Abstract

This and the following two papers describe a half-day workshop, at which a range of hypothetical scenarios were presented and discussed. The aim of the session was to explore, in a practical hands-on context, the range of options for using statistics and performance indicators for effective management.

The objectives were to:

• develop an appreciation of the importance of performance indicators and statistics in managing effectively
• identify the different aspects of management that can be supported and enhanced by appropriate data
• raise awareness of the data that are available
• demonstrate how these can be applied in practice

A short introduction to the range of data and techniques which can be utilised for effective management was followed by a series of practical workshops, where a range of real-life problems was examined and discussed, finishing with a general reporting and discussion.

Introduction

There is a general need to work towards demystifying statistics and performance assessment metrics, if all who are involved in the design and delivery of information and library services are to assimilate an evidence-based management culture that is so vital to achieving and demonstrating success. LISU has worked for some time with individual institutions to support their collection and use of data. This endeavour has manifested itself in several different ways including; data audits, data presentation reviews, detailed benchmarking studies and concentrated workshops involving an array of levels of management.

This contribution to the IFLA satellite conference offers an illustration of the approach that is adopted towards making statistics more accessible to managers as well as revealing the range of options for using statistics and performance indicators for effective management. It takes the form of an account of the ‘demonstration workshop’ that was presented on the second morning of the satellite conference. The session comprised a linked series of short paper presentations and practical exercises. The conference delegates entered fully into the spirit of the event and were enthusiastic participants in the various tasks that were given to them.

The key objectives of the session were, in summary, to:

• develop an appreciation of the importance of performance indicators and statistics in managing effectively
• identify the different aspects of management that can be supported and enhanced by appropriate data
• raise awareness of the data that are available
• demonstrate how these can be applied in practice
• provide a skills underpinning for interpreting and using data effectively
Each exercise also had its own individual set of learning objectives. Such an approach enables a clearer focus about the content, presentation and management of each exercise to be retained. The workshop content, including an outline of the objectives, is described in more detail below.

Two papers were presented as introductions to the exercises, covering the fundamentals of adopting the evidence based management approach to library and information services, and giving a brief introduction to relevant statistical techniques.

**The workshop programme**

The workshop programme comprised the following:

**09:00 Options for measuring and managing**
- Introduction to the workshop
- Mission statements as a background to performance improvement
- Types and sources of useful data
- Data applications
- Data acquisition methods

**09:40 Exercise 1 – Mission possibilities**
An exercise in evaluating pre-prepared mission statements according to prescribed criteria with particular emphasis on specifying the kinds of tests (and associated data) that are appropriate to establishing whether missions have been achieved. This comprised 15 minutes of group discussion, followed by 15 minutes of reporting and general discussion on the issues raised.

**Learning outcomes**
- **Attitudes** – Properly developed, missions can contribute to good service management
- **Knowledge** – Missions must have:
  - Meaning
  - Credibility
  - Acceptability
  - Testability
- **Skills** – Assessing mission statements critically; identifying appropriate performance metrics

**10:10 Statistics for the faint-hearted**
- Introduction to basic statistical techniques
- Presentation of data and results
- Introduction to benchmarking

**10:45 Break**

**11:15 Exercise 2 – Managing scenarios, strategies and statistics in practice**
A group exercise to determine suitable performance indicators for specified management scenarios. Each group is tasked to specify the range of indicators that are appropriate to managing the scenario, including how they will be acquired, applied and presented. This comprised 30 minutes of group discussion, followed by 30 minutes of reporting and general discussion on the issues raised.

The scenarios prescribed were:
1. Academic Library – determining the strategic balance between access and holdings
2. Academic Library – increasing access through 24 hour opening
3. Academic Library – introducing resource allocation criteria for materials funds
4. Public Library – increasing access through Sunday opening
5. Public Library – achieving social inclusion in relation to disability access and use.

**Learning outcomes**
- **Attitudes** – Statistics are not scary – honest!
- **Knowledge** – Methods and criteria for assessing the suitability of data for:
  - Revealing the situation clearly and convincingly
  - Establishing level of progress in meeting mission, aims, objectives
  - Highlighting examples of good practice
  - Identifying areas in need of development
  - Identifying factors affecting service development
  - Testing the effect of service innovations
  - Enabling comparison over time, against standards, and against peer institutions
  - Supporting advocacy for resource enhancement
**Skills** – Determining what data are needed to:
- Support management action
- Test decisions
- Demonstrate service quality and relevance

**12:15 Conclusions / Summing up**
- Reviewing what has been achieved
- Identifying key issues in the workshop
- Offering an opportunity for general questions
Options for Measuring and Managing

J Eric Davies
Director, LISU, Loughborough University, UK

Abstract
This paper explores a range of aspects of measuring and managing. They include: the importance of clear (and measurable) organisational missions and goals, the range of performance data available and their management applications, as well as the various audiences for evidence, options for gathering useful performance data, and some fundamentals of data interpretation and handling.

