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« INTERNATIONAL BUSINESS RESEARCH »

Study guide for independent work and distance learning

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The purpose and objective of the Guide is to provide the students with basic knowledge about methodologies, methods and organization of scientific processes as a part of training for their professional scientific career. International business is considered as a special case of business in general. The different aspects of business research are also discussed in view of business practice. Different fonts are used to mobilize attention of the readers.

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INTRODUCTION. MOTIVATION IN RESEARCH

What makes people to undertake research? This is a question of fundamental importance. The possible motives for doing research may be either one or more of the following:

1. Desire to get a research degree along with its consequential benefits;
2. Desire to face the challenge in solving the unsolved problems, i.e., concern over practical problems initiates research;
3. Desire to get intellectual joy of doing some creative work;
4. Desire to be of service to society;
5. Desire to get respectability.

However, this is not an exhaustive list of factors motivating people to undertake research studies.

Many more factors such as directives of government, employment conditions, curiosity about new things, desire to understand causal relationships, social thinking and awakening, and the like may as well motivate (or at times compel) people to perform research operations.

Research is essentially an investigation, a recording and an analysis of evidence for the purpose of gaining knowledge." It can generally be defined as a systematic method of finding solutions to problems.

A research need not lead to ideal solution but it may give rise to new problems which may require further research. In other words research is not an end to a problem since every research gives birth to a new question. It is carried on both for discovering new facts and verification of old ones.

Features of Research

- It means the discovery of new knowledge
- Is essentially an investigation
- Is related with the solution of a problem
- It is based on observation or experimental evidences.
- It demands accurate observation or experimentation.
- In research, the researchers try to find out answers for unsolved questions
- It should be carefully recorded and reported

The Nature of Business Research

Business research refers to systematic collection and analysis of data with the purpose of finding answers to problems facing management. It can be carried out with the objective to explore, to describe or to diagnose a phenomenon. It involves establishing objectives and gathering relevant information to obtain the answer to a business issue and it can be conducted to answer a businessrelated question, such as: What is the target market of my product? Business research can also be used to solve a business-related problem, such as determining how to decrease the amount of excess inventory on hand.

When deciding whether business research is to be conducted or not, the firm keeps in mind factors like the availability of data, time constraints and the value of the research information to the company. Adequate planning and information-gathering are essential to derive results for business.

Social Research

Social research refers to research conducted by social scientists. It is the scientific investigation conducted in the field of social sciences and also in the behavioral sciences. Social research methods can generally vary along a quantitative/qualitative dimension. While various methods may sometimes be classified as quantitative or qualitative, most methods contain elements of both. Social scientists employ a range of methods in order to analyse a vast breadth of social phenomena; from census survey data derived from millions of individuals, to the in-depth analysis of a single agents' social experiences; from monitoring

what is happening on contemporary streets, to the investigation of ancient historical documents.

The social science research is a systematic method of exploring, analyzing and conceptualizing social life in order to expand, correct or verify knowledge whether that knowledge aids in the construction of theory or in the practice of an art. Business research is actually a type of social research.

Business research covers a wide range of phenomena. For managers, the purpose of research is to provide knowledge regarding the organization, the market, the economy, or another area of uncertainty. A financial manager may ask, "Will the environment for long-term financing be better two years from now?" A personnel manager may ask, "What kind of training is necessary forproduction employees?" or "What is the reason for the company's high employee turnover?" A marketing manager may ask, "How can I monitor my retail sales and retail trade activities?" Each of these questions requires information about how the environment, employees, customers, or the economy will respond to executives' decisions. Research is one of the principal tools for answering these practical questions.

Within an organization, a business researcher may be referred to as a marketing researcher, an organizational researcher, a director of financial and economic research, or one of many other titles. Although business researchers are often specialized, the term *business research* encompasses all of these functional specialties. While researchers in different functional areas may investigate different phenomena, they are similar to one another because they share similar research methods.

It's been said that "every business issue ultimately boils down to an information problem."

Can the right information be delivered?

The ultimate goal of research is to supply accurate information that reduces the uncertainty in managerial decision making. Very often, decisions

aremade with little information for various reasons, including cost considerations, insufficient time to conduct research, or management's belief that enough is already known. Relying on seat-of-the pants decision making—decision making without research—is like betting on a long shot at the racetrack because the horse's name is appealing. Occasionally there are successes, but in the long run, intuition without research leads to losses.

Business research helps decision makers shift from intuitive information gathering to systematic and objective investigation.

Business Research Defined

Business research is the application of the scientific method in searching for the truth about business phenomena. These activities include defining business opportunities and problems, generating and evaluating alternative courses of action, and monitoring employee and organizational performance. Business research is more than conducting surveys. This process includes idea and theory development, problem definition, searching for and collecting information, analyzing data, and communicating the findings and their implications.

This definition suggests that business research information is not intuitive or haphazardly gathered. Literally, *research* (re-search) means "to search again." The term connotes patient study and scientific investigation wherein the researcher takes another, more careful look at the data to discover all that is known about the subject. Ultimately, all findings are tied back to the underlying theory.

The definition also emphasizes, through reference to the scientific method, that any information generated should be accurate and objective. The nineteenth-century American humorist Artemus Ward claimed, "It ain't the things we don't know that gets us in trouble. It's the things we know that ain't so." In other words, research isn't performed to support preconceived ideas but to test them. The researcher must be personally detached and free of bias in attempting to find truth. If bias enters into the research process, the value of the research is considerably reduced.

So, business research is the application of the scientific

method in searching for the truth about business phenomena. These activities include defining business opportunities and problems, generating and evaluating ideas, monitoring performance, and understanding the business process.

This definition makes it clear that business research is designed to facilitate the managerial decision-making process for all aspects of the business: finance, marketing, human resources, and so on. Business research is an essential tool for management in virtually all problem-solving and decision-making activities. By providing the necessary information on which to base business decisions, research can decrease the risk of making a wrong decision in each area. However, it is important to note that research is an aid to managerial decision making, never a substitute for it.

Finally, this definition of business research is limited by one's definition of *business*. Certainly, research regarding production, finance, marketing, and management in for-profit corporations like DuPont is business research. However, business research also includes efforts that assist nonprofit organizations such as the American Heart Association, the San Diego Zoo, the Boston Pops Orchestra, or a parochial school. Further, governmental agencies such as the Federal Emergency Management Agency (FEMA) and the Department of Homeland Security (DHS) perform many functions that are similar, if not identical, to those of for-profit business organizations. For instance, the Food and Drug Administration (FDA) is an important user of research, employing it to address the way people view and use various food and drugs. One such study commissioned and funded research to address the question of how consumers used the risk summaries that are included with all drugs sold in the United States.10 Therefore, not-for-profits and governmental agencies can use research in much the

same way as managers at Starbucks, Jelly Belly, or DuPont. Actually business research applies to all institutions.

Applied and Basic Business Research

One useful way to describe research is based on the specificity of its purpose.

Applied business research is conducted to address a specific business decision for a specific firm or organization. Research conducted to address a specific business decision for a specific firm or organization.

Basic business research (sometimes referred to as pure research) is conducted without a specific decision in mind, and it usually does not address the needs of a specific organization. It attempts to expand the limits of knowledge in general, and as such it is not aimed at solving a particular pragmatic problem. Basic research can be used to test the validity of a general business theory (one that applies to all businesses) or to learn more about a particular business phenomenon. For instance, a great deal of basic research addresses employee motivation. How can managers best encourage workers to dedicate themselves toward the organization's goals? From such research, we can learn the factors that are most important to workers and how to create an environment where employees are most highly motivated. This basic research does not examine the problem from any single organization's perspective. However, Starbucks, or DuPont's management may become aware of such research and use it to design applied research studies examining questions about their own employees. Thus, the two types of research are not completely independent, as basic research often provides the foundation for later applied research.

While the distinction between basic and applied is useful in describing research, there are very few aspects of research that apply only to basic or only to applied research. We will use the term ***business research*** more generally to refer to either type of research. The focus of this text is more on applied research—studies that are undertaken to answer questions about specific problems or to make decisions about particular courses of action or policies. Applied research is

emphasized in this text because most students will be oriented toward the day-to-day practice of management, and most students and researchers will be exposed to short-term, problem-solving research conducted for businesses or nonprofit organizations.

So,basic business research
Research conducted without a specific decision in mind that usually does not address the needs of a specific organization.
It attempts to expand the limits of knowledge in general and is not aimed at solving a particular pragmatic problem.

The Scientific Method

All research, whether basic or applied, involves the scientific method. **The scientific method** is the way researchers go about using knowledge and evidence to reach objective conclusions about the real world. The scientific method is the same in social sciences, such as business, as in physical sciences, such as physics. In this case, it is the way we come to understand business phenomena.

Exhibit 1.1 briefly illustrates the scientific method. In the scientific method, there are multiple routes to developing ideas. When the ideas can be stated in researchable terms, we reach the hypothesis stage. The next step involves testing the hypothesis against empirical evidence (facts from observation or experimentation). The results either support a hypothesis or do not support a hypothesis. From these results, new knowledge is generated.

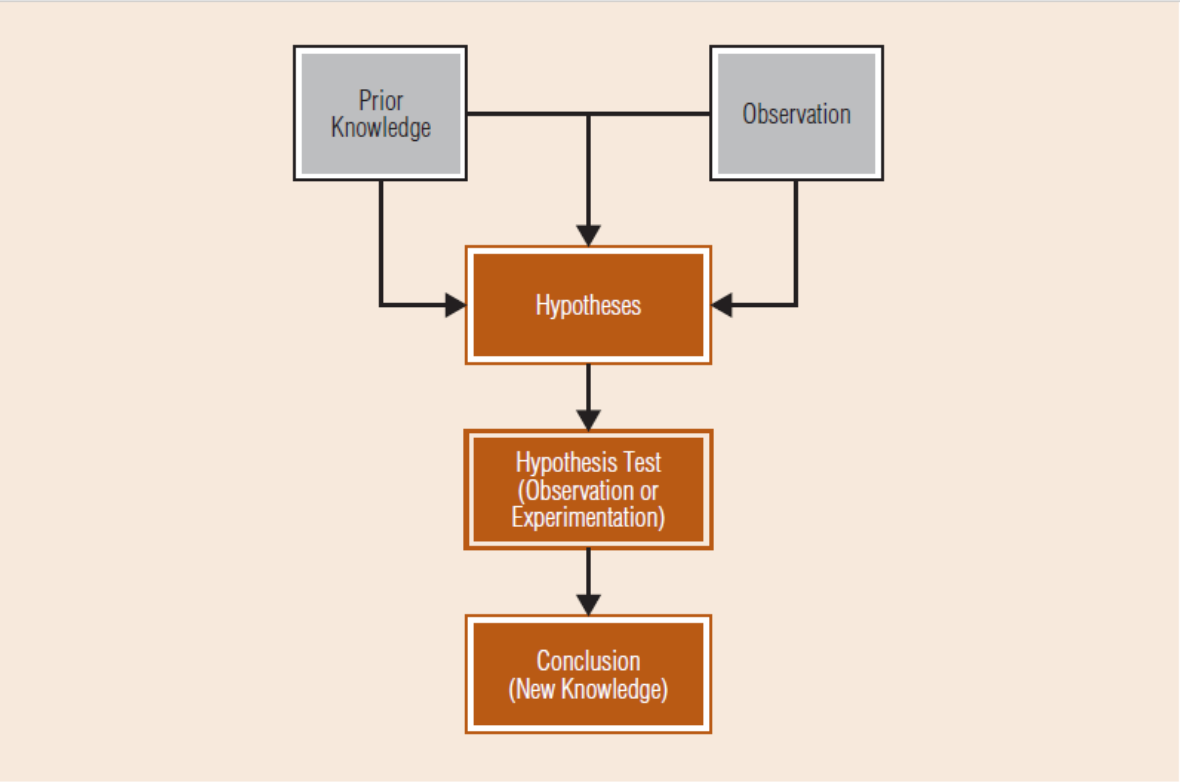


EXHIBIT 1.1 A Summary of the Scientific Method

In basic research, testing these prior conceptions or hypotheses and then making inferences and conclusions about the phenomena leads to the establishment of general laws about the phenomena.

Use of the scientific method in applied research ensures objectivity in gathering facts and testing creative ideas for alternative business strategies. The essence of research, whether basic or applied, lies in the scientific method. Much of this book deals with scientific methodology. Thus, the techniques of basic and applied research differ largely in degree rather than in substance.

So,the scientific method is the way researchers go about using knowledge and evidence to reach objective conclusions about the real world.

Managerial Value of Business Research

In all of business strategy, there are only a few business orientations (see Exhibit 1.2).

