MERITS AND DEMERITS OF MEASURING THE PERFORMANCE OF A LIBRARY SERVICE USING QUANTITATIVE METHODS

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Abstract

The article examines the strengths and weaknesses of assessing the performance of a library service using quantitative measures. It argues that quantitative methods are useful in justifying additional funding, continued existence, comparing the performance of library services, among others. It is the kind of approach that is more acceptable to decision makers who find library statistics convincing. It is however noted that quantitative measures do not demonstrate the value of a library service. It does not show how effective the resources are used. It is less useful to a user who is more concerned about the benefits he/she obtains from the library. Such benefits can only be ascertained by qualitative methods.

Introduction

Libraries are established to achieve certain objectives and it is necessary to constantly monitor or evaluate the level of attainment of those objectives. Evaluation is therefore an integral part of the management process simply because libraries either implicitly or explicitly are attempting to achieve something. Blagden (1980) has pointed out that the library manager must be able to demonstrate that some progress has been made in achieving the objectives that inspired the initial decision to invest in that library, otherwise the whole validity of that decision will be constantly under attack.

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Library evaluation data can either be qualitative or quantitative. This paper discusses some of the merits and demerits of using quantitative evaluation methods in a library environment.

Purpose of evaluation

According to Alemna (1999) and de Jager (2004), evaluation is basically a judgement of worth; it testifies whether the objectives are achieved and if so, to what extent. Thus, it means assessing the worth or value of the unit to the people for whom it is meant. Lancaster, (1988) provides four reasons why a library manager may wish to conduct an evaluation of the services provided:

- Establish a benchmark to show at what level of performance the service is now operating so that if changes are subsequently made to the services, the effects can then be measured against the benchmark previously established
- Compare the performance of several libraries or services, or what de Jager (2004) refers to as comparability both across time and between institutions. This could include, for example, coverage of different databases, the comparative evaluation of the document delivery capabilities of several libraries, and so on.
- Justify its existence, that is, an analysis of the cost-benefit of the service. It is vital to ensure the survival of the library by gaining financial support.
- Identify possible sources of failure or inefficiency in the service with a view to raising the level of performance at some future date.

The following reasons could also be added to the above list:

- As a public relations exercise: to show that the librarian cares for the interest of the users.
- To show how the resources are used and to assist in reviewing the resources of the library. As Poll (2003) observes, sustaining a library is an expensive task, and financing authorities want to know, among other things, whether it is worthwhile to support the library, and whether there are concrete and visible effects on the users. He goes on to say that when resources are getting scarce and cultural and educational institutions are

competing for them, it is vital for libraries to prove the benefits achieved by their existence.

- There is also the need to demonstrate that the library is indeed run efficiently & effectively (de Jager, 2004).

Evaluation methods

Evaluation literature bristles with debates over basic approaches to evaluation, especially with respect to qualitative versus quantitative methods (Marchionini, 2000). Ambrozi (2003) quotes Olausson (1992) as stating that evaluation is assessing (giving value) the effectiveness of a certain activity in light of the goals set. According to Alemna (1999), there are two main methods for the evaluation of a library's effectiveness: subjective and objective methods. Subjective methods utilise questionnaires and/or interviews, and are based on users' opinion and attitude of a service. They are thus qualitative and utilise feedback from users, for example, how satisfied they are with the service.

Objective methods are quantitative and include use of quantifiable objectives, that is, ascertaining the extent to which the objectives of a service have been achieved, as well as statistics of library or information use. In essence, quantitative evaluation is an assessment process that answers the question, "How *much*?" In situations where librarians prefer the results of an evaluation to be quantifiable, the objective methods are favoured. However, the use of quantitative methods to evaluate library and information services has both merits and demerits, as discussed below.

Merits of quantitative methods

Quantitative methods are ***easy to understand*** compared to qualitative ones. Policy makers and top management who control the purse strings often find it easier to look at figures rather than reading analytical reports. This could be because they view such reading, quite wrongly of course, as 'extra-curricular' activities, or they do not have the time to do so even if persuaded by the worthiness of such an activity. Moreover, the availability of computer packages that enable one to quickly and easily prepare statistical reports also have the added advantage to add colour and other enhancements for good measure.

Furthermore, quantitative methods are also a ***quick way of presenting one's side of an argument***, especially as a defence against budget cuts. Using figures rather than a written narrative, it is very easy for the librarian to show for example, what was allocated (the input) and what was gained on the output side and where the service was deficient as a result of inadequate allocation. Ashworth (1979) has indeed pointed out that some librarians keep statistics such as those of loan of items and numbers of enquiries handled, because they find it easier to present to management as indicators of the value of the service.