Missions, goals and managing

Much the same way as a voyage must have a destination and a course plotted that takes tides and weather into consideration, so the approach to managing successfully requires a firm idea of an organisation’s goals, what it is trying to achieve and the direction in which it is seeking to develop as well as assessing how it is getting there. Only then is there anything really to measure and manage sensibly; the alternative risks being the accumulation of data for its own sake. It is summed up very succinctly by Sawhill and Williamson (2001) in the McKinsey Quarterly:

Every organisation, no matter what its mission or scope needs three kinds of performance metrics - to measure its success in mobilizing its resources, its staff’s effectiveness on the job, and its progress in fulfilling its mission.

It is important to develop a strategic focus which entails having a clear idea of what you are doing and why you are doing it at present, as well as what you want to do in the future, and why. This raises questions about the kind of organisation that is being managed, the character and the scope of the services, and the overall direction of the endeavour, now and later. At a broad level this translates into determination (and codification) of organisational vision and mission. Now, occasionally, vision and mission statements are viewed with scepticism – or are even discounted as mere verbal froth. However, if they are constructed after proper thought and consultation they can serve to inspire and bind in a common cause. To some extent it was the Athenians’ shared vision that gave them their strength and courage against overwhelming odds in their confrontations with the Persians. Little has changed; an organisation that knows what it wants to achieve and what has to be done is already part of the way to success. Measuring the rate of change as it heads towards its objectives adds the necessary precision to managing the situation and staying on course.

Types of data

An array of data, or evidence, both quantitative and qualitative, can be used to assess performance and to support management. Conventional and convenient groupings into types give: inputs, outputs, outcomes and impact.

To these can be added data about the service domain; that is, information about the context in which the service is operating. Complimentary to such data, but of critical importance in assessing performance, is evidence, whether solicited or unsolicited, that is derived from users. There is also a growing interest in ‘soft’ or ‘social’ indicators which employ a range of novel measures. They impinge on the realm of
impact assessment but go far beyond in the way that they address social issues.

The majority of inputs and outputs are relatively easy to measure and in many cases feature straightforward numerical values. Most service domain data is also easily quantifiable. Outcomes and impacts present a greater challenge in terms of assembling meaningful data and, importantly, making convincing causal connections about data and the service. In the current climate of accountability and the need to demonstrate best value, some of the most useful and persuasive evidence is the hardest to handle.

Inputs represent data about the resources that are deployed to provide a service. They include: how much is spent on the service, the numbers and levels of staff, the accommodation available, opening hours of service points, the collections (both real and virtual) that are accessible, and the equipment, including workstations, employed.

Outputs are quantities and values that represent the various aspects of the service delivered. They include: the number of visits made to a service, items loaned or documents supplied, items consulted within a library, enquiries received and answered, search sessions performed and end user training events arranged. Some indicators can be refined to yield more information on service quality. For example, the number of enquiries answered inside a specified target time can be measured.

Outcomes represent the contributions that the information and library service makes to the activities of its end-users, and as such involve some kind of effect on, or interaction with users. The level of active membership and the amount of repeat use of a service offer measures of service outcomes. Another example is the needs-fill rate – that is, measuring the proportion of times that a user gets what he, or she wanted. The reciprocal measure of failure to satisfy demand is also a significant outcome indicator. The overall level of client satisfaction (or even dissatisfaction) with particular aspects of the service can also indicate outcomes.

Impacts are consequential. They describe the higher order effects that the service can claim to have on its operating context, whether it be the community at large or, more parochially, an institution or organisation. Thus, impacts demonstrate – in an educational environment, how the service supports learning and research; in a commercial organisation, how it contributes to profitability and growth; and in a public library service, how it adds to the wider social and cultural well being of the community.

Service domain data provide a contextual framework for service policy and practice. The potential user population has to be mapped, its various components analysed and their separate needs understood. Thus, for example, a simple breakdown of an academic institution’s population will reveal learners at various levels, teachers, researchers and administrators; and the constituencies may not be mutually exclusive. More exhaustive analysis will identify full-time and part-time learners, learners of different ages, learners with various access requirements such as those with visual impairment. All these factors relate to the character of the service needed. It is also important to be aware that the service domain will include non-users.