Product-Oriented Firm	Example
Prioritizes decision making that emphasizes the physical product design, trendiness or technical superiority	The fashion industry makes clothes in styles and sizes that few can adopt.
Research focuses on technicians and experts in the field.	
Production-Oriented Firm	**Example**
Prioritizes efficiency and effectiveness of the production processes in making decisions	U.S. auto industry's assembly-line process is intent on reducing costs of production as low as possible.
Research focuses on line employees, engineers, accountants, and other efficiency experts.	
Marketing-Oriented Firm	**Example**
Focuses on how the firm provides value to customers	Well-known hotel chains are designed to address the needs of travelers, particularly business travelers.
Research focuses on customers.	

EXHIBIT 1.2 Business Orientations

A firm can be **product-oriented**. A product-oriented firm prioritizes decision making in a way that emphasizes technical superiority in the product. Thus, research gathering information from technicians and experts in the field are very important in making critical decisions.

A firm can be **production-oriented**. Production orientation means that the firm prioritizes efficiency and effectiveness of the production processes in making decisions. Here, research providing input from workers, engineers, finance, and accounting becomes important as the firm seeks to drive costs down. Production-oriented firms are usually very large firms manufacturing products in very large quantities.

The third is **marketing-oriented**, which focuses more on how the firm provides value to customers than on the physical product or production process. With a marketing-oriented organization the majority of research focuses on the customer. Research addressing consumer desires, beliefs, and attitudes becomes essential.

So,1) product-oriented
Describes a firm that prioritizes decision making in a way that emphasizes technical superiority

in the product.

2)production-oriented
Describes a firm that prioritizes efficiency and effectiveness of the production processes in making decisions.

3)marketing-oriented
Describes a firm in which all decisions are made with a conscious awareness of their effect on the customer.

We have argued that research facilitates effective management. For example, Yoplait Go-Gurt illustrates the benefit of business research. The company's consumer research about eating regular yogurt at school showed that moms and kids in their "tweens" wanted convenience and portability. Some brands, like Colombo Spoon in a Snap, offered the convenience of having a utensil as part of the packaging/delivery system. However, from what Yoplait learned about consumers, they thought kids would eat more yogurts if they could "lose the spoon" and eat yogurt anywhere, anytime. Moms and kids participating in a taste test were invited to sample different brand-on-the-go packaging shapes—long tubes, thin tubes, fat tubes, and other shapes—without being told how to handle the packaging. One of the company's researchers said, "It was funny to see the moms fidget around, then daintily pour the product onto a spoon, then into their mouths.

The kids instantly jumped on it. They knew what to do."11 Squeezing Go-Gurt from the tube was a big plus. The kids loved the fact that the packaging gave them permission to play with their food, something parents always tell them not to do. Based on their research, Yoplait introduced Go-Gurt in a three-sided tube designed to fit in kids' lunchboxes. The results were spectacular, with more than $100 million in sales its first year on the market. Yoplait realized that knowledge of consumers' needs, coupled with product research and development, leads to successful business strategies.

As the Yoplait example shows, the prime managerial value of business research is that it provides information that improves the decision-making process. The decision-making process associated with the development and implementation of a business strategy involves four interrelated stages:

1. Identifying problems or opportunities
2. Diagnosing and assessing problems or opportunities
3. Selecting and implementing a course of action
4. Evaluating the course of action

Business research, by supplying managers with pertinent information, may play an important role by reducing managerial uncertainty in each of these .

1. Identifying Problems or Opportunities

Before any strategy can be developed, an organization must determine where it wants to go and how it will get there. Business research can help managers plan strategies by determining the nature of situations or by identifying the existence of problems or opportunities present in the organization.

Business research may be used as a scanning activity to provide information about what is occurring within an organization or in its environment. The mere description of some social or economic activity may familiarize managers with organizational and environmental occurrences and help them understand a situation. Consider these two examples:

• The description of the dividend history of stocks in an industry may point to an attractive investment opportunity. Information supplied by business research may also indicate problems.

• Employee interviews undertaken to characterize the dimensions of an airline reservation clerk's job may reveal that reservation clerks emphasize competence in issuing tickets over courtesy and friendliness in customer contact.

Once business research indicates a problem or opportunity, managers may feel that the alternatives are clear enough to make a decision based on their experience or intuition. However, often they decide that more business research is

needed to generate additional information for a better understanding of the situation.

2. Diagnosing and Assessing Problems or Opportunities

After an organization recognizes a problem or identifies a potential opportunity, business research can help clarify the situation. Managers need to gain insight about the underlying factors causing the situation. If there is a problem, they need to specify what happened and why. If an opportunity exists, they may need to explore, refine, and quantity the opportunity. If multiple opportunities exist, research may be conducted to set priorities.

3. Selecting and Implementing a Course of Action

After the alternative courses of action have been clearly identified, business research is often conducted to obtain specific information that will aid in evaluating the alternatives and in selecting the best course of action. For example, suppose Harley-Davidson is considering establishing a dealer network in either China or India. In this case, business research can be designed to gather the relevant information necessary to determine which, if either, course of action is best for the organization. Opportunities may be evaluated through the use of various performance criteria. For example, estimates of market potential allow managers to evaluate the revenue that will be generated by each of the possible opportunities. A good forecast supplied by business researchers is among the most useful pieces of planning information a manager can have. Of course, complete accuracy in forecasting the future is not possible, because change is constantly occurring in the business environment. Nevertheless, objective information generated by business research to forecast environmental occurrences may be the foundation for selecting a particular course of action.

Even the best plan is likely to fail if it is not properly implemented. Business research may be conducted to indicate the specific tactics required to implement a course of action.

4. Evaluating the Course of Action

After a course of action has been implemented, business research may serve as a tool to tell managers whether or not planned activities were properly executed and if they accomplished what they were expected to accomplish. In other words, managers may use evaluation research to provide feedback for evaluation and control of strategies and tactics.

Evaluation research is the formal, objective measurement and appraisal of the extent a given activity, project, or program has achieved its objectives. In addition to measuring the extent to which completed programs achieved their objectives or whether continuing programs are presently performing as projected, evaluation research may provide information about the major factors influencing the observed performance levels.

In addition to business organizations, nonprofit organizations and governmental agencies frequently conduct evaluation research. Every year thousands of federal evaluation studies are undertaken to systematically assess the effects of public programs.

Performance-monitoring research is a specific type of evaluation research that regularly, perhaps routinely, provides feedback for the evaluation and control of recurring business activity. For example, most firms continuously monitor wholesale and retail activity to ensure early detection of sales declines and other anomalies. In the grocery and retail drug industries, sales research may use the Universal Product Code (UPC) for packages, together with computerized cash registers and electronic scanners at checkout counters, to provide valuable market-share information to store and brand managers interested in the retail sales volume of specific products.

United Airlines' Omnibus in-flight survey provides a good example of performance monitoring research for quality management. United routinely selects sample flights and administers a questionnaire about inflight service, food, and other aspects of air travel. The Omnibus survey is conducted quarterly to determine who is flying and for what reasons. It enables United to track demographic changes and to monitor customerratings of its services on

a continuing basis, allowing the airline to gather vast amounts of information at low cost. The information relating to customer reaction to services can be compared over time. For example, suppose United decided to change its menu for in-flight meals. The results of the Omnibus survey might indicate that, shortly after the menu changed, the customers' rating of the airline's food declined. Such information about product quality would be extremely valuable, as it would allow management to quickly spot trends among passengers in other aspects of air travel, such as airport lounges, gate-line waits, or cabin cleanliness. Then managers could rapidly take action to remedy such problems.

Importance of Research

The main importance of research is to produce knowledge that can be applied outside a research setting. Research also forms the foundation of program development and policies everywhere around the universe. It also solves particular existing problems of concern. Research is important because we are able to learn more about things, people, and events. In doing research, we are able to make smart decisions.

Marketing research is important because it allows consumers and producers to become more familiar with the products, goods, and services around them. Research is important to society because it allows us to discover more and more that might make are lives easier, more comfortable, and safer. It presents more information for investigation. This allows for improvements based on greater information and study. It is very important. Research encourages interdisciplinary approaches to find solution to problems and to make new discoveries. Research is a basic ingredient for development and therefore serves as a means for rapid economic development.

The main importance or uses may be listed as under:

 It provides basis for government policies

 Helps in solving various operational and planning problems of business and industry

 Research helps in problem solving

 Is useful to students, professionals, philosophers, literary men, analysts and intellectuals.

Purpose / Aims / Objectives of Research

1. To find out the truth which is hidden and which has not been discovered so far.

2. Aims at advancing systematic knowledge and formulating basic theories about the forces influencing the relation between groups as well as those acting on personality development and is adjustment with individuals.

3. Try to improve tools of analysis or to test these against the complex human behaviour and institutions.

4. To understand social life and thereby to gain a greater measure of control over social behaviour.

5. To provide an educational program in the accumulated knowledge of group dynamics, in skills of research, in techniques of training leaders and in social action.

Qualities / Characteristics of A Good Research

 A good research must be systematic

 A good research must be logical

 A good research must be empirical

 A good research must be verifiable

 As far as possible common concepts must be used

 Procedure followed in research must be sufficiently described

 Research procedure should be so described that objective of research can be achieved.

Limitations of Research

 Conclusions in research are based upon data collected. Therefore when the data collected are not valid or adequate, the conclusion will not be conclusive or appropriate.]

 Research results in theory

 Activities in a society are influenced by various internal and external factors

Small organizations cannot afford to have research on various issues

 Many people in society depend on customs, traditions, routines and practices for taking decision; instead of going for research.

Research is usually based on sample studies. But in many cases samples are not true representatives. Therefore the research reports based on these samples may not be accurate.

When Is Business Research Needed?

The need to make intelligent, informed decisions ultimately motivates an organization to engage in business research. Not every decision requires research. Thus, when confronting a key decision, a manager must initially decide whether or not to conduct business research. The determination of the need for research centers on (1) time constraints, (2) the availability of data, (3) the nature of the decision to be made, and (4) the value of the research information in relation to costs.

Time Constraints

Systematic research takes time. In many instances, management believes that a decision must be made immediately, allowing no time for research. Decisions sometimes are made without adequate information or thorough understanding of the business situation. Although making decisions without researching a situation is not ideal, sometimes the urgency of a situation precludes the use of research. The urgency with which managers usually want to make decisions conflicts with researchers' desire for rigor in following the scientific method.

Availability of Data

Often managers already possess enough data, or information, to make sound decisions without additional research. When they lack adequate information, however, research must be considered.

This means that data need to be collected from an appropriate source. If a potential source of data exists, managers will want to know how much it will cost to get the data.

If the data cannot be obtained, or it cannot be obtained in a timely fashion, this particular research project should not be conducted. For example, many African nations have never conducted a population census. Organizations engaged in international business often find that data bout business activity or population characteristics that are readily available in the United States are nonexistent or sparse in developing countries. Imagine the problems facing researchers who wish to investigate market potential in places like Uzbekistan, Macedonia, or Rwanda.

Nature of the Decision

The value of business research will depend on the nature of the managerial decision to be made. A routine tactical decision that does not require a substantial investment may not seem to warrant a substantial expenditure for research. For example, a computer company must update its operator's instruction manual when it makes minor product modifications. The research cost of determining the proper wording to use in the updated manual is likely to be too high for such a minor decision.

The nature of the decision is not totally independent of the next issue to be considered: the benefits versus the costs of the research. In general, however, the more strategically or tactically important the decision, the more likely it is that research will be conducted.

Benefits versus Costs

Earlier we discussed some of the managerial benefits of business research. Of course, conducting research to obtain these benefits requires an expenditure of money. In any decision-making situation, managers must identify alternative courses of action and then weigh the value of each alternative against its cost. Business research can be thought of as an investment alternative. When

deciding whether to make a decision without research or to postpone the decision in order to conduct research, managers should ask three questions:

1. Will the payoff or rate of return be worth the investment?

2. Will the information gained by business research improve the quality of the managerial decision enough to warrant the expenditure?

3. Is the proposed research expenditure the best use of the available funds?

For example, *TV-Cable Week* was not test-marketed before its launch. Although the magazine had articles and stories about television personalities and events, its main feature was program listings, channel by channel, showing the exact programs a particular subscriber could receive. To produce a custom magazine for each individual cable television system in the country required developing a costly computer system. Because that development necessitated a substantial expenditure, one that could not be scaled down by research, conducting research was judged to be an unwise investment. The value of the potential research information was not positive because its cost exceeded its benefits. Unfortunately, pricing and distribution problems became so compelling after the magazine was launched that the product was a failure. Nevertheless, without the luxury of hindsight, managers made a reasonable decision not to conduct research. They analyzed the cost of the information relative to the potential benefits of the information. Exhibit 1.3 outlines the criteria for determining when to conduct business research.

