session of the courses concerned, will be surveyed at the very commencement of their courses to identify and quantify their initial expectations.

Building on the Year 1 exploratory studies including the attitude survey currently in hand, the initial expectations instrument will be employed at the beginning of October.

4.2 Diary Panels

The diary panels, building upon the present pilot panel, will be conducted with a stratified random sample of students from the M.Sc. and MBA courses, with a goal of 75 complete data sets. A group of six doctoral candidates from each faculty will be taken, two in each of their first, second or third years of study.

The diarists will record for our panel details of their information expectations as they arise. These details will afford our prime data source for the measurement of derived value by comparison with their perceived level of actualisation in the library service.

As opposed to the total population of the courses whose expectations are measured once, i.e. at the outset of each programme, the evolution of diarists' expectations will be traced. This data will be supplemented by individual interviews with diarists during the course of the year.

4.3 Perceived Actualisation

At the end of each course, the same group who were interviewed in 4.1 for the initial expectations study, will be re-interviewed to measure their level of perceived actualisation and to monitor any evolution in these 'group' expectations.

4.4 Extension of the Methodology to a Second Institution

By early Summer 1975, it will have become apparent how well the full scale research investigation is progressing. At this juncture, we will consider how to extend the methodology to a second institution.

There are two obvious candidates in the vicinity of Cranfield in the National College of Agricultural Engineering at Silsoe, which conducts both M.Sc. and B.Sc. degree work; and the Bedford College of Education. The former has very close ties with Cranfield and is contemplating a merger in 1975 to become a School of the Institute; the Principal Investigator is a Governor of the latter. Its courses include conventional teacher training and a B.Ed. (Cantab) fourth year option.

5. THE MANAGERIAL IMPLICATIONS FOR LIBRARIES

The managerial implications of the derived value approach we are taking, can be examined in two broad frameworks: the optimal management of a fixed budget, and the determination of an appropriate size of the library budget for a particular institution.

5.1 Fixed Budget Management

The derived value concept requires the librarian to maximise DV. To do this, he can either reduce expectations and continue to afford the same extent of perceived actualisation, or he can attempt to provide a higher level of perceived actualisation by re-allocating his resources amongst the mix of facilities he currently offers. The distance which the diary panel has demonstrated, on a course by course basis, between expectations and perceived actualisation, permits him to see in what direction he must move if he wishes to re-allocate his facilities mix.

The alternative of reducing expectations is not as dastardly as it might appear at first sight. To a certain extent we would expect the system to be self-adjusting in this respect anyway. The movement in expectations found in 4.3 above, for example, could perhaps be in this direction. It is, in our opinion, quite wrong managerially to allow the gap between expectations and perceived actualisation to grow too great. It will simply lead to a general downgrading of the library function into a role of little significance, to the development of private collections, the birth of sub- and departmental facilities, defection to other libraries, etcetera. Nonetheless, a healthy imbalance or straining at the leash within reasonable limits, is the very essence of the politics of library budget appropriations at the legislative level.

Before we turn to the discussion of the implications of the DV concept for the legislative actor group, however, we must be quite clear that we have not discussed the optimisation of DV on a fixed budget in anything but "relative" terms. An institution which has for years spent 3% of its total budget on its library, compared with another that has spent 5%, or one which has spent 20% of the library budget on books, compared with another that has spent 32%, can each in their own way be delivering an optimal DV. The absolute expenditure being allocated to and within a library is, of course, an important variable in determining how "good" the institution as a whole might be in the national or international context; but the derived value as perceived by the individual is very much conditioned by his environment and the educational norms and his extant expectations.

5.2 The Library Appropriation

It will be apparent from what has been said thus far that in theory the institution should allocate resources at the margin to the library until the DV of the last £ spent on the library service is equal to the DV at the margin of all other competing activities, e.g. academic staff.

If, and it is an important "if", the librarian sees himself as capable, by the marketing of his services to his potential and actual users, to enhance their expectations, many fascinating possibilities open up. Bearing in mind the caveat that the difference between expectations and perceived actualisation must never be so great that it brings the library service into disrepute, we can see how it can be healthily different in the battle to gain a more satisfactory appropriation. This notion fits well with reality. A librarian who wishes to accomplish a major extension of his services by an expenditure of, say, £8,000 on a bibliographic service, will first extol its virtues and point out what is lost by not having it. Once the realisation has become widespread, the discussions on the necessary budgetary allocation can begin in earnest. Equally, the same phenomenon is present at the macro level. A library with high DV will offer benefit which leads to a band wagon effect amongst the student body, often to the point of self-adjustment whereby excessive demand reduces the DV. The successful library manager is he who demonstrates this effect to the legislative actors in order to attain a higher level of facility to afford a greater absolute level for DV for all students on any particular course.