User data offer the prospect of acquiring a rich picture of the expectations, experiences, actions and perceptions of those who make use of, at least part of, a service. If the data can be reliably gathered without impeding too greatly the activities of users then so much the better. It is worth noting that useful data can be gleaned from lapsed users and non-users also.
‘Soft’ or ‘social’ indicators have their origins in the area of social work and address the broad effects of a project, or service on individuals and the wider community. They seek to describe how lives are changed in terms of the ‘distance travelled’ in personal development and wellbeing, and in community cohesion and empowerment. There is scope to explore these issues in relation to the social and cultural influence of public library services.

Managing with data

The complete spectrum of management activity is touched by the systematic application of data. Whether it is in providing core services, or in undertaking special projects, the intelligent use of data facilitates the endeavour. En passant, it should be observed that special projects can often ‘migrate’ into mainstream services after a successful period of implementation and appropriate evaluation, so performance assessment becomes even more of an imperative to identify sustainable projects and to ensure a smooth transition. The UK People’s Network initiative is an example of a national ‘project’ whose success points to the desirability of its becoming embedded in core provision if a funding route to sustainability can be achieved (People’s Network, 2002; Library and Information Commission, 1997).

The role of data in managing encompasses:

- Policies
- Strategies
- Tactics
- Processes
- Operations
- Advocacy

In the context of core services these can be redefined to answer questions of the following kind:

- What do we need to do?
- Where are we going?
- How do we get there?

- How have we done in the past?
- How are we doing now?
- How can we do better?
- How are we making a difference?
- How do we get the resources?

Another perspective on assessing service delivery relates to the Three ‘E’s – Economy, Efficiency and Effectiveness, all of which require a range of underpinning data. The approach gained much support in the early 1980s, particularly from government, and especially a UK Treasury Department which was setting a new agenda for accountability and value through its Financial Management Initiative. An agenda which, incidentally, has endured and manifests itself in today’s Best Value approach (Office of the Deputy Prime Minister, 2002).

The Three ‘E’s expand to:

- Economy in the acquisition and deployment of resources. That is, doing things as cost effectively as possible commensurate with achieving acceptable quality and target quantities
- Efficiency in the use of resources. That is, deploying resources in a way that maximises the returns from them. Also described as ‘doing things right’
- Effectiveness in the achievement of objectives. That is applying resources to meet the priorities and needs of the client base. Also described as ‘doing the right things’

A similar outlook is evident in a thorough review of university library management and provision conducted in the early 1990s by a committee under the chairmanship of Sir Brian Follett (Joint Funding Councils’ Libraries Review Group, 1993). It arrived at a five point Proposed Framework for performance measurement which, in addition to economy, efficiency and effectiveness, specified integration and user satisfaction as key principles. Integration
described the way in which library service objectives were congruent with broader institutional objectives. User satisfaction is a fairly self-explanatory principle but its inclusion served to indicate how thinking had, in a decade, moved on to feature more prominently the people at whom services are directed. The discussion in the Follett Report emphasised the need for evidence to underpin the principles and gave copious examples of the kind of data that would be appropriate.

Another aspect of applying data relates to benchmarking, or making comparisons with the aid of data. The technique has its origins in the collaborative endeavours of companies in the high technology industries, including Motorola, DEC and Xerox, to pool knowledge in order to achieve improvements in products, processes and services (and, of course, profitability).

Benchmarking can be undertaken on a broad strategic basis, or focused on specific processes. It can be applied internally, or externally in comparison with other like services. In any case it demands access to reliable and, of course, reasonably comparable data. It enables managers to evaluate the level of performance of various services within an institution by comparing:

- performance against published standards
- performance over time
- performance in relation to that of other institutions

**Audiences for data**

There are various audiences for data and they represent, in some way or another and however tentatively, stakeholders in the activity that the data describe. The way in which the data, together with their accompanying interpretation, are presented, will be tailored to the needs of different audiences, most notably in the level of detail that will be provided. Thus a busy university chief officer will welcome a brief digest of key indicators rather than an array of spreadsheets! Though the latter should be available in reserve to answer specific questions and to respond to challenges about the service.

A shortlist of stakeholders may include amongst others:

- funding bodies
- governments
- managers
- front-line staff
- service users
- the broader community (including non-users)
- vendors

The entire issue of stakeholder involvement raises important questions about the principles and practice of data sharing, which place heavy responsibilities on management and demand a commitment to transparency. Clearly, effective sharing takes place only with data that are accurate, reliable and meaningful.