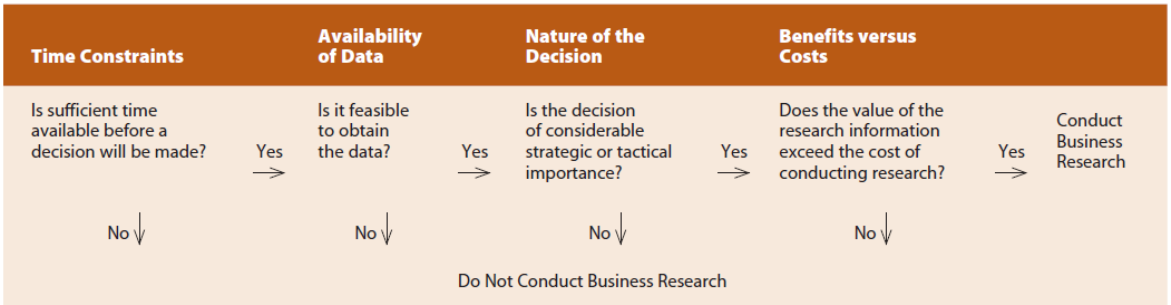


EXHIBIT 1.3 Determining When to Conduct Business Research

Business Research in the Twenty-First Century

Business research, like all business activity, continues to change. Changes in communication technologies and the trend toward an ever more global marketplace have played a large role in many of these changes.

Communication Technologies

Virtually everyone is "connected" today. Increasingly, many people are "connected" nearly all the time. Within the lifetime of the typical undergraduate college senior, the way information is exchanged, stored, and gathered has been revolutionized completely. Today, the amount of information formally contained in an entire library can rest easily in a single personal computer.

The speed with which information can be exchanged has also increased tremendously. During the 1970s, exchanging information overnight through a courier service from anywhere in the continental United States was heralded as a near miracle of modern technology. Today, we can exchange information from nearly anywhere in the world to nearly anywhere in the world almost instantly. Internet connections are now wireless, so one doesn't have to be tethered to a wall to access the World Wide Web. Our mobile phones and handheld data devices can be used not only to converse, but also as a means of communication that can even involve business research data. In many cases, technology also has made it possible to store or collect data for lower costs than in the past. Electronic communications are usually less costly than regular mail—and certainly less costly than a face-to-face interview—and cost about the same amount no matter how far away a respondent is from a researcher. Thus, the expressions "time is collapsing" and "distance is disappearing" capture the tremendous revolution in the speed and reach of our communication technologies. Changes in computer technology have made for easier data collection and data analysis. As we discuss in a later chapter, many consumer household panels now exist and can be accessed via the Internet.

Thus, there is less need for the time and expense associated with regular mail survey approaches.

Furthermore, the computing power necessary to solve complicated statistical problems is now easily accessible. Again, as recently as the 1970s, such computer applications required expensive mainframe computers found only in very large corporations, major universities, and large governmental/military institutions. Researchers could expect to wait hours or even longer to get results from a statistical program involving 200 respondents. Today, even the most basic laptop computers can solve complicated statistical problems involving thousands of data points in practically a nanosecond.

Global Business Research

Like all business activities, business research has become increasingly global as more and more firms operate with few, if any, geographic boundaries. Some companies have extensive international research operations. Upjohn conducts research in 160 different countries. ACNielsen International, known for its television ratings, is the world's largest research company. Two-thirds of its business comes from outside the United States.12 Starbucks can now be found in nearly every developed country on the earth. AFLAC offers its products on multiple continents. DuPont has a significant presence in all regions of the world.

Companies that conduct business in foreign countries must understand the nature of those particular markets and judge whether they require customized business strategies. For example, although the fifteen nations of the European Union share a single formal market, research shows that Europeans do not share identical tastes for many consumer products. Business researchers have found no such thing as a "typical" European consumer; language, religion, climate, and centuries of tradition divide the nations of the European Union. Scantel Research, a British firm that advises companies on color preferences, found inexplicable differences in Europeans' preferences in medicines. The French prefer to pop purple pills, but the English and Dutch favor white ones.

Consumers in all three countries dislike bright red capsules, which are big sellers in the United States. This example illustrates that companies that do business in Europe must research throughout Europe to adapt to local customs and

buying habits. Even companies that produce brands that are icons in their own country are now doing research internationally. Look at Brown-Forman, the parent "Jacques" Daniels experience. Sales of U.S. distilled spirits have declined over the last 10 to 15 years as more Americans turn to wine or beer as their beverage of choice. As a result, companies like Bacardi and Brown-Forman, producers of Jack Daniels, have pursued business development strategies involving increased efforts to expand into international markets. The Brown-Forman budget for international ventures includes a significant allocation for research. By doing research before launching the product, Brown-Forman can learn product usage patterns within a particular culture. Some of the findings from this research indicate:

1. Japanese consumers use Jack Daniels (JD) as a dinner beverage. A party of four or five consumers in a restaurant will order and drink a bottle of JD with their meal.

2. Australian consumers mostly consume distilled spirits in their homes. Also in contrast to Japanese consumers, Australians prefer to mix JD with soft drinks or other mixers. As a result of this research, JD launched a mixture called "Jack and Cola" sold in 12-ounce bottles all around Australia. The product has been very successful.

3. British distilled spirit consumers also like mixed drinks, but they usually partake in bars and restaurants.

4. In China and India, consumers more often chose counterfeit or "knock-offs" to save money. Thus, innovative research approaches have addressed questions related to the way the black market works and how they can better educate consumers about the differences between the real thing and the knock-offs.

The result is that Jack Daniels is now sold extensively, in various forms, and with different promotional campaigns, outside of the United States.

(Sources: Swibel, Mathew, "How Distiller Brown-Forman Gets Rich by Exploiting the Greenback's Fall—and Pushing Its Brands Abroad," *Forbes* 175, no. 8 (2005), 152–155.)

This example shows how Brown-Forman, the parent company of Jack Daniels (the classic American “sour mash” or Bourbon whiskey), is now interviewing consumers in the far corners of the world.14 The internationalization of research places greater demands on business researchers and heightens the need for research tools that allow us to **cross-validate** research results, meaning that the empirical findings from one culture also exist and behave similarly in another culture. The development and application of these international research tools are an important topic in basic business research.

The business research process is often presented as a linear, sequential process, with one specific step following another. In reality, this is not the case. For example, the time spent on each step varies, overlap between steps is common, some stages may be omitted, occasionally we need to backtrack, and the order sometimes changes. Nonetheless, some structure for the research process is necessary.

Summary

Be sure to fully understand the differing roles of exploratory, descriptive, and causal research.

● Exploratory research provides new insights—the domain of discovery in philosophy of science terms—and often sets the groundwork for further investigation.

● Descriptive research describes the characteristics of objects, people, or organizations. Much of business information is based on descriptive research.

● Causal research is the only research that establishes cause and effect relationships. Most commonly, causal research takes the form of experiments such as test markets.

● A major flaw in business research is to not give due diligence to exploratory research (especially secondary data and qualitative research). Instead, researchers often move too quickly to collecting descriptive data.

● A second, and related, flaw in business research is to fail to carefully define the research objective There were six learning objectives in this chapter.

After reading the chapter, the student should be competent in each area described by a learning objective.

1. Understand how research contributes to business success. While many business decisions are made "by the seat of the pants" or based on a manager's intuition, this type of decision making carries with it a large amount of risk. By first researching an issue and gathering the appropriate information (from employees, customers, competitors, and the market) managers can make a more informed decision. The result is less risky decision making.

Research is the intelligence-gathering function in business. The intelligence includes information about customers, competitors, economic trends, employees, and other factors that affect business success. This intelligence assists in decisions ranging from long-range planning to near term tactical decisions.

2. Know how to define business research. Business research is the application of the scientific method in searching for truth about business phenomena. The research must be conducted systematically, not haphazardly. It must be objective to avoid the distorting effects of personal bias.

Business research should be rigorous, but the rigor is always traded off against the resource and time constraints that go with a particular business decision.

3. Understand the difference between basic and applied business research. Applied business research seeks to facilitate managerial decision making. It is directed toward a specific managerial decision in a particular organization. Basic or pure research seeks to increase knowledge of theories and concepts. Both are important, but applied research is more often the topic in this text.

4. Understand how research activities can be used to address business decisions. Businesses can make more accurate decisions about dealing with problems and/or the opportunities to pursue and how to best pursue them. The chapter provides examples of studies involving several dimensions of managerial decision making. Thus, business research is useful both in a strategic and in

tactical sense.

5. Know when business research should and should not be conducted. Managers determine whether research should be conducted based on (1) time constraints, (2) availability of data, (3) the nature of the decision to be made, and (4) the benefit of the research information versus its cost.

6. Appreciate the way that technology and internationalization are changing business research. Technology has changed almost every aspect of business research. Modern computer and communications technology makes data collection, study design, data analysis, data reporting, and practically all other aspects of research easier and better. Furthermore, as more companies do business outside their own borders, companies are conducting research globally. This places a greater emphasis on research that can assess the degree to which research tools can be applied and interpreted the same way in different cultures. Thus, research techniques often must crossvalidate results.

Key Terms and Concepts – Find them in this Chapter:

applied business research, basic business research, business research, cross-validate, evaluation research, marketing-oriented, performance-monitoring research, product-oriented, production-oriented, the scientific method,

Questions for Review and Critical Thinking

1. Is it possible to make sound managerial decisions without business research? What advantages does research offer to the decisionmaker over seat-of-the-pants decision making?

2. Define a marketing orientation and a product orientation. Under which strategic orientation is there a greater need for business research?

3. Name some products that logically might have been developed with the help of business research.

4. Define ***business research*** and describe its task.

5. Which of the following organizations are likely to use business research? Why? How?

a. Manufacturer of breakfast cereals

b. Manufacturer of nuts, bolts, and other fasteners

c. The Federal Trade Commission

d. A hospital

e. A company that publishes business textbooks

6. An automobile manufacturer is conducting research in anattempt to predict the type of car design consumers will desire in the year 2020. Is this basic or applied research? Explain.

Theory and Concept

Theory is one of the main results of research. It is defined as a set of systematically interrelated concepts, definitions and propositions that are advanced to explain and predict a phenomenon. It may also specify causal relationship among variables. A theory is an integrated body of definitions, assumptions, and general propositions covering a given subject matter from which a comprehensive and consistent set of specific and testable principles can be deducted logically. This theory provides a basis for studying consumer ehaviour and formulating appropriate marketing strategies.

Requisites (Criteria) of Theory

Theory starts out as ideas. The criteria to be met by the set of ideas are:

 They must be logically consistent.

 They must be interrelated.

 The statements must be exhaustive.

 The propositions should be mutually exclusive.

 They must be capable of being tested through research.

Role of Theory in Research

1. Theory narrows the range of facts to be studied

2. Theory provides a conceptual framework for a study

3. Summarizes concisely what is already known about the object of study.

4. Theory states a general uniformity beyond the immediate observations.

5. Theoretical generalization can be used to predict further facts.

General Principles Regarding the Use of Theory in Research

1. Knowledge of the existing theory in one's area of research is essential for conducting research.

2. Concepts are crucial components of theory and so their clear definitions are essential to the designing of the study.

3. One should view theory as hypothetical proposition and not as conclusive fact.

4. One should pay attention to all odd and puzzling unexpected observations in one's research and enquire into them. They may be a source for new theoretical approaches.

Methods of Formation of Theory

Deduction: It is one of the important methods employed in theory building. It is a process of drawing generalizations, through a process of reasoning on the basis of certain assumptions which are either self evident or based on observation. By deduction, is meant reasoning or inference from the general to particular or from the universal to the individual.

Eg., All men are mortal (Major Premise)

A is a man (Minor premise)

Therefore A is mortal **(**Conclusion)

The conclusion follows from the two premises logically. Therefore it is valid. The deduction is the logical conclusion obtained by deducting it from the statements, called premise of the argument. The argument is so constructed that if the premises are true, conclusion must also be true. The logical deduction derives only conclusions from given premises and it cannot affirm the truth of given statements. It serves in connecting different truths and thus logical derivation is not a means to find ultimate truth.

Induction: It is the process of reasoning from a part to the whole, from particular to general or from the individual to the universal. It gives rise to empirical generalizations. It is a passage from observed to unobserved. It involves two processes namely observation and generalization.

Induction may be regarded as a method by means of which material truth of the premises is established. Generating ideas from empirical observation is the process of induction. As a matter of fact, concepts can be generated from experience which justifies the description of particular situations towards theory-building. It is generally observed that experience is regarded as a sum of individual observations held together by the loose tie of association and constantly extended by the idea of inductive inferences.

It is generally stated that knowledge is based on the foundations of particular facts. In empirical sciences, we start from the consideration of a single case, go on to prove many cases.

Consider the following illustration.

“I saw a raven in black colour. Other revens seen by me were also black in colour”.

“All ravens are therefore black”.

Inductive method is classified into two types- enumerative induction and analytical induction.

Retroduction: It is a technique of successive approximation by which, the concepts and assumptions of theories are brought into closer alignment with

relevant evidence. At the same time it maintains the logical consistency required of deductive systems.