Quantitative methods can be used to some degree to ***justify the existence*** of the library or information service. Libraries keep a variety of statistics such as the number of people who came into the library during the year under review, the number of people registered as library users within a given period, and the number of books circulated to a given user group in a given period. If, for example, the library were able to show that there was a significant increase in the number of users who borrowed information materials in a given period this year compared to the same period last year, this would present a certain degree of development.

Poll (2003) observes that statistical data about the quantity of use can show in what degree and for what purposes library services have been drawn on, especially where high use may seem to indicate that users profited by the services (even though such data cannot prove an outcome on users). As a result of this development, a strong case can be made for the continued existence of the library. Statistics such as of library usage are fairly important in environments like that of an academic library where numbers, rather than the underlying reasons, may help to show that the library is active and not moribund.

Consequent to the preceding argument, it can be stated that quantitative methods, just as is the case with qualitative ones, can be used to justify continued or even ***increased funding*** of the library. In a university environment for example where there are annual student intakes and new programmes are started each year, statistics can be used to justify more budgetary allocation. It can be shown, for

example, that due to an increase in the enrolment figures and hence an increase in the number of registered users, then there is an imbalance between the ratio of users to available stock levels.

This can be addressed through increased funding to purchase more books, and so on. A practical example is provided by Virginia Polytechnic (Virginia Tech) libraries which have been using quantitative data derived from LibQUAL+™ software in presentations to University Advisory Committee for Budget and Planning (Hitchingham, 2002) to source for more funding.

Quantitative measures can also be used to ***determine the inputs*** of an information service. According to Lancaster (1988), inputs are tangible and easily quantified in contrast to outcomes, and that indeed both primary and secondary inputs are inherently quantitative rather than qualitative in nature. A tangible primary input here could be the money set aside for purchase of library books in a university library, say US $ 50,000.

The value of this input would of course have to be evaluated in terms of the role it plays in helping to achieve desired outcomes, that is the extent it satisfies the demands placed upon it (output). Such an output could be the percentage of all titles needed, which the money was sufficient to purchase. If not all ordered titles were purchased because money was insufficient, and therefore leading to complaints from teaching departments, then in the consecutive year an increase in the budgetary allocation (inputs) can be made.

Quantitative methods are also useful in ***establishing absolute minimal requirements*** for various types of libraries. It is usual for library standards to be set against quantifiable measures, for example, the requisite measurement of reading space that should be occupied by a single user, the ratio of professional library staff to support staff, and so on. Standards of this type tend to be related to the size of the population served by the library. A good example is the Association of College and Research Libraries (ACRL) standards for collection development levels in college and research libraries, which specify a core collection of

85,000 volumes with additional increments determined as follows: 100 volumes per full-time equivalent faculty (FTEF) member, 15 volumes per full-time equivalent student (FTES), and so on.

Moreover, library standards often emphasise inputs rather than outputs, and as already discussed elsewhere in this paper, inputs are tangible and easily quantified. Thus, a librarian could very well use such methods to argue, say, for extra funding to increase the book stock to a level commensurate with recommended standards.

Quantifiable methods are also more appropriate than qualitative ones in ***comparing different libraries.*** This is because quantitative methods provide uniformity in measurements. For example, Liu (1997) observes that library statistics generated by the Public Library Data Service (PLDS), which is a national public library statistical system in USA, are expected to describe and compare the effectiveness and efficiency of libraries. The PLDS was initiated to have a role in measuring library output nationwide using uniform measures. Systems designers who worked for both PLDS and National Centre for Education Statistics (NCES) developed the national systems with uniform measurements to make a powerful tool for performance measurement in public libraries across the nation.

Similarly, Virginia Tech libraries were using quantitative data derived from LibQUAL+^{TM} software to benchmark their processes and services against other libraries so that they could consider emulating operations that appeared likely to contribute to making them more effective or efficient (Hitchingham, 2002). Also, the ACRL standards discussed above, which are of a quantitative nature, are a very good example of comparative measures between libraries.

