Part 1
General Orientation to Research in Business and Management

Chapter 1
Research, Statistics and Business Decisions

'If there is a 50-50 chance that something can go wrong then 9 times out of 10 it will'

(Source unknown)

'39% of unemployed persons wear glasses; 80% of employed persons wear glasses; therefore working stuffs up your eyesight'

(Source unknown)

Content list

By the end of this chapter you will understand:

1 Why knowledge of statistics and research is useful in the world of business.
2 How knowledge of research and statistics would help reduce uncertainty in business decisions.
3 The relative merits of in-house and external consultants.

> 4 The different roles of descriptive and inferential
>   statistics.
> 5 The distinction between basic and applied research.

Introduction

This chapter will provide a general introduction about how statistics and research methods can help to reduce uncertainty and lead to more effective planning and decision making for businesses and their managers.

The relevance of research and statistics to management and business

As our world grows in complexity, it becomes increasingly difficult to make informed and intelligent decisions. Often decisions essential to our well-being must be made with less than perfect knowledge and in the presence of considerable uncertainty. We are continually pressured by economic problems such as inflation, cumbersome taxation systems, fluctuations in exchange and interest rates, excessive demands for scarce and costly power and water resources, and swings in the business cycle. Management structures, employment conditions, and advertising issues continually present changing business environments. Our entire social and economic fabric is threatened by environmental issues such as climate change, pollution, power and water resource problems, by burdensome public and private debt, unemployment, the need for two-income families, unpredictable government interference, and global effects that swamp non-involved countries.

No responsible corporate executive would consider making important business decisions and recommending policy changes without first consulting others and trying to obtain and interpret the facts or data. Sometimes these facts can inform; at other times, they may mislead or deceive. Business people who are illiterate in statistics face a two-edged sword – they are deprived of a powerful tool that may provide a competitive edge, and they are unable to distinguish intelligently between useful and useless statistical information.

> *Statistics and research methods can help to reduce uncertainty and lead to more effective planning and decision making in the business and management fields.*

Let us look at a few specific examples and see how intelligent business decision makers research for relevant data and apply statistics to plan, control, and reduce the uncertainty involved in business decisions.

- An investment advisor calculates the rate of return on a specific kind of investment for the most recent year. He compares this with rates obtained on the same investment in

other years. He also compares this rate with the current rates on other investments in order to provide reliable advice.

- The personnel manager uses data on the proportion of handicapped persons in various job categories to determine compliance with affirmative action legislation and what recommendations need to be made to the CEO on this issue.
- The national marketing manager of a large supermarket chain locates and reviews statistics on income distribution in each region of the country to set prices for a new product. Based on obtained data, decisions may be made to set prices differently for different areas.
- An ammunition manufacturer must be sure that there are very few dud rounds. The only perfect indication would be to fire every round but this is not very practical. What percentage should be fired in order to have a very good indication of what the remainder are like? How safe is this indication? An indication will not be perfect – only probable – so what level of probability is acceptable.
- Given the increasing demand for water supplies in the country over the last 10 years what is the best estimate the National Water Board can make of the likely demand over the next 20 years so that new supplies can be planned.
- The Community National Credit Union Bank has learned from hard experience that there are four factors that largely determine whether a borrower will repay their personal loan on time or default. These factors are (1) the number of years at the present address, (2) the number of years in the present job, (3) whether the applicant owns their own home, and (4) whether the applicant has a cheque or savings account with the bank. It has computer files of information on applicants and on how each granted loan turned out. John Smith applies for a loan. He has lived at his present address four years, owns his own home, has been in his current job only three months, and is not a Community National Bank depositor. Using statistics, the bank can calculate the probability of John repaying his loan on time if it is granted.

All of the above examples have one thing in common. Facilitating decision making under uncertainty is the main purpose of the use of research and statistics. Through the application of precise statistical procedures, it is possible to predict the future with some degree of accuracy. Any business firm faced with competitive pressures can benefit considerably from the ability to anticipate business conditions before they occur. If a firm knows what its sales are going to be at some time in the near future, management can devise more accurate and effective plans regarding current operations and take important decisions regarding inventory levels, raw material orders, employment requirements, and virtually every other aspect of business operations.

What is research?

We have a stereotype of research being something conducted by people in white coats in science labs. But research can be carried out in many contexts. Research is a process of systematic enquiry or investigation into a specific problem or issue that leads to new or improved knowledge. There are many approaches and methods that this systematic investigation can follow from the stereotypic scientific quantitative, objective, replicable

experimentation based on hypothesis testing to more subjective and qualitative face-to-face depth interviewing and participant observation modes. But whatever the general approach or method of investigation in the business field, the aim is to enable managers and consultants deliver informed decisions that generate successful outcomes. A range of different research approaches and methods are briefly introduced below in this chapter although succeeding chapters give emphatic focus to the quantitative approach to business research

What are statistics?