Advance or retreat in total appropriation for a library within a total institutional framework, can accordingly be seen in terms of our DV equation, as determined by the success with which we manage expectations and perceived actualisations. Our research submission is simply this: if we can in our investigation come nearer to under standing how to measure DV, and how 'Exp' and 'Per Act' are derived, we have a powerful analytical formulation for the library manager of the future.

ANNEX: THE RESEARCH LITERATURE IN CONTEXT AND REFERENCES CITED

The study's object is to measure the benefits derived from library services in an academic environment, and to explore the costs of producing those benefits.

The first task was to stand back somewhat from the problem rather than attempt any immediate fieldwork. What are the components and implications of the problem? What assumptions must we make? What must be discarded and conversely, what must we emphasize?

Our project can be classified under the general heading of library evaluation, in which there have been many attempts to measure a library's performance. There would seem to be two basic orientations:

(a) Firstly, recognition that information is a vital resource in our increasingly complex society. Information, although traditionally included under labour as "stored knowledge" is perhaps more usefully treated separately from the traditional inputs of economic analysis: land, labour and capital. Formal information systems continually attempt to control the information explosion so as to assist the activities of their client groups. This approach has given rise to the extensive development of user studies. The perspective is one of understanding the potential and actual consumer of information. A managerial approach is often absent, and questions such as what does it cost the formal system to assist its customers, have often been ignored.

(b) Secondly, we can take the library system as our point of departure. Libraries are increasingly management conscious and such approaches address themselves to the central question - what decision rules are needed to allocate scarce resources in what is usually a non-market situation? The library manager's allocation problem, therefore, is not very different from other decisions in the public sector, viz: how are financial resources to be allocated to non-financial goals? Various management techniques such as operations research, cost-benefit analysis, cost-effectiveness analysis, output budgeting, have been employed as aids to the solution of the allocation problem.

Both approaches have virtues and failings. The managerial approach, (b), outlined above, which involves model building, is obliged to make many assumptions about user behaviour. The more subjective or qualitative areas are neglected. In a very understandable concern to 'save' a library, some cost benefit studies have made some dubious assumptions.

The user-orientated approach outlined in (a), does sometimes attempt to expose the 'softer' areas of library behaviour. However, there is a tendency not to consider the managerial implications of the findings. An overstatement of the two perspectives would be: library behaviour is a black box to the systems analyst (b); the library is a black box to the library user (a). Hopefully we will synthesise these perspectives. Sight will neither be lost of the fact that this project is concerned with allocation of resources, nor that we want a user-oriented measure of value. In our context, there are two dimensions to the resource problem:

* what proportion of *total* resources available to academic institutions should go to the library?

* what is the best mix to resources within the library?

An expansion of the problem statement is necessary to show the steps that were taken before a research design could be refined and implemented. The problem was deliberately reformulated as "Can we devise a satisfactory measure of the value of information derived from library services, by students?" Conceptually, there is a distinction between (a) the value of library services, and (b) the value of information contained within those services. In practice we shall not regard them as separable. They can be labelled the technical aspect and the intellectual or cognitive aspects respectively. They can be illustrated in that loss of value may occur if the student 'fails' at the catalogue, but that it may also occur if a 'bit' of information obtained by the student is perceived by him to be irrelevant to his educational task.

It has been noted already that there are many approaches to library evaluation. What criteria exist to judge the validity of any particular approach? What in fact is required of an evaluation study? Are there limitations, due to the particular characteristics of information, to the application of economic analysis to information problems? These are some of the questions that have been asked and to which we have given tentative answers during the first stage of this research.

One economic tool that has been employed in evaluation exercises when the price mechanism is absent is cost benefit analysis. Such analysis requires that *all* costs and *all* benefits are compared in terms of a common unit (individual and social costs, individual and social benefits). There are now many CBA applications, particularly in the field of transport. They are evaluated according to the extent their appraisers believe the above requirements to have been met. The contentious issue is usually the benefit size of the equation. What constitutes a benefit?

Can all benefits be identified and can they be translated into a common monetary unit? The opponents of CBA will say that the neglect of important, intangible, unquantifiable benefits leads to distortion of the analysis. The protagonists say benefits are only unquantifiable because the objectives of the topic under appraisal have not been systematized.

There is now a large literature in the field of information on cost benefit and its variant cost-effectiveness. There are some very useful conceptualisations of the problem (4), but few operational studies. There is considerable confusion in the literature between the two techniques - CBA and CEA. Some studies which claim to be CBA are in fact CEA. The latter is an analytical procedure for discovering the cheapest way of achieving some given objective when benefits cannot be measured in the cardinal form, i.e. the costs of alternative means of achieving some defined objective are measured. Both analyses are aids to the decision maker's resource allocationproblem. However, a CEA *cannot* indicate whether a project is worthwhile. The obvious problem in the information field is that objectives can rarely be agreed upon. Some studies are clearly neither CBA nor CEA, but rather they are cost comparisons (5). The costs of the formal information system are compared with the costs of an alternative system, e.g. a user do-it-himself service (the assumption being, what would happen if the library ceased to exist?). The question of benefit is side-stepped. The worth of the formal information system is not considered. The Wolfe study (6) at Edinburgh, in spite of its title, does have a cost-benefit orientation. The approach to the valuation of information in that ttudy, and in others, is to consider as measures of value both the time saved by researchers and their willingness to pay for information. The subjectivity of such an approach is undeniable, but it is user-orientated and has our very considerable sympathy as an approach.