Quantitative measures can also sometimes be considered good ***predictors of desired outputs.*** This can be explained by the following hypothesis. Supposing 10 library users search the CD-ROM databases on the two available computers at a university reference section, and that the library desires to increase this number of users to 40 (which would be the desired output) during any given day. The

library could conveniently increase not only the variety of CD-ROM databases, but also more significantly increase the number of networked computers maybe to 8 or 10, through which the users could interact with the CD-ROM service online. The prediction here is that the number of users can be increased to a given figure through a specific intervention or action.

Similarly it can be argued that the larger the collection of reference tools, the more questions that could be answered completely and correctly. Or that the more items the service brings to the attention of users that are directly related to their interests, the more likely that the users will become better informed, and so on. Indeed, Lancaster (1988) argues that it is possible to use certain quantitative methods, applied to input, that are intended to simulate an output situation and thus approximate an evaluation of output.

Quantitative methods may sometimes be used as a ***measure of library effectiveness***. One argument that favours this point of view says that one way of measuring the effectiveness of an information service is looking at the number of clients, who having used the service, come back to it a second time. It is also claimed that the bigger the number of returnees the more effective is the library or information service, or that the amount of time users spend in the library or when working on material the library has supplied (that is, exposure time of users) can be used as a measure of effectiveness.

Evidence of current use of statistical data in measuring effectiveness is provided by the EU-supported EQUINOX project (which was established to identify appropriate indicators for the evaluation of both print and electronic services), which uses performance indicators that are primarily measures of extensiveness (quantitative) (Cullen, 2003). Even in today's electronic information environment, quantitative data are increasingly being used to measure library effectiveness, as evidenced by some of the performance indicators proposed for Europe's digital libraries, such as operational measures, focusing on resource discovery (such as sessions per service per month), resource delivery (items downloaded, or hits per service month), and so on.

Statistical data which are relevant in measuring effectiveness might include: the percentage of a potential clientele actually served, loan and enquiry figures, and the assessment of a collection in terms of the percentage of material it contains which is relevant for its users. The contention here is that the higher the figures, the more effective the library is. The PLDS quoted above has adopted some major measures, such as registration as a percentage of the population, rate of reference completion, and collection turnover, among others, which had been identified by a number of experts as being useful in promoting efficiency and cost-effectiveness in public libraries.

The problem with such an argument is that no attempt is made to find out the real reasons why the users used the service in the first place or even why they chose to come back a second time. Those who advocate for this method of measuring or evaluating effectiveness do so on the basis that users must have encountered some usefulness within the library and so chose to come back.

Quantitative methods may be useful in ***assisting to review the allocation of resources within the library***. Ford (1989) qualifies this by pointing out that many activities can take place in a library and resources have to be allocated to reflect priorities. This is particularly useful in collection development activities where collection imbalance can be addressed through re-allocation of more funds to subject areas deemed to be less developed.

For example, Bischof (2002), reports on a project at Wesleyan University Library in Connecticut, USA, where an infrastructure has been created to actively collect information and usage statistics to help shape their long and short-term services. This infrastructure helps to collect data on in-house print and electronic journal usage, which are then used as one of the criteria when cancelling journal subscriptions, or for purchasing new titles. Similarly, the performance indicators and their related measures used by Bjarno (1994) in co-operation with some Danish university libraries to develop a technique to assess performance of inter-library loans management in Danish academic libraries are largely quantitative.

Orr (1984) says that of the four variables (i.e. resources, capability, utilisation and beneficial effects) used to measure quality and value of a library, only resources lend themselves most readily to quantification in that they seem to have natural units which should be countable. Hence, the library statistics that are usually compiled are very largely measures of resources.

Indeed, LIU (1997) reports that the focus of the Public Library Statistical Records (PLSR), which are performance measures used in Chinese library systems, are designed to determine the investment of government resources in library development. Furthermore, the main measures, such as the number of seats and volumes, size of library stacks and reading rooms, and annual book purchasing budget are examined and used to compare the quantity and quality of library development.

Demerits of quantitative methods

Quantitative methods may be ***too imprecise to be used in the detailed evaluation*** of library services. For example, should a 5-page pamphlet be given the same weight as a 500-page monograph? How are microfiche to be counted? How are patents to be treated? And so on. This is critical for example when one is discussing collection size for purposes of determining into which category a library fits (such as the ACRL categorisation discussed elsewhere in this paper). Indeed Lancaster (1988) points out that the possible imprecision of some of the units of measurement – such as "volume" when one is talking about collection levels – presents some special problems. He argues that "title" is a more meaningful unit than "volume" in comparing institutions, especially in a public library environment.