Most people associate the term statistics with masses of numbers or, perhaps, with the tables and graphs that display them and with the averages or similar measures that summarize them. This mental image is reinforced daily by the abundance of numerical and graphical information in newspapers, magazines, and on television screens: on the prices of bonds and stocks, on the performance of businesses and sports teams, on the movements of exchange rates and commodity futures, on the rates of unemployment, on the incidence of poverty and disease, on accidents, crime, water supply, and climate change – the list goes on. It is not surprising, therefore, that people imagine statistics as being concerned with the collection and presentation of numbers.

In reality, the term statistics has four meanings. Depending on context it can imply:

(a)   the actual data;
(b)   characteristics of data such as an average or percentage;
(c)   techniques for the collection, presentation, analysis and interpretation of data for decision making; and
(d)   the science of developing and applying such techniques.

All these meanings are repeatedly illustrated in this text. But overall, the term statistics is a guide to the unknown and best defined **as a branch of mathematics that is concerned with facilitating wise decision making in the face of uncertainty.** It develops and utilizes techniques for the careful collection and effective presentation of data to highlight patterns otherwise buried in unorganized data **(descriptive statistics)**, and proper analysis of such numerical information (**inferential or analytic statistics**).

Only in a world of standardization and cloning in which everything is the same – a bit like *'The Stepford Wives'* – would you not need any statistics. Unfortunately, our world is far more complex than this. You see, if nothing varies, then everything that is to be known about people could be obtained from information from a single person. Generalizing would be perfect since what is true of Jane Smith is true of everyone else. Fortunately, we are not all cloned – yet! Variability is an essential characteristic of life and the world in which we exist. This sheer quantity of variability has to be tamed when trying to make statements about the real world. **Statistics helps us to make sense out of variability.**

Statistics is concerned with the collection, organization, presentation, analysis, and interpretation of data. It enables data to be parsimoniously described and more precisely and objectively analysed than by merely 'eyeballing the columns', or following a hunch. But statistical results should not be equated with the final conclusions of scientific judegment.

Even with a skilfully designed study and the judicious use of statistical methods, the wise decision maker must weigh other factors, such as legal constraints, ethical issues, political realities and costs, with the statistical results in reaching a conclusion and making a wise management decision.

In sum, statistics and research methods are used to conduct systematic investigations to find answers to problems.

Descriptive and inferential statistics

There are two primary types of statistics as applied to business, each with their own purpose. Statistical techniques which are used to describe data are referred to as **descriptive statistics** which summarize sets of numerical data such as production levels, sales by district, and years of employment.

The term descriptive statistics relates to:

- the process of collecting, organizing, and presenting data in some manner that quickly and easily describes these data; and
- the numbers that reduce a mass of data to one or two relatively easily understood values, such as averages, percentages and counts.

Given a mass of numerical data to interpret, it is first necessary to organize and summarize these data in such a way that they can be meaningfully understood and communicated. A computer printout of all the employees of a large organization providing a host of details such as age, sex, length of service, current salary, etc. is unwieldy and with patterns difficult to discern. However, reducing the data to such as average salary for males and females, percentages of employees in different age groups or salary levels, makes the data more understandable. Counts and percentages, such as the count of the number of people now residing in Mexico City and the percentage of those people who possess a mobile phone in the People's Republic of China, the average age of persons making insurance claims for car accident repairs, and the average weekly household expenditure for retired persons are examples of descriptive statistics. Other descriptive statistics involve the collection of data on exports, imports, incomes, and expenditures in order to facilitate the collection of taxes. A look at present-day government publications suggests that the tradition of descriptive statistics aiding government has certainly not died out.

The principles of descriptive statistics give us a pathway for getting from raw scores to a usable summary of data.

Presenting descriptive statistics

Frequently the most useful first step in understanding what patterns and trends exist is to arrange the data in some logical order. The effective presentation of data can lead a production engineer to discover the pattern behind recent breakdowns of motors produced by a firm, or can help a sales manager unravel variations in sales by month, district and type of goods. Output from various assembly lines on a daily basis could be displayed in a table in

which the assembly lines were listed across and days down. Inspection of the data can then provide information about the general pattern of the performance of the particular group. Daily changes, and variations in performance between different assembly lines can be detected. In particular, visual presentation with graphs and charts add to the discerning of patterns. In our example, we might wish to know whether or not there is a relationship between performance and day (does performance decrease on the last working day of the week?) using a histogram. We will consider descriptive statistics and methods of presentation in Chapter 7.

> ***Descriptive statistics** involves the collection, presentation, summarization and description of data so the data can be more easily comprehended.*

Inferential statistics

The second principal use of statistics in business is to allow the manager **to draw better** inferences as to whether a phenomenon such as work satisfaction, or relative demand among competing brands, measured in a sample, can be legitimately generalized to a population. This second use of statistical methods is usually termed **inferential statistics**.