**Data acquisition methods**

A range of useful methods of acquiring data is available to the manager. A fundamental consideration concerns the relevance and value of what is collected. Put briefly – collect what you need; need what you collect! There is a temptation to gather some types of data because it is easy to do so. Conversely, some useful data that might add greatly to decision-making may be eschewed because they are harder to acquire. The opportunity to capitalise on the availability of data emerging readily as a by-product of operations should not, however, be overlooked. Sources and methods which are currently in use include:

- management information systems (including budget systems)
- automated circulation records (including inter-library loans data)
- OPAC transactions
- subject enquiry logs
Data publications offer an additional avenue of useful management information. They may originate from government departments, professional bodies, commercial organisations and academic institutions. There is a growing trend for such material to be also offered electronically, with additional features for data manipulation. They contain authoritative data where the hard work of compilation, and sometimes interpretation has already been undertaken. They are suitable for making comparisons and studying trends as well as providing insights into special topics such as ‘social inclusion’ for example. They can also inform the design of local data collection.

It is possible to gather too much data, with all the attendant expense that implies. Always to the forefront of management thinking must remain the idea that data gathering is a means to an end – that of managing well to achieve the best service possible – rather than an end in itself. Moreover, methods and data deserve continuous scrutiny to maintain reliability and relevance. The way that services evolve may signal the need for gathering new data and, perhaps, dispensing with some established ones. At the same time the value of retaining and assembling a time series of uniformly gathered data needs to be appreciated as this facilitates trend monitoring and offers raw material for benchmarking.

Some guiding principles

It should never be forgotten that data do not predict the future although they may offer the manager insights that contribute to decision-making. John Sumision (1997), whose wisdom and experience of matters statistical have long been well respected in IFLA circles, reminds us:

*Statistics, being essentially historical, can only provide information after the event.*

In another source, Sumision (2001) offers his own perspective on what we should make of the meaning of data in what I regard as Sumision’s Law of Statistical Dullness:

*In comparative statistics the great majority of results are inherently close to the average and consequently dull.*

I would venture to suggest that, far from being dull, such outcomes may offer reassurance to the harassed manager. Why? Well, because if they are unspectacular they do not give cause for alarm that something is well out of line. On the other hand, neither do they offer grounds for elation when some spectacular peak of achievement is reached. However, particular attention should be paid to diminishing variance – that is, the trend for data to tend towards a middle ground and thus reduce its capacity to identify good and bad comparative performance. This can arise from a genuine improvement in service levels throughout a population. The general rise in the quality, range and depth of provision in UK libraries in the last few decades, for example, is undeniable. Another explanation for diminishing variance in results is ‘gaming’ where work is concentrated on achieving specific targets that are under the spotlight whilst aspects of the service commanding less attention (and without performance indicators) may be neglected. Yet another may represent simply inaccurate or badly reported data that present a false picture of what is really going on. The price of using data properly is eternal vigilance (and a reasonable level of numeracy).

Data, then, do not subsume, let alone usurp the manager’s role in managing. Properly and
intelligently applied they do, however, provide a sound underpinning for policy and practice. Measuring and managing are activities full of challenge and interest; managing without measuring, however, offers nothing but the prospect of journeying blindly with no prospect of admiring the view.

References
Statistics for the Faint-Hearted

Claire Creaser
Deputy Director and Senior Statistician, LISU, Loughborough University, UK

Abstract
This paper gives a brief introduction to the types of data and some statistical techniques relevant to library management. It covers data collection, simple analysis methods for different types of data, an introduction to sampling and questionnaire design, and a range of data presentation techniques.

Introduction to Statistics
All of us use statistics of some sort in our everyday lives, without even thinking about it. For, at their most basic, statistics are simply numbers with context. They can be:

- **Simple counts**
  - 1,300 items issued last month
- **Ratios or proportions**
  - The average price paid for a CD is £12.50
  - 25% of staff time is spent re-shelving books
- **Comparisons**
  - Women borrow twice as many books on average as men
  - Serials cost three times as much as books
- **Complex**
  - The average spend per user has increased less than general inflation over the last ten years

*(note that these examples are fictitious!)*

Formal analysis using statistical techniques is at the top end of this range. Methods which are frequently quoted include correlation and regression, to investigate relationships, and analysis of variance and contingency tables, used to investigate differences between groups. Such techniques may be used for some specialist investigations and research, but are less common in everyday management.

Data collection
Always begin with the questions for which you need answers, not with what it is possible to collect, or what is automatically produced by your library system. There is a great deal of data which it is possible to gather on a regular basis, but not all of this will necessarily be of use. You may be interested in demonstrating the efficiency and effectiveness of your service, or you may wish to answer specific questions about one particular aspect of it, or to make a case for improved resources. The routine data you need for everyday management may be useful in demonstrating value for money, and such demonstration will help any case you may need to make for more resources. But such a case may also benefit from the results of user surveys, for example, and value for money can be demonstrated by comparison with other services.