The purpose of theory is to systematize the data of every experience. The three methods – deduction, induction and retroduction based on the relationships among the observed data, concepts and theoretical assumptions are adopted for generating theory.

Concept

A concept symbolizes a phenomenon and helps to communicate its finding. For instance, labour is a concept. Concepts are logical constructs created from sense impression or complex experiences. It symbolizes the empirical relationship and phenomena which are indicated by facts. A **concept** is an abstraction or generalization from experience or the result of a transformation of existing ideas. The concept is instantiated (reified) by all of its actual or potential instances, whether these are things in the real world or other ideas.

Thus, concepts and facts are not the same. A fact is a logical construct of concepts. The process of conceptualization arises out of abstraction and generalization of sense impression.

Types of concepts

On the basis of origin, concepts may be classified into two categories:

1) **Postulational Concepts:** It has meaning only with reference to some deductively postulated theory. Its meaning will be different when it will be used in some other context or theories.

For instance, the concept ‘function’ has one meaning in Economics and another meaning in Physics.

2) Intuitive Concepts: It has a particular meaning. The meaning is never changed by the people who use it. This type of concept denotes something, which is immediately understood. For example, ‘black’ as a colour, its meaning is abstracted from a wider and empirical context.

Intuitive concepts are divided into two forms (a) those by sensation and (b) those by introspection. Similarly, Postulational concepts are divided into

(a)those by imagination and

(b)those by intellection. However, for the matter of social science research, such classification does not convey any special significance.

Requisites of a concept

 In every field of study, concepts are used to convey special meaning.

 Concepts should be precise, comprehensive and clear. There should be no misunderstanding about them.

 Concepts must not have multiple meaning. It is possible that different terms may refer to the same phenomenon; and there may be danger of overlapping of meaning.

 Concepts should be well understood. A concept may have a very complex series of references. Ultimately there may be an empirical reference. If one empirical reference is not immediate then the concepts will less well be understood.

How to use concepts

In research, the proper concept has to be carefully chosen and its usage should be explained thoroughly. The meaning of a concept does not remain fixed all the time. The meaning of the concept is modified with the accumulation of knowledge. In course of time, some concepts may become outmoded and irrelevant, and therefore, they are to be discarded.

Theory is a statement of the meaningful relation between concepts. Therefore the first stage in the development of a theory is concept formation. A scientific theory is a statement of a specific type of invariance in the conceptual representation of a phenomenon. Therefore, the choice we make in the representation of phenomenon is a critical step in the development of scientific theory.

Theory implies an explanatory relationship. The development and validity of a theory is dependent on the conceptual apparatus used. Concepts are the medium of scientific explanations.

Conceptual definition and theory formulation are two major requirements of unified process of scientific explanation. Formulation of concepts is therefore a major step of one unified process of complex scientific inquiry towards theory building.

Types of Concepts

Definition. A definition states the meaning of a word using other words. This is sometimes challenging. Common dictionaries contain lexical, descriptive definitions, but there are various types of definition - all with different purposes and focuses.A definition is a statement of the meaning of a term (a word, phrase, or other set of symbols). Definitions can be classified into two large categories, intensional definitions (which try to give the essence of a term) and extensional definitions (which list every single object that a term describes). A term may have many different senses and multiple meanings, and thus require multiple definitions. Definition means a careful study of something to learn about its parts, what they do, and how they are related to each other; an explanation of the nature and meaning of something.

Abstraction in its main sense is a conceptual process by which general rules and concepts are derived from the usage and classification of specific examples, literal ("real" or "concrete") signifiers, first principles, or other methods. "An abstraction" is the product of this process—a concept that acts as a super-categorical noun for all subordinate concepts, and connects any related concepts as a *group.*

Analysis means:

1.A systematic examination and evaluation of data or information, by breaking it into its component parts to uncover their interrelationships. Opposite of synthesis.

2.An examination of data and facts to uncover and understand cause-effect relationships, thus providing basis for problem solving and decision making.

***1*:** separation of a whole into its component parts

2 **:** the identification or separation of ingredients of a substance***b*** **:** a statement of the constituents of a mixture

3 **:** proof of a mathematical proposition by assuming the result and deducing a valid statement by a series of reversible steps***b*** *(1)* **:** a branch of mathematics concerned mainly with limits, continuity, and infinite series*(2)* **:** calculus 1b

4 **:** an examination of a complex, its elements, and their relations***b*** **:** a statement of such an analysis

Approach:- a way of considering or doing something.

Axiom:

1**:** a statement accepted as true as the basis for argument or inference **:** POSTULATE SENSE 1one of the *axioms* of the theory of evolution

2**:** an established rule or principle or a self-evident truthcites the *axiom* "no one gives what he does not have"

3**:** a maxim widely accepted on its intrinsic merit the *axioms* of wisdom

An **axiom** or **postulate** as defined in classic philosophy, is a statement (in mathematics often shown in symbolic form) that is so evident or well-established, that it is accepted without controversy or question. Thus, the axiom can be used as the premise or starting point for further reasoning or arguments, usually in logic or in mathematics[1] The word comes from the Greek *axíōma* (ἀξίωμα) 'that which is thought worthy or fit' or 'that which commends itself as evident.

As used in modern logic, an axiom is simply a premise or starting point for reasoning. Whether it is meaningful (and, if so, what it means) for an axiom, or any mathematical statement, to be "true" is a central question in the philosophy of mathematics, with modern mathematicians] holding a multitude of different opinions.

Classification is a general process related to categorization, the process in which ideas and objects are recognized, differentiated, and understood.

A **system** is an approach to accomplishing classification.

Types of **classification:** Classification of customers, for marketing (as in Master data management) or for profitability (e.g. by Activity-Based Costing)

- Standard Industrial Classification, economic activities
- Job classification, as in job analysis
- Product classification
- Classification of wine
- Civil service classification, personnel grades in government
- Library classification, system of coding, assorting and organizing

library materials according to their subject

- Classification by essential signs is called as a typology; it is based on concept of type, as units of a partition of the studied reality, concrete ideal model of historically developing objects (a typology biological, language, etc.).
- Any classification is result of some posterization of the valid sides between types because they are always conditional and relative. To development of knowledge there is a specification and change of classifications.
- Disclosure of volume of known concept is called as division; it occurs by transfer of all types (that is concepts, smaller on volume) which are a part of divisible concept. From here it is clear that only the general concepts covering themselves various parts can be shared; it is clear also that for division it is necessary to have the basis or the principle (principium divisionis) doing possible the correct transfer of the members of its (parles divisionis) received thanks to division.
- subjects (for example, alphabetical catalogs). Such classifications call artificial.

CONFORMITY: ***1*****:** correspondence in form, manner, or character **:** agreement <*behaved in conformity with her beliefs*>

2**:** an act or instance of conforming

3**:** action in accordance with some specified standard or authority <*conformity to social custom*>

CRITERION : ***1*****:** a standard on which a judgment or decision may be based

2**:** a characterizing mark or trait

Model - graphical, mathematical (symbolic), physical, or verbal representation or simplified version of a concept, phenomenon, relationship, structure, system, or an aspect of the real world. The objectives of a model include (1) to facilitate understanding by eliminating unnecessary components, (2) to aid in decision making by simulating 'what if' scenarios, (3) to explain, control, and predict events on the basis of past observations. Since most objects and phenomenon are very complicated (have numerous parts) and much too complex (parts have dense interconnections) to be comprehended in their entirety, a model contains only those features that are of primary importance to the model maker's purpose.

Necessity and sufficiency - In logic, **necessity** and **sufficiency** are terms used to describe a conditional or implicational relationship between statements. For example, in the conditional statement "If P then Q", we say that "Q is **necessary** for P" because P cannot be true unless Q is true. Similarly, we say that "P is **sufficient** for Q" because P being true always implies that Q is true, but P not being true does not always imply that Q is not true.[1]

The assertion that a statement is a "necessary *and* sufficient" condition of another means that the former statement is true if and only ifthe latter is true. That is, the two statements must be either simultaneously true or simultaneously false.

In ordinary English, "necessary" and "sufficient" indicate relations between conditions or states of affairs, not statements. Being a male sibling is a necessary and sufficient condition for being a brother.

Paradox - A **paradox** is a statement that apparently contradicts itself and yet might be true (or wrong at the same time). Some logical paradoxes are known to be invalid arguments but are still valuable in promoting critical thinking.

A **hypothesis** (plural *hypotheses*) is a proposed explanation for a phenomenon. For a hypothesis to be a scientific hypothesis, the scientific method requires that one can test it. Scientists generally base scientific hypotheses on previous observations that cannot satisfactorily be explained with the available scientific theories. Even though the words "hypothesis" and "theory" are often used

synonymously, a scientific hypothesis is not the same as a scientific theory. A working hypothesis is a provisionally accepted hypothesis proposed for further research.

PLANNING OF RESEARCH AND RESEARCH PROCESS

Actually a planning of research starts with **study of the literature**.

What kinds of literature should we search for?

At an early stage in trying to identify a research project, any kind of literature may help us. So a Google search (www.google.com) or using Wikipedia (www.wikipedia.com) or any other general search engine will help us experiment with key words until we begin to find material which is helpful.

As soon as we get a clearer idea of what is out there, we need to identify specific kinds of literature, so that we can judge the relative merit of what we find for our research study.

Primary literature sources.

These are the sources, which are the least accessible, often being company literature or unpublished research, private correspondence and can include conference proceedings. What is their value? In some cases this is very valuable information, which relates directly to the research problem in which you are interested. For example, suppose you are researching corporate advertising to children, an area, which is sensitive. Much information about what companies decide, and why, will be contained in company documents and emails. However access to primary sources is becoming easier as the web provides an instant publishing medium.

Blogs and personal websites are able to bring primary literature directly to the public, however we should bear in mind that in such direct personal publication, there is no vetting or monitoring process as there usually is in a secondary source. DO NOT confuse primary literature sources with “primary

research". The latter means research you have conducted yourself for a specific purpose (which produces more primary literature ie yours).

Secondary literature sources.

These sources are much more easily available in the public domain. They include published books and articles in journals, news media and published business, government and international body publications. Why are they secondary sources? Usually they reproduce in a different format what was original primary work. For example, a researcher will often first reveal their findings at a relevant conference and these may get published later in an academic journal. Similarly business consultants will report research findings to their clients - often the company in which or for which the research was completed - but later may seek permission to disseminate findings more publicly, perhaps in an anonymised or generalised form, in a professional journal or news report.

Value is high but information in these publicly available media is likely to be less current than primary sources, due to the time it takes to check, review, authorise and publish. However, the web is making a huge difference here. Already many academic journals and professional publications are available fulltext on the web. In some cases, there is no time difference between primary and secondary sources.

For academic research, peer-reviewed journals, such as the Journal of Management Studies, are considered more reliable sources than trade magazines or news channels, as the material will have to by monitored by experts in the relevant field, who are not in the business of selling publications. Textbooks may also be peer-reviewed to some extent, but due to the time lag of publication, and the need to reach a wider readership in order to recoup the costs of publication, they tend to be less specialized than journal articles and possibly less current.

It is also possible to find academic journal articles which are themselves reviews of academic literature. While most articles will relate studies to the published field, a published literature review will provide a deep and wide range critique within a particular field. Of course, the review will only be useful at a time

close to its publication, since there will usually be additions to the field after that time which are not included. There is a rigorous method for undertaking such reviews, known as “systematic review"’. Such systematic reviews enable findings to be checked by readers as they show an audit trail of review, and are usually high quality scholarly works.

Consider doing a brief search using either Google Scholar (www.scholar.google.com) or another database or search engine such as Emerald for a “systematic review” of an area of business literature. Read the abstract, or the full article if you prefer, and familiarise yourself with a good quality literature review.

Tertiary literature sources.

These are collections of, or gateways to, secondary sources. They include encyclopedias, dictionaries, citation indexes, catalogues and web-based portals, databases and journals’ contents pages. We use tertiary sources to track down secondary literature which is relevant to our field of study.

Useful lists and details of primary, secondary and tertiary literature sources are given in most business research methods textbooks.

Most of you will have received guidance on literature searching at some point in your studies. Just in case you don’t remember it, or you would like a refresher, here are some tips.

Sometimes searching for academic literature is simple. You want academic information on a specific topic or by a particular author. You put the information into a web search engine and there it is.

But sometimes it can seem like looking for a needle in haystack.

For these times, consider a **3 stage search for literature**:

Stage 1

1. First, make sure you are using appropriate search terms. Perhaps you don’t know enough about the topic to use the right vocabulary for searching. Or someone mentions a theory or idea, which means nothing to you. As a first step, just enter whatever you do know into Google or Wikipedia. Remember that to

narrow a search engine search you need to lengthen (ie make more specific) the search string. E.g. rather than just looking for “motivation”, try more detail “Herzberg's theory of motivation”. Hopefully that will bring you fewer and more relevant results.