Another disadvantage is that quantitative standards or formulae (such as the one developed by the ACRL) to grade academic libraries – an *A* library has 90% or the recommended number of volumes, a *B* library has 70—80%, etc) ***can be subjected to misinterpretation***. This is because although these standards are intended to prescribe minimum requirements, some bodies responsible for funding have been known to use them against the library, reducing levels of financial support on the grounds that the library already

exceeds the standards. So some of the sub-standard libraries may benefit by using the formulae to show how much they need to improve, while some of the better libraries could actually suffer financially as a result of comparison with the standards.

Although statistics may be used to show if full use is being made of the library services, Ashworth (1979) points out that ***they cannot show whether that use has enriched*** the clients and the organisation in line with stated aims. In other words, just keeping track of the number of people who borrow library materials, for example, does not tell the librarian if the materials they borrowed were of any use to them. True, the materials may have been useful, but their degree of usefulness cannot be determined through statistical methods.

Ambrozi (2003) is emphatic that collecting data about existing patrons and the corresponding use of the library do not tell us anything about their characteristics, about the reason for their visit to the library, about their expectations, about the way in which they intend to use the library's services, about the benefits they have had from the visit, and nothing about the potential users or non-users of the library. He goes on to say that even measurement of library collections, which extends only to the size of the collection in number of units, indicates nothing about the quality of this collection, or about its relevancy to patron needs.

As a matter of fact, statistics cannot show whether better and quicker decisions have been reached through help from the library or information service. It is therefore necessary to remember, as Hannabuss (1983) asserts, that "however else it is seen, evaluating the effectiveness of library and information services is closely bound up with user needs and demands and the extent to which those needs and demands are satisfied."

It is also ***difficult to determine alternatives to any one given problem*** merely by using the quantitative methods. For instance statistics may be used to show that all the funds allocated for, say, purchase of information materials have been expended for that purpose. However, there are two evaluative questions that can be raised regarding this: would

the funds spent on the information resources be better spent elsewhere and are the funds allocated to the library spent in the most effective manner? To get clear answers to these and many other questions would require an evaluator to utilise evaluative methods that allow for more detailed analysis of the issued at hand, which quantitative measures may not readily provide.

Quantitative methods are also ***not a true measure of the gains (outcomes)*** that an organisation obtains as a result of making use of its library or information services. This is especially true of a special library or documentation centre where there is a very close association between library/information service staff and users of the service who are both united in a common purpose. In connection with this, Lancaster (1988) has pointed out that one may not readily isolate the contribution made by an information service itself when one attempts to determine to what extent the desired outcomes of a service have been attained.

For example the objective "to keep researchers and practitioners abreast with latest developments in their fields of specialisation" represent a desired outcome that is intangible. It cannot therefore be effectively determined or measured using quantitative methods. In other words, what really matters is the resultant gain when the organisation puts the information obtained by and from its library to use.

An addition to the foregoing discussion is that quantitative methods ***cannot be used to measure quality and value*** of a library or information service, i.e. what Orr (1984) refers to as library "goodness". "Goodness" has to do with quality and value, where quality is represented by the question: 'how good is the service?' and value is represented by the question: 'how much good does it do?' But even using this explanation cannot always be helpful because, as de Jager (2004) points out, "good" means different things to different people.

Ambrozi (2003) quotes Usherwood (1999) warning that perceptions of librarians and users differ and that users' perceptions, in evaluating library services, are influenced by the understanding of these services as an assurance of the possibility for equal access to information, ideas, works, etc.

But for adequate evaluation, it is necessary to evaluate the operations also in connection with the set goals, and this requires much more than just quantitative data.

It is may, thus, be seen to be more prudent to argue that quality has to do with the users' opinion on how "good" or useful the service is. Indeed, Dalton (1992) reminds us that only "the user is likely to be the most qualified to evaluate the quality of the service (received)", and this finds common ground with Zeithaml, Parasuraman and Berry (1999) who point out that "...only customers judge quality; all other judgments are essentially irrelevant". And as pointed out earlier, opinion is qualitative.

Ashworth (1979) goes on to say that statistics are poor indicators of the value of the service, because the differences in real value of items of use are so great that there can be little comparability. In a university library or national public library services situation where there are many branch libraries for example, the work of one library can be so unlike any other that statistics of usage are not generally helpful for specific inter-service comparisons either. Even within a single library system, such as a national or public library, such statistics may fail to be useful, especially where a library may have too many purposes that some may even conflict with one another (de Jager, 2004).