It is also a good idea to collect only that which is relevant to the questions you are trying to answer, and which will be used. There is little more soul destroying than to spend effort in gathering data which is filed away and never used, particularly if it has been difficult to compile. Currency is also important – figures which are out of date can be worse than nothing at all, particularly in areas which are developing rapidly.

Sources of data are many and various, including:

- Library Management Systems – and other internal sources – for basic stock and usage figures, financial details and staffing information
• Regular user surveys are valuable, and other types of survey may be conducted on a regular basis as well – non-users, stock condition, in-house use …

• Occasional surveys are often associated with particular research questions or projects, but may also act as pilot studies for regular implementation at a later date.

Data types
There are three basic types of data, and how you analyse and present them will depend on what type you have.

• Categorical
These are descriptive – they allocate people or objects into categories. Examples are gender; membership status; material format; classmark. They may be numbers, but often are not, and they have no inherent order.

• Ordinal
These are also generally descriptive, but the categories have an inherent natural order. Examples include satisfaction ratings in customer surveys – there is a natural progression from very dissatisfied to very satisfied, which can be expressed in any number of stages according to need. Similarly stock condition could be assessed as ‘needs immediate replacement’, ‘poor’, ‘OK’, ‘like new’ – an inherent order from bad to good. It is not generally possible to quantify the difference between individual points on the scale, and the difference between any two adjacent points is variable.

• Ratio or interval
These are technically different, but in practice in the library context this difference is not important. They are always numerical, and generally are counts of various types – number of issues, age in years, expenditure data. Ratio or interval variables can be reduced to ordinal scales by grouping – age in years is a ratio measure, but age group (0-15, 16-64, 65+, for example) is an ordinal measure.

Analysis
Specify the analysis with reference to the research questions. In many cases, basic descriptive statistics will be sufficient, and graphical presentation is often useful in the interpretation of such basic measures. Sample survey data may require more advanced techniques for hypothesis testing, to draw inferences about the population from which the sample was drawn. If the quality and quantity of data are sufficient, you may wish to employ advanced techniques such as correlation to look at the relationship between two measures, regression to investigate how one measure depends on any number of others, or analysis of variance, comparing groups within the population. Readers are referred to one of the many introductory texts available for details of such methods (e.g. Simpson, 1988; Stephen and Hornby, 1997; Vaughan, 2001).

A frequent mistake, particularly by those unfamiliar with statistical techniques, is to over-analyse and over-complicate. It can be very tempting to enter the data into a spreadsheet or specialist analysis package, then extract every possible table and statistic you can. This leads to a wealth of analysis of doubtful value. The key is to remember what questions you are asking, and pick your analysis to fit. Above all, keep it simple!

The techniques you should use depend on the data type. For categorical data, the options are quite limited. Averages are not appropriate, the most common category (the mode) should be used as a measure of position. In general, such data are analysed by giving the proportions in each category (e.g. 55% of users are female, 45% male) or used to subdivide the population for comparative purposes (e.g. men borrow an average of 3.4 books per visit and women borrow 5.1).
Ordinal data can be used in the same way as categorical, with the additional ability to describe position using the median. This is the point at which half the values are above and half below (e.g. 88% of users rated the enquiry service as good or excellent; stock had a median condition rating of 4 on a scale where 1 is ‘very poor’ and 6 ‘as new’).

Ratio and interval data can be analysed in a range of ways. The most common descriptive measure used is the mean, or arithmetic average, although weighted averages are also used extensively (e.g. average cost per staff member, calculated as the total staff costs divided by the number of FTE staff). Proportions in each category are not really applicable here, but the data can be grouped and treated as ordinal – this is frequently done with measures of age, for example. Such data are also amenable to more advanced analytical techniques.

**Using samples**

A lot of routine management statistics are of the census type – the activity being measured is counted in its entirety, for the whole year. This is not always appropriate – e.g. if you do not have an entry gate, how can you count all your visitors? The reasons for choosing to sample categorise into two main areas – the cost of obtaining information on a census basis, or the practicalities of doing so (which may also be related to the cost).

Sampling methods can be used to obtain information on a wide range of activity. User (and non-user) surveys are the most common types of sample used in libraries, but they can also be used for estimating statistics such as seat occupancy rates, stock condition, in-house use, and so on.

There are three key elements to consider when sampling:

- **Sampling frame** – the population from which the sample is drawn. This might be all library users, all library visitors, all books in a particular area, all library seats. Sometimes there will be a formal list of everyone or everything in the sampling frame (e.g. catalogue records for stock, membership files for members), often there will not (e.g. visitors)
- **Sample design** – how you will select the elements to be included in the sample
- **Sample size** – how many you need to survey

**Sample designs**

The simplest form of sample, at least from a statistical point of view, is the **simple random sample**. This is the design on which all formal statistical theory is founded. In practice, however, it can be extremely difficult to achieve! Selecting elements genuinely at random requires a formal sampling frame, listing all elements in the population, and a set of random numbers to identify the elements which will be included in the sample. This is not as easy as it sounds, and in consequence it is little used in practice except for relatively small-scale surveys.