2. Are there American words and spellings to look out for? Use AND & OR to refine your search. Use ‘truncation' (e.g. sociol+ to find sociology or sociological). Use 'wild cards' (e.g. p*diatrics to allow for different spellings of paediatrics or pediatrics).

3. Once you have some results, scroll through and look for academic domain names in your results. E.g.....ac.uk or ....edu.au Such academic sites are more likely to give you reliable general information. There are often course outlines on the web for HE courses, which give basic information on topics or theories. Use these academic links to find more vocabulary to describe your topic search. A little reading at this point will help you narrow your second stage search.

4. Alternatively, you could look in a relevant book for useful keywords and definitions.

Stage 2

5. Now you have better vocabulary to describe what you are looking for, try a relevant database or portal (tertiary literature source). Examples for business research are Emerald (www.emeraldinsight.com good range of academic management journals, often fulltext), ABI/Inform Global (www.ovid.com wide range of periodicals and reports), Business Source Premier (www.search.epnet.com again a wide range of journals but also useful sources such as Harvard Business Review, Academy of Management Review and professional journals), and the Social Sciences Citation Index (www.wos.mimas.ac.uk this only has abstracts and titles but gives a wide search of what is currently being published in the social sciences).

6. Within the portal or database, use your more specific search terms and make sure you are looking in the right place e.g. full text or abstract or keywords rather than journal title.

7. Hopefully this search will find some useful academic articles. Read the abstracts and if they look appropriate, try to go to fulltext if available. If not available go to step 9.

8. Consider downloading 3 academic articles, which relate, to your chosen topic. If they are fulltext, then scroll straight to the reference list at the end. Compare them and see which authors and works appear in more than one of the three lists. If you find some, you have probably found important academic sources on your topic. Go back to your academic database (such as Emerald fulltext) to key in these author names or titles to find good quality information on your topic.

Stage 3

9. Often the fulltext version of the articles you want is not available. It may ask you to subscribe or pay, or it may simply not be online as fulltext. In this case, print off the abstract and journal details of articles and take them to your library. In some cases an inter-library loan or a photocopy can be procured for you.

10. Don't gi.ve up on important articles just because they aren't fully online. Physically going to the library may lead you to other similar information which is also not online. Also books! Loans of articles and books can take some time.

11. Finally, remember that searching for relevant literature is just one, quite time-consuming, stage of research. Leave plenty of time to do this, because much of what you find and read will not be useable in your final research study, but without searching and reading a wide range of literature, you are less likely to find the really appropriate sources that you need.

How do we know when we have found enough?

It is impossible to answer this question accurately. However, when you begin to find references to the same ideas and authors in several articles you have found, you should start to feel more comfortable that you have covered a good range of the literature for this topic. While you are still discovering yet more and more angles to the topic in your reading, keep on reading.

In most academic domains there are "seminal" articles or books, which are widely cited by other authors in the field. These are usually important to read,

preferably in the original version if you can get hold of them. They will be the key pieces of literature, which have shaped the thinking of researchers and practitioners in the field. We had an example of this in the last chapter w'hen we discussed interpretivist research approaches and mentioned Weber (1947). Many writers on research methods, and sociology and philosophy, use his work, so although it was written many years ago, it is still widely cited.

How up to date should references be?

As just mentioned, seminal works may go back a very long way in time. However, if we are discussing a relatively modern issue, for example employment protection legislation, then we need to use absolutely up to date references to show we understand current trends. It is not that older articles are less important, just that they may have been superseded in the field. Some academic journals regularly invite contributors to critique or respond to new articles. If you are using one of these journals (an example would be ALT-J on learning technology published by Taylor and Francis), then it is worth reading through the response articles as they often produce valuable critiques of the main article. As a general rule, look for academic references within the last three years for preference, going back further if you cannot find enough useful material.

If you are using professional journal or media information (e.g.in UK Financial Times or People Management, a professional FIRM magazine) then aim to use very current material, within the last two years if possible. Out of date news items are rarely useful in academic work, unless you are doing a historical analysis. If you are using professional journal or media information (e.g.in UK Financial Times or People Management, a professional FIRM magazine) then aim to use very current material, within the last two years if possible. Out of date news items are rarely useful in academic work, unless you are doing a historical analysis.

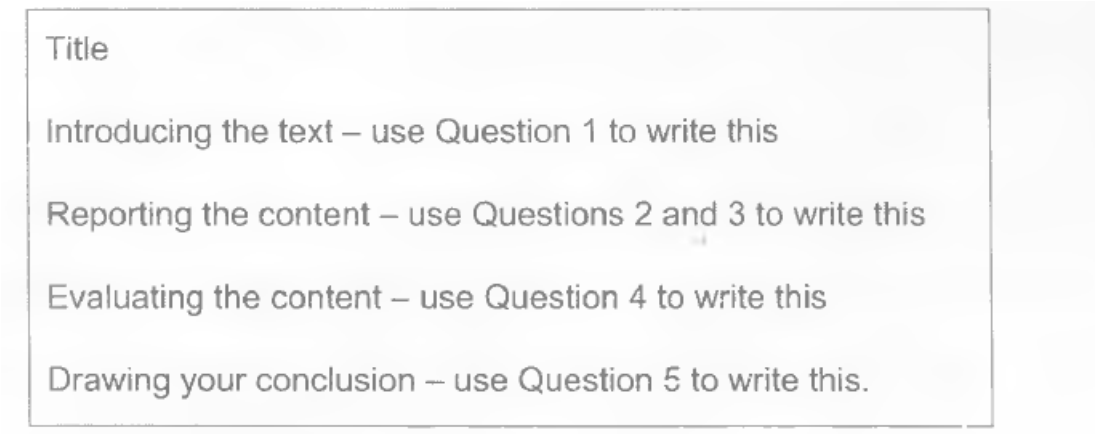
Critical analysis of literature

2.5.1 What does "critical" mean?

The following table is an extract from The Study Skills Handbook (Cottrell, S 2003 p232). You might consider using this when you are drafting a piece of

work. Check for those parts of your writing, which do the things on the left, and look across to see how you can redraft them into a critical analytical style.

Descriptive writing	Critical analytical writing
States what happened	Identifies the significance
States what something is like	Evaluates strengths and weaknesses
Gives the story so far	Weighs one piece of information against another
States the order in which things happened	Makes reasoned judgements
Says how to do something	Argues a case according to the evidence
Explains what a theory says	Shows why something is relevant or suitable
Explains how something works	Indicates why something will work (best)
Notes the method used	Identifies whether something is appropriate or suitable
Says when something occurred	Identifies why the timing is of importance
States the different components	Weighs up the importance of component parts
States options	Gives reasons for selecting each option
Lists details	Evaluates the relative significance of details
Lists in any order	Structures information in order of importance
States links between items	Shows the relevance of links between pieces of information
Gives information	Draws conclusions



When you are producing a literature review which will compare a number of articles or chapters about a subject, if you have completed the synopsis questions, again you have a ready-made set of information with which to compare articles:

So a comparative critical summary would take this structure:

Title
Introducing the text – use answers to Question 1 for all texts
Reporting the content -- use answers to Questions 2 and 3 for all texts to answer this (you can synthesise the answer rather than dealing with each one in turn)
Evaluating the content – use answers to Question 4 for all texts to answer this (you can easily compare each text this way)
Drawing your conclusion – use answers to Question 5 to compare how useful each of the texts is in relation to your research question.

Are there different ways of reading academic literature?

It is always tempting to read without writing. Reading for academic purposes, however, invariably means reading with a computer to hand, or pen and paper, so that notes can be made during reading. Even just highlighting important extracts as you read can be futile if you are not going to go back over the highlighted text and read it again to make useful notes.

What kind of notes do you make? First it will be vital that you note down bibliographic details if you are making notes outside the text itself (on a separate piece of paper, in a notebook, in a database or citation software). Always remember key details such as volume and issue numbers of journal articles, access dates if retrieving articles online, editors if you are reading a contributed chapter in a book. On top of this, we need to note responses to what you are reading e.g. surprise, disbelief, admiration, links to other things you have read, questions. Doing this helps to ensure you don't just record a description, but that you are starting to respond critically to what you read.

2.5.4 Should I deal with each reference separately in the literature review?

It is possible to do this, but it is not best practice. If you look at an article from a peer-reviewed academic journal such as Personnel Review, you will rarely find a section on the literature, which deals with each piece separately. Instead you find that authors summarise and synthesise ideas from the literature, listing references together where they all take a particular perspective, discussing them

separately only when the difference between them is important to the article or research study.

This means that we can start to see some stages in preparing a literature review:

• General keyword search to learn about the topic area

• More specific search (online and in libraries) to identify high quality literature (academic and professional) which relates to the topic area and research questions

• Using really relevant and good quality articles to identify others in the field through their bibliographies

• Reading as much of what we find as possible until we are not finding new ideas

• Noting in a retrievable format not only what these articles and chapters say but their bibliographical details (including access dates for web material) and your critical responses to them and links w ith other literature (similarities, differences)

• Reviewing notes and discarding items which do not fit the research study

• Making new notes of the themes in the relevant literature

• Writing the literature review on the basis of these themes, including appropriate referencing.

• Summarising what you have learned from the literature review relating to your research study. For example, what gap your primary research needs to fill, or what hypotheses you could test from the literature.

2.5.5 Should I include my own opinions?

Just recording your likes and dislikes about a piece of writing is insufficient, since this just tells us about you, not about the piece of writing. Often universities spend some time encouraging students not to include their own opinions in their academic work, and this is because many students do include very subjective reactions to theories, models or concepts, without arguing logically for their view or supporting it with evidence from published literature.

However, your opinion is important. Provided your opinion is based on evidence and logic, and is expressed fairly and objectively, it is valuable. You will find that the simplest place to express your opinions, and develop them, is by posting messages in the discussion forum - recording your responses to what you read for the module. A discussion forum thrives on argument and people expressing ideas and being open to others' ideas. However, your academic assignment will need more careful and cautious monitoring of how you express your views, to ensure that you express a balanced view, having weighed up, and referenced where possible, both sides of an argument.

Consider searching for an academic article, preferably a systematic review as mentioned above, on a business topic which interests you, follow the general search advice in these notes until you have tracked one dow'n. Read and make notes on the article and then develop a 250 word critical response to the article, using the technique described above. This should provide you with useable notes for revision later, as well as good notes on the article if you are using it for an assignment.

Using Harvard referencing style

For any research of professional standard, consistent referencing of all sources of information used is vital. You will already have been doing this in your degree course, but at this stage in your studies you will be penalised if the referencing style is not correct. When you have produced your own research studies and published them, you will want them to be correctly referenced so that no-one uses your work without attributing it to you.

The Harvard style is the most common referencing style in use in universities across the world, but other styles do exist. The main point about Harvard style is that it does not use footnotes, which can interrupt the flow of the text, and its bibliography is ordered alphabetically by author surname. Most in-text referencing includes simply the author surname(s) and year of publication, plus page number if a direct quotation is given. This means it is easy to find that reference in the surname ordered bibliography.

The basic bibliographic style is author, year of publication, title, publisher, so even for web pages without clear guidance on referencing, we have to look for an author (perhaps the institution hosting the site?), a year of publication (is there a recent revision or last updated date?), a title (even of the page used) and a publisher (this could also be the hosting institution).

For more detailed guidance, especially on referencing personal correspondence and electronic sources, try this Australian website:

http://www.usq.edu.au/library/help/ehelp/ref_guides/harvard.htm

Questions for self review

1. Why are critical reviews of relevant literature important in research studies?

2. What are the three main types of literature source and what are the key differences between them?

3. If you were advising a novice researcher, how would you suggest they find useful published work?

4. What should you include in the bibliographic details of a chapter written by three contributing authors, within an academic textbook?

5. How can the five critical synopsis questions from Wallace and Wray help you to avoid “description” in literature reviews?

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Weber, M. (1947). *The Theory of Social and Economic Organisation. Translated by A.M.Henderson and T.Parsons.* New York, Free Press.Business Research Methods Putting the problem into context...

Choosing research approaches and strategies

"Whether we are considering the physical sciences, the life sciences or the social sciences, the research process begins with an interesting thought about the world around us. Without this there is no research. The interesting thought or research question is the common starting point of all research work in all fields of study. From this point research is always concerned with the emergence of theory whereby concepts and notions develop through the application of ideas, the observation of evidence and the evaluation of results. It is worth always keeping in mind that the final result of research is to add something of value to the body of theoretical knowledge. " (Remsnyi, D 2002)

This is a great starting point, because this chapter is about how you start a research study - and the first step is usually a thought or an idea or an unsupported opinion. But do we really start there? Or do we have to take account of what is already there in our minds? For example we may have strong opinions, or no opinions, about reality, the world, politics, history, people etc. When that "original thought" occurs to us, it comes up already embedded in a context of what we already think we know about the world.

You might like to look online for an article by Bannister (2005 see bibliography) which has an intriguing discussion of "realities" and the kinds of

filters applied by people directly experiencing an event, researchers looking at the event through their eyes and readers of that research applying a third set of filters to reality.