Measurement of value is particularly problematic because it has to do with the beneficial effects derived from the use of the service. In order to determine quality and value, an evaluator has to gather and analyze a wide range of data through the use of subjective (qualitative) methods rather than objective (quantitative) methods which are less analytical. In other words quantitative methods cannot really help libraries to better understand user perceptions of library service quality.

Quantitative methods are also ***not good determinants of the value of the outputs*** of an information service, even though as seen earlier they can be used to predict the outputs. This is because it is not enough to quantify the outputs, i.e. the services provided. For each service provided, qualitative criteria of success should be identified. Thus, we

can measure the output of a library by the number of loans or enquiries dealt with, the number of abstracts which appear each year in its alerting services, or the number of copies of its publications distributed. However, such statistics would only be an indicator, and an unreliable one, of the first step in the information process. As Lancaster (1988) observes, unlike inputs, the outputs can and must be evaluated in terms of quality.

Another demerit in using quantitative methods is that even though they can be used to predict desired outputs, they still will ***not enable the librarian know the precise degree*** to which those outputs are desired. That is, such measures do not take into consideration the causal or underlying factors that lead to things being the way they are, for example, why a user may be asking the question that he/she is asking at the reference desk. People say they want information, but they do not say "how much" of the information they need. Indeed, Lancaster (1988) observes that the library can be looked upon as an interface between the available information resources and the community of users to be served.

Therefore, any evaluation applied to the library should be concerned with determining to what extent it successfully fulfils this interface role. Quantitative methods may not be best suited to help in such determination. Instead, using quantitative methods may provide the library with a false sense of understanding the needs of its users. That is, it amounts to scratching only the surface, and yet to fully comprehend the complexities of user needs, it is necessary to dig below the surface.

As a consequence to the foregoing, it is clear that quantitative methods ***cannot be used to adequately improve the library service***. Improvements in library and information services have to be more qualitative than quantitative if they are to make any impact on the user population. For example it is easy to show that the number of library-going population has decreased or increased over a given period of time, but this does not tell us why there is that decrease or increase. Even detailed statistics showing a rise in the demand and usage of library services are not a real guide to the health of the service.

The situation is much more complex today with digital and electronic libraries on the rise. Digital libraries are emergent complex systems, a changing environment that requires a flexible, responsive approach to evaluation (Cullen, 2004). These considerations have been instrumental in designing methods to evaluate digital libraries, such as those described by Marchionini (2000) for evaluating the Perseus Digital Library (a digitized collection of classical literature texts and images of coins, vases, etc.). In describing these methods, he focuses on more than just the traditional measures of physical libraries (circulation, collection size, patron visits, reference questions answered, among others) in order to reflect the reality of the new digital environment.

That is why Childers (1989) says that evaluative studies seek to discover causal sequence and that they necessarily strive to determine a cause-effective relationship. Hence, by using quantitative methods, one cannot adequately identify the major problems afflicting an information service with an aim of solving them.

Another demerit of using quantitative methods in the evaluation of library services is that ***they are not amenable to diagnostic and therapeutic evaluation***. Lancaster (1988) observes that to be useful, an evaluative study must do more than indicate what the 'score' of the library is for the service. It must also provide data that indicate how that score fluctuates when conditions change. In other words, evaluation should demonstrate under what conditions it performs badly, thereby allowing identification of the most efficient ways to improve performance. Indeed, the most important element of diagnosis is the identification of reasons why particular failures occur.

Lancaster (1988) goes on to caution that to be more than an academic exercise, evaluation should be diagnostic, collecting data that indicate how a service performs and why it performs as it does, including why failures occur. It is obvious that quantitative methods are not well suited to providing the kind of data needed for diagnostic evaluation.

Quantitative methods ***may also be used inappropriately*** by a librarian who is under pressure to justify the use of

resources that the organisation has expended on the library for a period of time. This is not to suggest that librarians cheat using numbers, but it is not beyond a person who is under pressure to manipulate figures, especially where questions may be raised about how transparent and accountable the librarian has been in utilising resources. Moreover, statistics may be exaggerated as a way of seeking more attention for the library. There is no documented evidence to this effect, and professional ethics must always be the guiding principles, but librarians are human beings after all.

Conclusion and Recommendation

In general it is accepted that gathering and analysing data (on costs, on effectiveness, on efficiency) and/or studying and utilising results of evaluations, helps any library/information service administration that is interested in improving its operations. There are a variety of evaluation methods that can be utilised and each has advantages and disadvantages. As this paper has demonstrated through discussion, in some instances the quantitative methods of evaluation may be preferred over qualitative ones.