An alternative, which is statistically equivalent, is the **systematic sample**. You do not need a formal sampling frame for this, although it is helpful to know how large that sampling frame is. A systematic sample is drawn by selecting the first element at random, then choosing every n\text{th} element after that. The method is frequently used for visitor surveys, for example, where every 10\text{th} or 18\text{th} or 25\text{th} visitor will be asked to complete a survey.

For large-scale samples, covering a wide geographical area or large number of service points, the sample may be stratified, or clustered.
• Stratification helps to ensure that all sub-divisions within a population are adequately represented, and can be used to increase representation of minority groups in research studies. It is achieved by dividing the population according to some criterion, then drawing the sample proportionately from each stratum. It can be used, for example, to ensure that every service point is covered in a survey of stock items, or that both students and staff are represented in a user survey.

• Clustering is generally used to minimise the costs associated with sampling from large populations. Again, it involves dividing the population according to some criterion, but then selecting only some of these clusters to be included in the sample. It is frequently used in market research, where surveyors will be sent to a selection of towns for their survey, rather than attempting to survey the whole country.

Another sample design, frequently used in market research, is the quota sample. This is where a range of criteria are used to stratify the sample before the start, usually in considerable detail, and these criteria are monitored as the survey is conducted, to ensure that an exact number of elements from each layer is included. By the end of the day, the researcher on the street may be desperate to find a disabled male aged between 25 and 34 of Asian ethnic origin to answer some questions! For this reason, quota samples are not random, and should be avoided if possible.

A point of caution – leaving a pile of questionnaires on the front desk and hoping for volunteers to fill them in will not give useful results. Although a sample of users will complete them they will be a self selected group, and will almost invariably give a biased result – those who return the forms are usually those with the strongest views, and are unlikely to be representative of the whole.

Sample size
One of the most frequent questions about sampling is – how many? The answer is generally less than you think. There are a number of considerations when determining sample size:

• how much detail is required in the analysis: the greater the level of detail, the larger the sample needs to be to give valid results for the smallest groups

• what margins of error are acceptable: for some applications accuracy within 5% may be sufficient; in other cases only 1% is needed

• the expected response rate: the response rate is important, because the accuracy of statistics calculated from a sample depends on the number of responses, not the number of questionnaires that were issued. Sometimes an incentive – such as a prize draw – can be used to improve response rates

Sample size does not depend on the size of the population – the same level of accuracy will be obtained from a sample of 1,000 out of 1 million, as from 1,000 out of 100 million. The only exception is when the population is relatively small – if the sample is more than 10% of the total population, then you can reduce the sample size slightly without loss of precision.

The general rule of thumb for sample sizes is:

• A sample of 400 will give accuracy within five percentage points either way

• 1,000 will improve this to three percentage points – this is the level generally used in political surveys, for example

• 2,500 will give two percentage points either way
In practice, estimates will often be better than this – the calculations of sample size are done for the worst possible case.

**Questionnaire design**
How you design your questionnaire can have a considerable impact on your survey. Start, as always, with what you want to find out. Think about every question – what information will it give you, and is that what you want to know?

Whether the survey is self-completion or interview style will depend on just what you are doing, and what the population is. Some client groups may have difficulties completing a questionnaire themselves, or you may wish to conduct telephone interviews. Web based surveys are a particular form of self-completion survey, while a survey of stock condition could be thought of as a particular form of interview survey. However you do your survey, the same design principles and considerations apply:

- Clear unambiguous questions
- Clear, easy to follow layout – surveys where respondents skip questions according to previous answers often cause problems
- Length – the shorter the questionnaire, the more likely respondents are to continue until the end
- If you use tick boxes, make sure you have covered all the possible options for answers, or leave space for respondents to comment. Tick boxes are easier at the data entry stage than wordy answers, and amenable to being scanned for example
- How will the data be analysed? It is worth thinking about how the responses are going to be processed as you design the questionnaire, as the format of questions can have a significant effect on the costs of data entry

**Sampling over time**
When estimating visitor numbers, for example, or monitoring processes and services such as speed of reshelving, or the enquiry service, which are not easily monitored continuously, a frequent method is to select one or more time periods to carry out a survey.