We earlier discussed ideas about positivist and interpretivist research approaches. Basically this is a debate about the nature of knowledge, which is also called "epistemology". Questions asked are "to what extent can we know something is true?" "does a phenomenon (e.g. gender discrimination at work) have an objective existence, or is it only existing in the minds of those who discuss it?

Can we investigate it directly, or must be interpret its meaning from what people say about it?

Then there is "ontology". We have already begun to look at ontology through discussion of objectivism and constructivism. This is like epistemology but deals not with the nature of what we can know or reveal as "true" but with the nature of social entities such as organizations. Again the question is how and if they exist.

We regularly refer to teams in business studies. What are teams? An objectivist view of a team is that it exists in itself, beyond the team members. A constructivist view of a team is that every time team members interact, they have a concept of team which is there in their minds and which can alter over time depending on how they interact, but does not have an independent reality.

Questions like this are relevant to business research because they will affect the kind of research strategy we choose. A further idea which will be helpful in looking at where researchers are coming from is the idea of paradigm.

Identify differing research paradigms for business.

What is a paradigm? Try web-searching for the word "paradigm". Is it only researchers and academics who use this term?

Is it helpful - or could you find a better word which is less academic? Kuhn (1970) describes it as a cluster of beliefs, which guide researchers to decide what should be studied and how results should be interpreted.

Saunders, Lewis and Thornhill cite research by Burrell and Morgan (1979 cited pi

12) which offers four paradigms for social sciences research, within which business research is just one type:

• Functionalist (problem-solving and rational approach to organizations)

• Interpretive (organizations only understood through perceptions of people about those organizations)

• Radical humanist (organizations are social arrangements and research is about changing them)

• Radical structuralist (organizations are a product of structural power relations, where conflict is inherent)

These paradigms are held by the authors to be inconsistent with each other, in other words, if you hold one paradigm, you cannot also hold a different one. They therefore foster different research methods and focus on different areas for study.

For example a functionalist paradigm takes a classic survey approach to issues, which are thought to have objective reality. A climate survey of employees would be an example, made to assess something "real" how employees feel about working in an organization, and using a questionnaire with both quantitative and qualitative questions to gain descriptive responses about that ''reality".

An interpretive paradigm uses a qualitative research method such as discourse analysis, unstructured interviews to investigate perceptions and constructions of reality by "actors" in organizations, i.e. employees, managers, shareholders etc.

A radical humanist paradigm would suggest again a qualitative method but looks not necessarily at the perceptions of social actors in the organization but seeks to probe a deeper level of values and social definitions, which underpin the organization. A relevant method would be grounded theory, which looks for theory through a structured method of investigation of what is said or written (inductive) and produces categories of idea, w'hich can then be used to characterize, develop or change organizations.

A radical structuralist paradigm may suggest a histoiical analysis of power in the organization, by developing case studies or seeking to symbolize transactions between actors in the organization, for example an analysis of employee relations

over time.

This is one attempt to pull together the ontological and epistemological debates about conducting social science research. It is the ontological and epistemological stance of the researcher which affect the methodology and specific methods they choose for their research. Does this make sense to you?

We are talking about how you think about the world and the stuff you find in it; for example whether you believe in objective truth, or whether you find all things subjective. What kind of status business organizations have, and the policies and plans and structures and cultures they develop. As researchers we have to develop a clear sense of how we understand the world so that we don't make the mistake of thinking everyone else thinks about it the same way. We have to learn to be as objective as possible, to recognize when our assumptions and philosophies may cloud our thinking and try to dispel them for the purposes of research.

Key differences between qualitative and quantitative research methods and how and why they may be mixed

You can have integrated paradigms as just mentioned, but you can also have a mix of qualitative data from a case study approach and the perspective of "grounded theory" (Glaser, B and Strauss, A 1967; Locke, K 2001; Strauss, A and Corbin, J 1998) and quantitative data from a subsequent survey. We will go into detail about grounded theory when we cover qualitative data analysis. For now, you should know that this approach is interpretive, as written and verbal data are collected and transcribed so that the texts can be fragmented into ideas, categories and themes by the researcher. So such a mix involves mixed methods as well as an integrated paradigm.

Research approaches or strategies need to be seen as related but distinct from the actual methods used in research. Make sure you understand what methods are; for example: experiment, interview, survey, case study, action research, grounded theory, ethnography, archival research. This is by no means an exhaustive list of research methods, but it is a useful broad range to keep in mind at

this stage.

Why should a business researcher want to mix qualitative and quantitative research methods?

It is increasingly usual for business research to mix methods of data collection and analysis. This can be done by using different data collection methods which are all either quantitative or qualitative (e.g. web and paper survey, or interviews and focus groups; (a multi-method approach), or you can use both qualitative and quantitative data collection and analysis methods (e.g. survey and interview and action research) (a mixed method approach). One of the reasons for this is "triangulation" where different methods of data collection and analysis will both enrich and confirm the picture you collect of a situation. Often survey results are used to map out a broad view of the research question, and to provide themes or areas for investigation in more depth through interview. Triangulation can also provide a check on findings from a particular method.

It will also be important to decide whether research should take a point in time approach, i.e. look at a phenomenon (a new training course, induction process, technology, product launch) at a particular time from the perspectives of more than one person - this is cross-sectional research, or whether you have the opportunity to look at a phenomenon over a time period (for example tracking a new product from launch to maturity, looking at industry trends over time, or following cohorts of new employees through their employment over an extended period) - this is a longitudinal study. Most academic studies for qualifications tend to be cross-sectional as they are completed in a very limited time period.

Longitudinal studies usually require external funding to protract the period of research.

Criteria of validity and reliability in the context of business research

Reliability

Another term for consistency or repeatability over time. Reliability is required of research studies. We must try to design research which is auditable i.e. transparent

and clear so that the reader can either undertake the same method themselves and produce the same results, or at least the method is clear enough to instill confidence in the reader that the results were not fudged in any way. (Triangulation will help here).

Make sure you understand the concepts of participant error, participant bias, observer error and observer bias.

Validity

There are three main ways of characterizing validity in research studies. It is important that research methods have "face validity" and "construct validity" and "internal validity". Face validity means effectively that the non-researcher or lay person can broadly see that this is a valid method of researching this question "on the face of it" it makes sense as a method. Face validity is important to encourage participation in surveys or interviews, as well as other experimental or research designs. We want to be able to answer the question "why do you want to know that?".

Construct validity is a more complex idea and means that the method must actually measure what you think it measures. There are, for example, statistical ways of checking surveys and questionnaires to check that the questions are really asking what you think (factor analysis and item response theory).

Construct validity is particularly important in questionnaires which are not administered face to face by a researcher but sent by post, email on done online, as there is no chance then to discuss and clarify the meaning of a question. Sometimes results can be invalidated because respondents have misunderstood a question and answered in a way which was not intended. This is also referred to as "measurement" validity. We can illustrate this idea by the famous IQ test which was intended to measure intelligence (IQ stands for Intelligence Quotient) but includes items which bias towards particular ethnic groups and educational norms.

Or we could ask the question, do examinations test knowledge? Is their measurement validity strong? Or do they actually test something else, for example examination technique?

Internal validity relates to causality, i.e. does factor X cause factor Y to happen? It is sometimes easy to assume causality when in fact there is only association of two factors. For example, does strong motivation cause or lead to effective teamwork, or does effective teamwork lead to or cause strong motivation? In this case causality can work either way or may be quite independent concepts. We cannot assume causality either way. In business research it is easy to make assumptions about a factor (or "independent variable") causing an effect (or "dependent variable). To test internal validity we have to ask the question, does the independent variable account completely for a change in a dependent variable, or are other factors affecting this outcome. Usually in business organizations, there are very few simple cause and effect relationships. Does a performance bonus make someone work harder?

Other kinds of validity which are sometimes talked about include: external validity (this is more often called generalizability, ie can we generalize the results of our study to other contexts or situations?) and ecological validity (this relates to whether the act of researching a situation itself has an effect on that situation; it may be that findings from a business research study are clear within the study, but when applied to a different "ecology" ie outside the research study in "real life", they no longer apply).

Your choice of research strategy or design

A research design is a grand plan of approach to a research topic. It takes quite a lot of work and reading, as well as simply understanding your views as a researcher. For a start, there will be no one right way of conducting business research - this will depend on a number of factors such as research topic, audience for the research (you, your university tutor or your company for example), time and other resources available to you, and the kind of study which is considered appropriate for that topic. There will also be other practical considerations such as access to information and people.

Suppose you wanted to investigate what shoppers thought about a particular marketing strategy- associated with an organization. Can you stand outside its shop

and ask passers-by questions? From an academic perspective, it is never that simple. There are ethical issues (you would need permission from the retailer to stand outside accosting customers), practical issues (you may cause an obstruction or even a breach of the peace in a public place!), sampling issues (which ones do you talk to because you will have to make a choice), what language will you use for your questions (relevance to the interview subject, their ability to understand the questions), their motivation to respond (why should they? Do you offer an incentive? Will that affect results?) and how do you analyse the results (quantitative analysis of tick box answers? Textual analysis of their comments? Both? Record their body language as well?). And so on. Many of these questions are practical and detailed, but underpinning your approach there will be philosophical assumptions which you must make explicit.

So designing your research will be vital and choosing a strategy will mean you have considered your views on truth and knowledge, social entities, what business research can and cannot achieve and how- all this will affect what you actually do to answer a research question.

So we have talked about the underpinning role of philosophy and research strategy , which then guides your choice of research method (e.g. survey, interview, grounded theory etc) and whether they should be mixed, i.e. both qualitative and quantitative. These questions need settling and justifying before you rush off to ask people questions.

Questions for self review

1. Review the ideas of epistemology/ontology, research paradigms, validity and reliability, mixed and multi-methods and triangulation. How do all these relate to yourself as a researcher?
2. If you used a mixed method approach, what reasons would you give to justify this choice?

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Strauss, A. and **J.** Corbin (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* Thousand Oaks, CA,, Sage Publications.Business Research Methods Choosing research approaches and strategies

Planning of research means deciding the question to be studied, setting the objectives of the study and determining the means of achieving those objectives taking into account the **Types of Research.**

Research may be broadly classified as (1) Fundamental and Applied Research (2) Descriptive and Analytical Research or (3) Quantitative and Qualitative Research or (4) Conceptual and Empirical Research

Fundamental (or Basic) and Applied Research

Fundamental research is mainly concerned with generalization with the formulation of a theory. It is a research concerning principles or laws or rules. It aims at the achievement of knowledge and truth. Research studies concentrating on some natural phenomenon or relating to pure mathematics are examples of

fundamental research. It aims at some theoretical conclusions. It may verify the old theory or establish a new one. It tries to explain the cause and effect relationship in social phenomena. It is essentially positive and not normative. That is, it explains the phenomena as they are and not as they should be.

Applied research is concerned with the solution of particular problems. It aims at finding a solution for an immediate problem facing a society or an industrial organization. It is empirical and practical. It is concerned with applied aspects of life. Research to identify social, economic or political trends that may affect a particular institution or the marketing research are examples of applied research.

Descriptive Research and Analytical Research

Descriptive research includes survey and fact finding enquiries of different kinds. It describes the state of affairs as it exists at present. The researcher has no control over the variables. He can only report what has happened or what is happening.

In Analytical research one has to use facts or information already available and analyse these to make a critical evaluation of the material.

Steps of planning of research refers to determining, in advance, various steps to be followed in a research.

1. Identifying, Evaluating and Formulating the Research Problems-:

After creating interest in a research work, a researcher has to think about formulating the problem related to his research work. Choosing a correct problem for study is the most important step in the entire research process. After selecting the problem, the researcher has to formulate the problem.

2. Extensive Literature Survey:-

Before formulating the research it is desirable that researcher examines all available literature, both conceptual and empirical. The conceptual literature is one which deals with concepts and theories. Empirical literature is that which contains studies made earlier and so it consists of many facts and figures observed in the earlier studies.

3. Writing a Primary Synopsis:-

After formulating the problems a brief summary of it should be written down. A research worker has to write a synopsis of the topic selected for research work mentioning the summary of what is going to be done under his research.

4. Indentifying and Labeling Variables: -

In any research the problem under study deals with relation between variables. The variables whose change has affected the other variable, is called independent variable.

Therefore there is a cause and effect relation between the variables. The research problem must be formulated in such a manner that it highlights the nature, extent and implications of relation existing between the variables. It is only through this process of establishing the effective relation between variables that meaningful conclusions are derived from the study.

5. Setting Up Of Hypothesis: -

Specification of working hypothesis is a basic step in the research process. A hypothesis is a tentative conclusion logically drawn. The research work is conducted to test the truth of this hypothesis.