Information about particular small groups is often of little intrinsic interest. If you want to draw meaningful conclusions with implications extending beyond your limited data, statistical inference is the way to do it. The business enterprise is often more interested in determining if the findings from a small finite group are likely to be true for larger groups or for all the potential observations that could be made as in the case of marketing and advertising studies. For example:

- In marketing research, we are often interested in the relationship between advertising and sales. A sample of randomly chosen sales and advertising figures for a company over a given period may be of some interest in itself, but the information in it is much more useful if it leads to implications and inferences about the underlying process – the general relationship between the firm's level of advertising and the resulting level of sales. An understanding of the true relationship between advertising and sales derived from our sample data would allow us to predict sales for any level of advertising and thus to set advertising at a level that maximizes profits. (This involves the concept of regression – see Chapter 16).
- A pharmaceutical manufacturer interested in marketing a new drug may be required by law to demonstrate conclusively that the drug does not cause serious side effects. The results of tests of the drug on a random sample of a defined population may then be used in a statistical inference about the effects of the drug on that entire population who may use the drug if it is introduced.
- A bank may be interested in assessing the potential use and popularity of banking from home using computer links. The system can be tried on a randomly chosen sample of bank customers. The conclusions of the study could then be generalized by statistical inference to the entire population of the bank's customers.

- A quality control engineer at a plant making brake discs for cars needs to be sure that no more than 3% of the discs produced are defective. The engineer will routinely collect random samples of discs and check their quality. Based on the random samples, the engineer may then draw a conclusion about the proportion of defective items in the entire population of discs.

These are just a few examples illustrating the use of statistical inference in business situations.

> *Inferential statistics are used to infer or predict population parameters from sample measures.*

The principles of inferential statistics provide a bridge across the chasm that looms between having data about a sample and having a description of a population. Crossing that chasm to tender a description of a population based on an observation of a sample drawn from that population is called *generalization*.

Inferential statistics comprise the middle section of this book.

Who should conduct research into business organizations and activities?

There are two major options here: in-house versus the external consultant.

1 **In-house.** The research can be conducted in-house by a member of, or team from the organization. The advantages of in-house research include existing in-depth knowledge of the organization so the researcher can hit the ground running. Provided the in-house researcher is personable and able to build positive relations, they can gain collaboration faster than an external consultant can as trust already exists. Conversely, because the internal researcher is known, employees may be wary of giving too much information or speaking the truth if it is unpalatable. Pressure can also be brought to bear on an in-house researcher by more senior staff if they want a particular view/proposal promoted. However, the study can be conducted at minimal cost as the person is already an employee, and since an in-house researcher will remain in the organization they are on hand to prompt follow-up on the recommendations and findings preventing the report simply being filed.

2 **External consultant.** The hire of outside expertise (university academic or business expert from a specialist consultant company) can be costly but if there is no one capable in the company then it is the only way. However, it can take an outsider some time to get to grips with the company's organization, culture and gain employee trust, but the external consultant can be more objective and subject to less bias and pressure than an internal researcher. Once the consultant has finished and left, there is unfortunately less chance of implementation or follow-up.

> ***Business research*** *is the objective and systematic process of obtaining, recording, analysing and interpreting data to discover new information or relationships or expand existing knowledge to remove uncertainty for business decision making.*

Basic and applied research

A way of classifying research is based on the reasons for undertaking the research: either to extend knowledge, or to solve practical problems.

Basic research

This type of research aims to extend the frontiers of knowledge. It may lack practical application in the short term. It is often concerned with developing a theory, further confirmation of an existing theory, providing more knowledge about an existing concept, or developing new perspectives. For example, does the amount of time available to reach a decision affect the balance between task oriented behaviours and socio-emotional behaviours in a group?

Applied research

This focuses on solving a particular business problem. This could be as mundane as *'is mail drop advertising more cost effective than newspaper advertising for pizza sales'*, or *'what sort of offers stimulate demand for our product?'*

Most business research tends to fall into the applied category. Basic research is associated more with longer-term university projects.

It must be emphasized that research is only a tool to assist management to make better decisions. It will rarely eliminate all uncertainty but it will certainly reduce it and form a vital input into the decision-making process.

What you have learned from this chapter

Statistics serve the useful purpose of reducing uncertainty in decision making and facilitates the use of systematic research in the business world to improve the effectiveness and efficiency of business. Statistical procedures help us reduce vast quantities of information to manageable form and to reach reasonable decisions with limited information.

Descriptive statistics summarize data, as you will discover from Chapter 7, while inferential statistics enable researchers to reach an understanding of characteristics of the population from sample statistics without having to measure the whole population – an issue more comprehensively explained in Chapter 9.

There are advantages and disadvantages associated with who conducts business research. Most business research is applied research rather than basic research.

Review questions (Check answers where necessary by referring back to the material above)

Qu.1.1
Descriptive statistics

(a) explain what it is   (c) evaluate what it is
(b) interpret economic policy   (d) find out what it is

Qu.1.2
Compare the main purposes and uses of descriptive and inferential statistics.

Qu.1.3
Discuss in groups and comment on the statement that if managers learned how to conduct research by taking a course such as this there would no need to seek outside consultant help to solve their problems.

Qu.1.4
In class discuss and compose a list of some situations or issues where you believe research will help you as a manager make more effective decisions.

Now visit the Web page for Chapter 1 and attempt the additional questions, problems and activities located there.