It was felt as a result of our examination of cost-benefit studies, that a formal cost-benefit analysis in our investigation would be premature. We have made this decision because the context of the studies examined was usually different from our own. The information seeker in such studies is often the highly specialised researcher working in a technical environment. Equally important, in order to quantify, many assumptions had to be made. The systematic, objective presentation of the studies disguises these assumptions.

Our prejudice began to be that we should delay quantification until we had attempted to discover by psychometric and/or sociometric methods, what were the perceived benefits to students of academic libraries. However, before the exploratory research was initiated, a review was made of other approaches to library evaluation, particularly those concerned with university libraries.

We examined the various 'systems' approaches to libraries (7 - 10) including the work conducted by Raffel and Shishko (11). A common theme of these studies is that *value is inferred from users' action.* Hamburg evaluates a library in terms of the extent to which it *maximises* exposure time per dollar input. The document exposure concept is attractive when expressed in terms of time. It is an advance on simple measures of utilisation, such as number of loans. The measure is global enough to incorporate the pro-active role of a library. He assumes that a library does not merely react to user demands. The objections to Hamburg's performance measure are, however, that maximising user behaviour cannot necessarily be presumed to be valuable. Nor do we have any certainty that users are not being exposed to what they *perceive* as "documents of irrevelant recorded human experience". Hamburg does recognise the quality argument. Exposures could be weighted. He describes sub-sets of users, sub-sets of documents. Moreover in his conceptualisation of his research, he flow-charts the impact of libraries (12). However, he believes that the impact cannot be built into the performance measure formula.

The Lancaster performance measure is the proportion of user demands satisfied. This measure judges the library on how well it *reacts* to users, not on how well it *promotes* use. Morse avoids user surveys altogether and predicts future use from past use. By calculating unsatisfied demand from circulation data, he excludes changes in exogenous variables, e.g. changes in curriculum. Orr's (13) document delivery test as an objective measure of performance is attractive as it incorporates time, i.e. libraries are rated according to the time it takes the user to obtain a document.

The inverse linear programming method of the PEBUL project appears to be logically unsound. They looked at present activities and worked backwards to discover the 'value' the library manager had placed on different activities. Their assumption was that the library manager had 'optimised'. However, the project presented a very detailed systematic examination of what a library was doing and what would happen if resources were re-allocated. Moreover, the project implicitly asserts that decisions are made on the basis of value judgements of librarians. The work of Raffel and Shishko comes nearest to our own orientation. They did not shy away from value judgements. At one stage they measured the preferences of faculty and student towards different mixes of library services. Respondents could 'buy' library systems, each having different benefit and cost measures. This type of exercise does not solve the decision maker's problem. How are intense preferences of a minority to be reconciled with the mild preferences of a majority?

Library researchers are rightly fearful of considering the value of information. Considerable work, however, has been conducted in industrial and commercial contexts on the evaluation of information. The traditional approach was to flood the manager with information. The costs of such action, of course, are rising increasingly. Management information systems are now being constructed not on the basis of comprehensiveness, but of 'relevance'. Is research in this field of any help to the academic library researcher? Wills and Christopher (14) have proposed a methodology for evaluating the net value of information, i.e. the difference between costs and benefit. Andrus (15) proposes two complementary approaches to information evaluation: Bayesian analysis and utility theory. Information is evaluated in terms of predicted expected results under the Bayesian approach. The value of imperfect information is determined by estimating how closely it will approximate perfection. Yet the nature of information is as important as the content. Information is a product possessing time, place and possession utilities. The latter 'utility' insight probably has more meaning to the librarian than the Bayesian orientation. It may be difficult to translate the above analyses to academic library research. However, the overall perspective can inform this present project. The perspective emphasizes the final stage of the information transfer process - assimilation, i.e. what is information being used for? It may, however, be easier to determine in a business situation what information is for - attainment of profit goals, risk reduction, etc. It is somewhat more difficult to define the objectives and activities of an educational institution to which information can make a clearly delineated contribution. We are suggesting that the value of information lies in the extent to which it is perceived as relating to and facilitating the attainment of individual or organisational goals.

We see as relevant for our approach, the work that has been done on the post-acquisition stage of information. Some years ago, Allen at MIT (16) monitored the effect of different information environments on research output. A great deal of work still needs to be done. For example, how much information is needed for a task? What sociological and psychological variables facilitate or militate against the information transfer process? If this behavioural perspective could be put into a cost framework, a great advance would have been made in the good management of libraries.

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