6. Preparing the Research Design:-

A research design is a plan that specifies the sources and types of information relevant to the research problem. It is a strategy which approach will be used for gathering and analyzing the data. It includes the time and cost budgets since most studies are done under these two constraints. A research design provides a rational approach to research enabling one to decide in advance what to do, how to do, in investigating the subjects.

7. Determining the Sample Design:-

A sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given universe.Sample design refers to the technique or the procedure which the researcher would adopt in selecting some sampling units from the universe for drawing inferences about the universe. If the

proper procedure is followed to select the sample, definitely the sample will give all dependable information.

8. Collecting of Data: -

There are several ways of collecting the appropriate data. Some of the methods of collecting primary data are (1) Observation method. (2) Direct personal interview method. (3) Telephone interview method. (4) Questionnaire method. (5) Schedule method.

9. Execution of the Project: -

The researcher has to see that the project is executed in a systematic manner and in time. He should make necessary preparations for successful conduct of the project.

10. Processing, Analysis and Interpretation of Data by Statistical Methods: - The processing of data consists of classification, tabulation and coding. By classification and tabulation the unwieldy data can be condense into few manageable and purposeful groups and tables so that further analysis becomes simple. Coding converts the data into symbols and small figures so that the data can be dealt with in an easy manner. Editing improves the quality of the data since it is at this stage that data which is irrelevant can be dropped.

Analysis and interpretation of data results in observation, analysis, conclusion, induction and deduction. For this various statistical measures are computed.

11. Testing of Hypothesis: - Depending upon the nature of data and conclusions to be arrived one or two of these tests can be applied. Testing of hypothesis will results in either accepting or rejecting the hypothesis. Testing of hypothesis may prove or disprove a theory and a theory facilitates formulating of a further hypothesis. Testing of hypothesis will result in contribution to existing theory or the generation of a new theory.

12. Preparation of the Report or Thesis:-

A report is a detailed description of what has been done and how it has been done with respect to a particular area or topic. The report should contain the

preliminary section, the main body and the end matter. The preliminary section contains only titles, data, acknowledgement foreword and table of contents. The important section of a report is its main body. It carries introduction, methodology, statements of findings, conclusions and recommendations. The end matter includes appendix, literature selected and bibliography.

The appendix includes letters, questions or other tools used. Bibliography is the list of books, journals. Reports, bulletins etc. used for reference.

Selection and Formulation of Research Problems

Research Problem

Problem means a question or an issue to be examined. A research problem refers to some kind of problem which a researcher experiences or observes in the context of either a theoretical or practical situation. The researcher has to find out suitable course of action by which the objective can be attained optimally in the context of given environment. Thus, selection of research problem has high value to the society and the researcher must be able to identify those problems that need an urgent solution.

Requisites or Characteristics of a Good Research Problem

- clear and unambiguous
- logical and systematic
- empirical
- relation between variables
- verifiable
- interesting

Various Aspects of a Research Problem

For an effective formulation of the problem following aspects of the problem are to be considered by the researcher.

• **Definition of the problem: -** Before one takes up a problem for the study one needs to define it properly. The issues for inquiry are to be identified clearly and specified in details. If any existing theoretical framework is tested, the particular theorem or theories must be identified.

Similarly if there are any assumptions made and terms used the meaning of them must be made clear. As far as possible the statement of the problem should not give any scope for ambiguity.

• **Scope of the problem: -** The research scholar has to fix up the four walls of the study. The researcher must identify which of the aspects he is trying to prove. Taking the example of sickness he should specify. (1) Whether his study extends to all types of small scale industries, or limited to only few of them. (2) Whether the study is limited to find cause for sickness or also to prescribe certain prescriptions etc.

• **Justification of the problem: -** Many a time research studies are put to the test of justification or relevance. In the scientific curiosity of the problems, th problem that needs urgent solution must be given preference.

• **Feasibility of the problem: -** Although a problem needs urgent attention and is justifiable in several respects, one has to consider the feasibility of the same. Feasibility means the possibility of conducting the study successfully. The elements of time, data, Cost is to be taken into consideration before a topic is selected for study.

• **Originality of the problem: -** In social sciences, particularly in commerce and management, there is no systematic compilation of the works already done or on hand. Two people may be doing a work more or less on similar topic. In such situations it is not advisable to continue work in the same manner. What is advisable is that, each of them should try to focus on different aspects, so that they could enrich the field of knowledge with their studies. Another problem faced by a researcher is that a problem which he intends to do is already worked out.

Should he repeat the same or not? This depends upon the situation or circumstances which engage his attention.

Defining and Formulating a Research Problem

A research is to be defined along with the bounds in which it is to be studied. Therefore defining a problem involves the task of laying down boundaries within which a researcher shall study the problem with a predetermined objective in view.

Defining a research problem and clearly is a crucial part of a research study and must in no case be accomplished hurriedly.

Steps for Defining and Formulating a Research Problem

(1) Stating the problem in a general way: - The researcher should state the problem in general terms, keeping in view either some practical concern or some scientific or intellectual interest. Often the guides put forth the problem in geneal terms and researcher narrows down the problem and phrase the problem in operational terms. The problem stated generally may contain various ambiguities which must be resolved by proper thinking and rethinking over the problem. There are two ways of stating a problem by way of posing questions and by way of making statements.

(2) Understanding the nature of the problem: - For understanding the nature of the problem in a better way, the researcher has to hold discussions with those who have Knowledge of the problem.

(3) Surveying the available literature:- This is necessary because only through such a survey, a researcher can understand the relevant theories, reports etc.studies on related problems are useful for knowing the type of difficulties that may encounter in the present study.

(4) Developing the ideas through discussions: - A researcher must discuss his problem with his colleagues and those who have enough experience in the same area or in working on similar problems. People with experience can enlighten the researcher on various aspects of his study.

(5) Rephrasing the research problem: - A researcher must rephrase the research problems into a working proposition. The researcher puts the research problem in as specific terms as possible so that it may become operationally viable and may help in the development of working hypothesis.

Terms defined

Relevant Variables

A variable is a measurable concept such as height, age, income etc. it takes quantitative values. It may vary from individuals to individuals or groups to

groups. When there are two variables in a study such that the values of one variable change in response to the change in the values of the other variable, then the former is said to be depending variable and latter is said to be

independent variable. A variable may be discrete or continuous. When a variable assumes only certain specified values in an interval, it is called discrete variable. But a continuous variable is one which can assume any number of values in an interval.

Extraneous variables: Besides the independent variable, a dependent variable can be influenced by other variables, which are not part of the study. They are called extraneous variable.

They are variables working from outside .

Unit of analysis: A variable can be measured and analyzed by statistical units. The statistical units used for analysis and interpretation are known as units of analysis. Rations percentages, coefficients etc are such units. They can be used for the purpose of comparison.

Hypothesis

Hypothesis is a tentative statement showing the relationship between two or more variables, the reliability and validity of which is to be tested and verified. It expresses the nature and degree of relationship between variables. Hypotheses are -

- Assumptions
- Tentative statements
- Propositions
- Answering the questions
- Proposed solution to a problem
- Statements which are to be tested
- To be accepted of rejected
- To be verified empirically on the basis of sample

Why Hypothesis?

- Gives the direction of research
- Specifies the sources of data

• Determines the data needs

• Type of research

• Appropriate techniques of research

• Contributes to the development of theory

Role of Hypothesis

• It guides the direction of the study

• It identifies facts that are relevant and those that are not

• It suggests which form of research design is likely to be most appropriate

• It provides a frame work for organising the conclusions that result

Sources of Hypothesis

• Observation –based on the behavior pattern

• Relation between price and demand is hypothesized,

• the sales and ad may be hypothesized

• Analogies casual observations in nature

• Poor people buy more lottery

• Intuitions and personal experiences –

• The story of Newton and falling of apple,

• The wisdom of Budha under the banyan tree

• A sparking in our mind at particular occasions

• Findings of studies

• State of Knowledge – the theorems may be modified

• Culture –castes, beliefs, habits, behaviour

• Contribution of research – the rejection of certain hypothesis may lead to further research

• Theory –large concerns earn more profit, return on capital is an index of business success

Different Types of Hypothesis

Descriptive Hypothesis – Describing the characteristics of a variable (may be an object, person, organisation, event, and situation) • Eg. Employment opportunity of commerce graduates is more than the arts students.

Relational Hypothesis – Establishes relationship between two variables. It may be positive, negative or nil relationship.

• Eg. High income leads to high savings

Causal Hypothesis – The change in one variable leads to change in another variable i.e. Dependent and independent variables, one variable is a cause and the other one is the effect

Statistical Hypothesis – association or difference between two variables are hypothesized

Null Hypothesis – it points out there is no difference between two populations in respect of same property.

Alternative Hypothesis- when we reject the null hypothesis, we accept another hypothesis known as alternate hypothesis.

Working Hypothesis. A **working hypothesis** is a hypothesis that is provisionally accepted as a basis for further ongoing research. in the hope that a tenable theory will be produced, even if the hypothesis ultimately fails. Like all hypotheses, a working hypothesis is constructed as a statement of expectations, which can be linked to deductive, exploratory research in empirical investigation and is often used as a conceptual framework in qualitative research. The term "working" indicates that the hypothesis is subject to change.

Complex Hypothesis. A complex hypothesis predicts the relationship between 2 or more idependent and dependent variables.

Directional Hypothesis. A directional hypothesis specifies the expected direction to be followed to determine the relationship between variables.

How to test using quantitative methods:

• State the two hypotheses - null and alternative

• Decide the test statistic t, Z, F, Chi-square

• Fix the level of significance

• Make the computations

• Take the decision

• Type 1 error and Type 11 error

• Degree of freedom (based on probability, distribution)

Another way of hypotheses making.

To formulate a **hypothesis state the problem and observe conditions** Observe or wonder about something in your world, or in your class, and wonder how, why, when, something occurs. **Create a short, meaningful title** of your project.

Write out a statement of purpose that describes what you want to do.

Make a careful, step-by-step notation. of your observation.

Be objective! and do not guess why something is happening. That takes place later.

Gather information of similar research. This is a literature review.

Identify significant conditions or factors of the situation.

Summarize the problem in a clear, simple statement. Emphasize the end result or effect.

Form your hypothesis.

Research options:

What are possible causes for what you observed?

Could they reliably and consistently predict or determine the same outcome?

What causes are the least likely to affect the outcome?

What are the best choices?

Choose the best option or answer to your problem as your **hypothesis.** This will be an "educated guess" based upon both your observation and past experiences

State your hypothesis in a simple, clear statement

Hypothesis: a possible explanation for a cause and effect of a given situation or set of factors that can be tested, and can be repetitively proved right (or wrong!) (Remember: A hypothesis is not an observation or description of an event, that is in the first, observation stage!)

Test Hypothesis

Types of data you need

Sciences such as sociology rely on interviews and observation due to limitations of experimentation with human subjects, and use descriptions and inferences to arrive at results

Design an experiment to test your hypothesis

Make a step-by-step procedure with each step's purpose

List and obtain materials and equipment you will need

Identify two groups in the test: the control group is your reference point; no variables are changed; the experimental group is the focus of changes to affect the outcome

Rely on your past experience to identify variables, but consult with a knowledgeable person for a second opinion

Run a series of experiments

Change only one variable in each experiment in order to isolate effects reliably

Make and record accurate measurements

Repeat the test as often as necessary with the experimental group to verify your results. Always change only one thing, or variable, in each test

Repeat successful tests with other groups to verify your findings

Common mistakes

The hypothesis is assumed to be the "answer" and is not supported with testing

Data is ignored that doesn't support your outcome

Beliefs/bias blind you to fatal flaws in the testing phase

Systematic errors are not noticed and are repeated within each experiment. These bias the outcome's standard deviation

Equipment or conditions are not adequate

Draw conclusions

Summarize your results and conclusions use graphs and tables to illustrate these

Refer back to your observations, data, and hypothesis for consistency

Note difficulties and problems, items for further research, or what you would do differently if you could

If you did not prove your hypothesis, you have succeeded in another sense! Unsuccessful experiments provide information that can lead to answers by eliminating options:

- save someone the trouble of repeating your experiments
- suggest other ways of solving similar problems

Remember: research builds on the work of others.

RESEARCH DESIGN

A research design is a "Blue Print" for collection, measurement and analysis of data. It outlines how the research will be carried out. It is like glue which sticks together the entire process of research. It provides answers to various questions like - What techniques will be used to gather data. What kind of sampling will be used? How time and cost constraints be dealt with? Etc.

Essentials of Research Design

1. The design should be an activity and time based plan
2. It is always based on research question
3. It guides the selection of sources and types of information
4. It indicates a framework for specifying the relationship among the study's variables
5. Outlines procedures for every research activity
6. It must be appropriate, efficient and economical
7. It should be flexible
8. It must be adequate

Types of Research Design

"*You cannot put the same shoe on every foot*" - Syrus

Although every problem and research objective may seem unique, there are usually enoughsimilarities among problems and objectives to allow decisions to be made in advance about the bestplan to resolve the problem. There are some basic research designs that can be successfullymatched to given problems and research objectives.