If you choose to base your estimates on a single period – a sample week, perhaps to estimate for the year – it is essential to try to choose a typical week, not one which will be exceptional. Even so, exceptional factors can come into play – a real-life example springs to mind of one library that estimated its visitor numbers using a set week in October each year. It avoided school holidays, but could do nothing about the weather, which was so bad one year that their estimate for the annual total fell by over 40%.

It is preferable to look at several weeks spread across the year, if resources allow. Another pitfall to avoid is periodicity in systematic sampling schemes – a sample comprising every 7th day or every 24th hour is not a good idea, even if you don’t start on a Sunday!

**Analysis**
When it comes to analysis, you don’t have to do it all yourself. There is a lot of software out there to help – some designed to work with particular questionnaire forms, others more general. It includes the readily available spreadsheet packages such as Excel and Lotus, which will do much of the descriptive work you need for management statistics, and have some capabilities for more complex analyses, and specialist packages such as SPSS and Minitab which are more geared towards analysis of sample survey data.

The basic principles outlined above apply – keep it simple. Don’t be tempted to extract every last possible statistic from your data – remember what is was you wanted you find
out, and stick to that. Basic descriptive statistics will tell you an awful lot – generally most of what you want to know. If in doubt, enlist professional help, and employ a statistician! They will be able to cut through the figures, and together you can make sense of even the most convoluted set of data.

**Benchmarking**

Benchmarking has been well covered by other papers in this volume. Whatever the purpose of the exercise, however, there is one golden rule – compare like with like. Whether you are making comparisons within your own service, or externally to national standards or other services, this is essential.

Note that some differences – in size of service, for example, or against national standards – can be overcome by comparing ratios rather than absolute figures. This is particularly true of measures which are related to size – issues, expenditure – many of the management statistics which are collected.

Comparing like with like is particularly important when making comparisons over time. Definitions change, and the effects of such changes need to be taken into account. Survey data should be collected on the same basis – you don’t need to survey the same people, but the sample should be selected from the same population and in the same way as before for trends to be valid.

**Presentation**

Appropriate presentation of results is essential to get the message across. Presentation needs to be appropriate to both the type of data you have, and to the audience. The level of detail you report to managers will be different from that which goes into a report for users, which is different again from what is needed for a press release.

One of the key questions is whether to show results as tables or graphs. I would suggest graphs every time – they are much easier for most people to absorb than tables of figures. There is a place for tables – particularly when more analysis might be needed, or the exact figures are of importance, but even then they can be given on a clear graph.

Whichever you choose, the key features are the same – your presentation should have clarity and integrity (i.e. not misrepresent the data). It should be descriptive – and can be enhanced by a written caption or commentary according to need, and it should be appropriate.

There are four basic graphical forms, and the following examples include a table of the same data for comparison. All these examples use real data, based on UK averages and totals.

**Line graph**

Line graphs are used for illustrating trends. Fig 1 shows issues per head of population in UK public libraries over the last ten years. Here the table is complex, although it easy to see a pattern of falling issues. The graph in this case illustrates that very clearly, and also allows easy comparison of the rates of decline in the different categories listed. Adult fiction issues are falling most rapidly, while AV issues have increased slightly.
Fig 1 Book issues in UK public libraries

<table>
<thead>
<tr>
<th>Year</th>
<th>Adult fiction</th>
<th>Adult non-fiction</th>
<th>Children's</th>
<th>AV</th>
</tr>
</thead>
<tbody>
<tr>
<td>89-90</td>
<td>333</td>
<td>129</td>
<td>105</td>
<td>26</td>
</tr>
<tr>
<td>90-91</td>
<td>326</td>
<td>129</td>
<td>105</td>
<td>28</td>
</tr>
<tr>
<td>91-92</td>
<td>325</td>
<td>138</td>
<td>113</td>
<td>30</td>
</tr>
<tr>
<td>92-93</td>
<td>314</td>
<td>136</td>
<td>112</td>
<td>31</td>
</tr>
<tr>
<td>93-94</td>
<td>303</td>
<td>136</td>
<td>112</td>
<td>33</td>
</tr>
<tr>
<td>94-95</td>
<td>289</td>
<td>133</td>
<td>112</td>
<td>34</td>
</tr>
<tr>
<td>95-96</td>
<td>275</td>
<td>129</td>
<td>110</td>
<td>36</td>
</tr>
<tr>
<td>96-97</td>
<td>261</td>
<td>127</td>
<td>111</td>
<td>37</td>
</tr>
<tr>
<td>97-98</td>
<td>246</td>
<td>122</td>
<td>111</td>
<td>37</td>
</tr>
<tr>
<td>98-99</td>
<td>234</td>
<td>114</td>
<td>109</td>
<td>38</td>
</tr>
<tr>
<td>99-00</td>
<td>221</td>
<td>107</td>
<td>101</td>
<td>38</td>
</tr>
</tbody>
</table>

Source: Creaser et al, 2001, p 63

Pie Chart
Pie charts illustrate the proportion of responses falling into each of a number of categories which together make up the whole. Fig 2 shows a breakdown of academic library expenditure, again from the UK, but for a single year. This is actually a double pie, giving the broad overall breakdown into the key areas of staff, information provision, equipment and other operating expenditure, with a secondary picture of how the information provision element breaks down into its key components of books, serials, electronic resources, interlibrary lending and binding.