However, it is recommended that the kind of evaluation method to use should depend, to a large extent, on the purpose of the exercise, and the kind of information that is expected from the evaluation exercise (whether qualitative or quantitative, or both). As noted in the discussion, some methods may be appropriate for one purpose while totally irrelevant for the other. An information manager needs to take this into account before he/she carries out an evaluation exercise.

REFERENCES

1. Alemna, A.A. (1999). "Library evaluation: some options for academic libraries". *Aslib Proceedings*, Vol. 51, No. 7, July/August. pp 243-246.

2. Ambrozi, M. (2003). "A few countries measure impact and outcomes - most would like to measure at least something". *Performance Measurement and Metrics: The International Journal for Library and Information Services*, Vol. 4 No. 2. pp. 64-78.

3. Ashworth,W. (1979). *Special librarianship*. London: Clive Bingley.

4. Bischof, S. (2002). *Collecting statistics: a college library's approach.* [Online available at:]http://www.nercomp.org/sigs/libit/402libit/schedule.html (Accessed 19th November 2004).

5. Bjarno, H. (1994). "Finding and performance measures in ILL management." *Interlending & Document Supply*, Vol. 22 No. 2. [Online available at:] http://www.ingentaconnect.com/searching/Expand?pub=infobike://mcb/122/1994/ (Accessed 20th November 2004).

6. Blagden, John (1980). Do we really need libraries: an assessment of approaches to the evaluation of the performance of libraries. New York: Clive Bingley.

7. Cullen, Rowena (2003). "Evaluating digital libraries in the health sector. Part 1: measuring inputs and outputs." *Health Information and Libraries Journal*, Vol. 20 Issue 4. [Online available at:] http://www.blackwell-zsynergy.com/links/doi/10.1111/j.1471-1842.2003.00456.x/full/ (Accessed 19th November 2004).

8. Dalton, G.M.E. (1992). "Qualitative approach to user satisfaction in reference service evaluation." *South African Journal of Library and Information Science, No.* 60, pp. 80–103.

9. Ford, G. (1989). "Performance measurements: principles and practice". *IFLA Journal*, Vol. 15, No. 1. Pp. 13-17.

10. Hannabuss, S. "Measuring the value and marketing the service: an approach to library benefit". *Aslib Proceedings*, Vol. 35, No. 10, October 1983. pp. 418-27.

11. Hitchingham, E. E. (2002). *LibQUAL+^{TM} at Virginia Tech.* [Online available

12. at:]http://www.nercomp.org/sigs/libit/402libit/Hitchingham.ppt (Accessed 22nd November 2004).

13. Hu, Te-Wei, B.H. Booms, L.W. Kaltreider (1975). *A benefit-cost analysis of alternative library delivery systems.* London: Greenwood Press.

14. de Jager, K. (2004). *Counting what matters to measure what counts.* [Online available at:] http://www.lib.sun.ac.za/sym2004/Presentations/KdeJStellenbosch.ppt (Accessed 19th November 2004).

15. Lancaster, F.W. (1988). *If you want to evaluate your library...* London: The Library Association

16. Liu, Y. O. (1997). "National public library statistical systems and management: a comparison between the United States and the People's Republic of China". *Library Management*, Vol. 18, No. 4, 1997. pp. 189-195.

17. Marchionini, G. (2000). "Evaluating digital libraries: a longitudinal and multifaceted view." *Library Trends*, Vol. 49. [Online available at:] Gary Marchionin http://ils.unc.edu/~march/perseus/lib-trends-final.pdfi (Accessed 22nd November 2004).

18. Orr, R.H. (1984). "Measuring the goodness of library services: a general framework for considering quantitative measures". **In** Roberts, Stephen A. (ed.). *Costing and the economics of library and information services.* London: Aslib. pp. 240-257.

19. Poll, R. (2003). "Measuring impact and outcome of libraries". *Performance Measurement and Metrics: The International Journal for Library and Information Services*, Vol. 4 No.1. [Online available at:] http://ninetta.emeraldinsight.com/vl=1275113/cl=17 9/nw=1/fm=html/rpsv/cw/mcb/14678047/v4n1/s1/ p5 (Accessed 22nd November 2004).

20. Zeithaml, P. Berry (1999). *Delivering quality service*. NY: The Free Press.