Fig 2 Breakdown of UK ‘old’ university library expenditure, 1999-2000

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount (£m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff</td>
<td>£128m</td>
</tr>
<tr>
<td>Information</td>
<td>£92m</td>
</tr>
<tr>
<td>Of which:</td>
<td></td>
</tr>
<tr>
<td>Books</td>
<td>£27.0m</td>
</tr>
<tr>
<td>Serials</td>
<td>£48.6m</td>
</tr>
<tr>
<td>Electronic</td>
<td>£8.4m</td>
</tr>
<tr>
<td>ILL</td>
<td>£3.5m</td>
</tr>
<tr>
<td>Binding</td>
<td>£4.9m</td>
</tr>
<tr>
<td>Equipment</td>
<td>£20m</td>
</tr>
<tr>
<td>Other</td>
<td>£17m</td>
</tr>
</tbody>
</table>

Source: Creaser et al, 2001, pp 113, 125

Bar graph
Bar graphs have a range of uses. They can demonstrate proportional breakdowns, or illustrate trends. They are useful for making comparisons of proportional breakdowns, either between categories or over time. Another use is to compare proportions engaging in different activities. Fig 3 shows the proportions of public library users engaged in different activities in their visit to the library. The table is relatively clear in this case, and the figures could be shown on the graph, which has been re-ordered to rank the activities undertaken, and clearly shows that borrowing books is by far the most popular use of public libraries in the UK. A pie chart is not appropriate in this case, as library visitors can undertake several activities in a single visit, and frequently do. Bar graphs may have horizontal or vertical bars. Those with vertical bars are correctly called column graphs.
**Fig 3** Activity in public libraries

<table>
<thead>
<tr>
<th>Proportion of visitors who:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borrow/return books</td>
</tr>
<tr>
<td>Borrow/return cassettes</td>
</tr>
<tr>
<td>Borrow/return CDs</td>
</tr>
<tr>
<td>Borrow/return videos</td>
</tr>
<tr>
<td>Read newspapers</td>
</tr>
<tr>
<td>Seek information</td>
</tr>
<tr>
<td>Use photocopier</td>
</tr>
<tr>
<td>Browse</td>
</tr>
<tr>
<td>Study</td>
</tr>
<tr>
<td>Visit event</td>
</tr>
<tr>
<td>Do something else</td>
</tr>
</tbody>
</table>

Source: Creaser et al, 2001, p 107

**Scatter diagram**

The fourth format illustrated is a scatter graph, which is used to demonstrate the relationship between two measures on the same individual. Fig 4 shows the relationship between book acquisitions and issues in individual service points within one public library authority in the UK. The data table here is extensive, and only a selection has been shown – there are around 75 service points in this authority. The relationship between acquisitions and issues is not immediately clear from the table, but the graph brings out a very strong relationship between the numbers of books acquired and the resulting number of issues.

However, it also illustrates one of the pitfalls of such analyses – this graph is not telling us that the more books you buy, the higher your issues will be – it is telling us that large service points both buy more books and have more issues than small ones. To use this kind of information for internal benchmarking, it is necessary to remove the effect of size from the equation, for example by dividing both figures by the user population.

**Fig 4** County library book acquisitions and issues

<table>
<thead>
<tr>
<th>Acquisitions</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>12,242</td>
</tr>
<tr>
<td>B1</td>
<td>10,730</td>
</tr>
<tr>
<td>B2</td>
<td>7,184</td>
</tr>
<tr>
<td>B3</td>
<td>8,121</td>
</tr>
<tr>
<td>B4</td>
<td>6,075</td>
</tr>
<tr>
<td>C1</td>
<td>2,895</td>
</tr>
<tr>
<td>C2</td>
<td>4,155</td>
</tr>
<tr>
<td>C3</td>
<td>3,572</td>
</tr>
<tr>
<td>C4</td>
<td>4,940</td>
</tr>
<tr>
<td>D1</td>
<td>5,209</td>
</tr>
<tr>
<td>D2</td>
<td>6,213</td>
</tr>
<tr>
<td>D3</td>
<td>4,798</td>
</tr>
</tbody>
</table>

Source: Local authority data, unpublished
References