Three traditional categories of research design:

• Exploratory

• Descriptive

• Causal

The choice of the most appropriate design depends largely on the objectives of the research and how much is known about the problem and these objectives. The overall research design for a project may include one or more of these three designs as part(s) of it.

Further, if more than one design is to be used, typically we progress from Exploratory toward Causal.

Basic Research Objectives and Research Design

Research Objective Appropriate Design

To gain background information, to define terms, to clarify Exploratory problems and develop hypotheses, to establish research priorities, to develop questions to be answered. To describe and measure phenomena at a point Descriptive In time. To determine causality, test hypotheses, to make “if-then” Causal Statements, to answer questions

Research Design: Exploratory Research

Exploratory research is most commonly unstructured, “informal” research that is undertaken to gain background information about the general nature of the research problem. Exploratory research is usually conducted when the researcher does not know much about the problem and needs additional information or desires new or more recent information. Exploratory research helps diagnose the dimensions of the problem so that successive research will be on target. It helps to set priorities for research. Exploratory research is used in a number of situations:

• To gain background information

• To define terms

• To clarify problems and hypotheses

• To establish research priorities

A variety of methods are available to conduct exploratory research:

• Secondary Data Analysis

• Experience Surveys

• Case Analysis

• Focus Groups

• Projective Techniques

Categories of Exploratory Research

• Experience Surveys: - Issues and ideas may be discussed with persons who have had personal experience in the field.

• Secondary data analysis:- Another quick and economical source of background information is existing literature containing data that has been compiled for some purpose other than the purpose in hand

• Case Study method: -obtains information from one or a few situations that are similar to the problem situation. Primary advantage is that an entire organisation or entity can be investigated in depth and with meticulous attention to detail.

• Pilot Studies are used in different types of designs. - Within the context of exploratory research it covers some part of the research on a small scale. Major categories of pilot study include focus group interviews, projective techniques, and depth interviews.

Categories of Pilot Studies

• Focus Group interviews: - Unstructured, free flowing, group dynamic sessions that allow individuals the opportunity to initiate the topics of discussion. There is synergistic and spontaneous interaction among the respondents. Found to be highly advantageous.

• Projective techniques; - An indirect means of questioning the respondents. Uses word association tests, sentence completion test, third person test, role playing technique and Thematic Apperception Test.

• Depth interviews:- unstructured,, extensive interviews that encourage an individual to talk freely and in depth about a topic

Historical Research

History, the meaningful record of human achievement, helps us to understand the present and to some extent, to predict the future.

• Used to "prevent reinventing the wheel" every few years.

• It is the application of scientific method to the description and analysis of past events.

Descriptive Research

Descriptive research is undertaken to provide answers to questions of who, what, where, when, and how – but not why.

Two basic classifications:

• **Cross-sectional studies**

• **Longitudinal studies**

Research Design

Descriptive Research -Cross-sectional Studies

• Cross-sectional studies measure units from a sample of the population at only one point in time.

• Sample surveys are cross-sectional studies whose samples are drawn in such a way as to be representative of a specific population.

• On-line survey research is being used to collect data for cross-sectional surveys at a faster rate of speed.

Descriptive Research -Longitudinal Studies

• Longitudinal studies repeatedly draw sample units of a population over time.

• One method is to draw different units from the same sampling frame.

• A second method is to use a "panel" where the same people are asked to respond periodically.

• On-line survey research firms recruit panel members to respond to online queries.

Research Design: Causal Research

• Causality may be thought of as understanding a phenomenon in terms of conditional statements of the form "If x, then y."

• Causal relationships are typically determined by the use of experiments, but other methods are also used.

Experiments

An experiment is defined as manipulating (changing values/situations) one or more independent variables to see how the dependent variable(s) is/are affected, while also controlling the affects of additional extraneous variables.

– Independent variables: - that over which the researcher has control and wishes to manipulate i.e. package size, ad copy, price.

– Dependent variables: - that over which the researcher has little to no direct control, but has a strong interest in testing i.e. sales, profit, market share.

– Extraneous variables: - those that may affect a dependent variable but are not independent variables.

Choosing samples from population

How and why sampling relates to business research

Problem 1: the world is large and full of people. To find out things about people we need to ask (research) them. We usually can't ask all of them because the numbers make this impossible. So we ask some of them. We sample the population.

Problem 2: we wanted to find out things about people, so we researched a sample of them. To what extent do our results relate to all people, and to what extent do they only relate to our sample?

Problems 1 and 2 put sampling in a nutshell. Sampling is a practical way of studying people and their activities, thoughts, attitudes, abilities, relationships etc in relation to business. But because we are not asking everyone in the chosen "population" (which could be the members of a company, or all sales managers in the United States, or all applicants for a particular job – any group we define in relation to our research objective), then how can we have any certainty that our results can be representative of the whole population?

The crunch is that we don't want any old sample, we usually want a sample to be representative of a group (population). That would mean that our findings can be generalised to the whole group. To make this happen, we have to learn about a number of issues and technical words and phrases in sampling. In

A range of probability and non-probability sampling techniques

The table below is a glossary of techniques and terms associated with sampling. To learn more about each technique, read the textbook and web search further, or ask questions about these techniques in livechat.

Of all the sampling techniques included in the table, quota sampling and convenience sampling, to some extent snowball sampling, are the least "statistical" in nature. These techniques offer varying levels of generalisability but always less than a random sampling method. Think about these three techniques and decide how justified you think each is for conducting business research.

Convenience sampling:	Sample is chosen for ease or convenience rather than through random sampling. This sounds underhand but is often used, at least in pilot studies or short term projects where there is insufficient time to construct a probability sample. Therefore, where this is used, the results cannot be generalised to the population (though many newspapers would like you to believe otherwise!).

Generalisability:	being able to use sample results as if they applied to the whole population – this must be based on sound sampling processes
Multi-stage cluster sampling:	When drawing a sample from a geographically dispersed population, the logistics suggest that cluster sampling can help. The sampling frame is first broken into clusters (eg geographic areas), and a random or systematic sample taken. Then the population of each cluster is sampled randomly to provide random sampling which is logistically feasible. This can of course introduce bias, but using both cluster and systematic sampling can usually produce effective samples.
Non-probability sample:	Random selection was not used so some units in the population may have had a higher chance of being selected (e.g. pointing to a crowd and saying "You, you and you!" to the people in front)

Non-response:	a source of non-sampling error when someone in the sample does not respond (eg to questionnaire or interview). A fair amount of this is normal and there are many reasons for it to happen (eg away on holiday, lack of time, lack of interest, doesn't understand question etc etc).
Non-sampling error:	as sampling error but these differences do not result from the sample chosen, instead they result from the sampling process (eg non-response, errors in sample frame, wording of questions, data analysis)
Population:	the full universe of people or things from which the sample is selected
Probability sample:	a sample selected using random selection (this is not the same as "selected randomly" – Why?) so that each unit in the population has a known (e.g. a 10% or 50%) chance of selection. Probability samples keep sampling error low and usually offer a sample which can be seen to be representative

Quota sampling:	Regularly used in market research and opinion polling. Like a stratified sample, this sample is chosen to include a certain proportion of particular variables (e.g. gender, age group, ethnicity, socio-economic group). Unlike a stratified sample, there is no random sampling stage; the choice of respondent is up to the interviewer provided the profile/quota is accurate.

Representative sample:	one which reflects the population accurately – showing the same distribution of characteristics or variables as the whole population

Sample:	the section of the population chosen for study
Sampling error:	the difference of results between a sample and that of the whole population
Sampling frame:	a list of all people or units in the population from which a sample can be chosen
Snowball sampling:	Similar idea to convenience sampling, the researcher contacts an initial group of people relevant to the research topic, and then uses this group to contact others for the research. There is no sampling frame here, so it is not random, but sometimes it is difficult to pre-define the population (eg staff in a company who contribute creative ideas). This technique is often used in qualitative approaches.
Purposive sampling:	Using your own judgement to select a sample. Often used with very small samples and populations within qualitative research, particularly case studies or grounded theory. This approach cannot yield any statistical inferences about the population. Cases may be selected for being unusual or special or particularly related to your research question.
Stratified sampling:	Random samples are just that and they can appear surprisingly "biased" or unrepresentative of the population (eg it would be possible for a random sample to include only one gender, which might affect your results). Stratified sampling specifies any characteristics, which you wish to be equally distributed amongst the sample, eg gender or work department. Provided the sampling frame can be easily identified by these characteristics, then strata for each characteristic are identified and within each group, random sampling or systematic sampling can proceed.
Systematic sample:	Doing without random numbers in selecting a "random" sample. Sample is chosen directly from the sampling frame (which ideally should not be in any specific order except alphabetical). Once you know the sample proportion required eg 1 in 20, start with a random number generated item in the list, then choose every 20th name until the sample is complete.
Random sampling:	(also called probability sampling – see explanation above). Define the population. Define the sampling frame (F) (this may be the same or it may exclude certain groups or individuals as not relevant to the study). Decide the sample size (Z). Apply consecutive numbers to the full sampling frame (F=N). Using a table (or computer programme) to generate random numbers, collect Z amount of different random numbers within the range 1-N. Apply the chosen random numbers to the sampling frame to identify your random sample.

Random number tables:	Lists of numbers which are randomly generated – there is an example of such a table at Appendix 4 in the textbook. Used in random sampling. Use whatever digits in the random numbers apply within your sampling frame total and ignore duplicates. You may find it is simpler to use Excel spreadsheet function to generate random numbers. Formula to find a random number between 0 and 100 is =RAND()*100 Use F9 key to recalculate.
Sampling fraction:	Number required for sample divided by number in total sampling frame expressed as a fraction or percentage.

Of all the sampling techniques included in the table, quota sampling and convenience sampling, to some extent snowball sampling, are the least "statistical" in nature. These techniques offer varying levels of generalisability but always less than a random sampling method. Think about these three techniques and decide how justified you think each is for conducting business research.

Selecting appropriate techniques for different research studies

When we are designing a research study, the most common question about sampling is – how large should the sample be? In the definitions of random sampling above, we have ignored this question so it is now time to tackle it. Unfortunately there is no right answer to sample size. You cannot just apply a consistent proportion to the total sample frame. Instead the following issues need consideration:

- Absolute sample size: it is more important to look at the absolute size of a sample than its relative size in relation to the total population. Imagine 10% of a population as a possibly sensible sample. If the population total is 100,000, then your sample size is 10,000 – yes this would probably be a good sample size (but see the next problem on this list). However if we apply a 10% sample size to a population of 10, we have a sample of 1 unit or person. We can see that this unit or person could be quite unrepresentative of the total population by itself. So relative sample size is not important. Absolute size is. The bigger the sample size, the more the sample is likely to represent the population and the lower is likely to be the sampling error. (Referred to as the Law of Large Numbers).
- Statistics and the Central limit theorem: the larger the absolute size of a sample, the more closely its distribution will be to the "normal distribution" (What is this? If you have not done any work on statistics before, do some quick web-searching or look at the index of the textbook to find out). If you wish to conduct a statistical analysis on your data, the minimum size of sample for any one category of data should be 30, as this is most likely to offer a reasonable chance of normal distribution. If your sample frame is 30 or less, then it would be wise to include the whole frame, rather than sampling.

- Margin of error: The expected margin of error is affected by absolute size of sample within a population. Note that a 5% margin of error (which is the same as saying 95% certainty) is the maximum normally appropriate for rigorous research. If your population size was 50, you would have to include at least 44 of them to achieve a 95% certainty that the sample would represent charactistics of the population. A very high proportion of the population will be needed to achieve 99% certainty. There is a diminishing need for higher samples at the high population end of the table (the figures to achieve 95% certainty for a population of 1m are the same as for a population of 10m).
- Time and cost: Bryman and Bell (2003 p101) suggest the law of diminishing returns kicks in at around a sample size of 1000 – i.e. that precision in the data increases up to a sample total of 1000, but then begins to decrease, making it less worthwhile to interview or survey more than 1000. Of course, the population you are researching may be way below 1000 in total, and it may in any case be very costly or time-consuming to use a large sample size. Practical considerations are important in research studies. Just bear in mind that if you choose a sample size which is small in absolute terms, then you must justify this action and take into account the fall in generalisability and representativeness which may result.

- Non-response: this is described as normal in the glossary above. Inevitably your respondents are less likely to be as motivated as you, the researcher, about your research, so some – and sometimes a majority – will not respond, ie refuse to take part. On top of this, some of those who do respond may not produce "useable" data (e.g. you may find that a high proportion of questions in a survey are unanswered, or that some people or units in your sample frame have moved away, changed job, stopped functioning in the role you expected etc). All this is taken into consideration when a) choosing your sample size and b) calculating the actual response rate.

$$\frac{\text{Number of useable responses}}{\text{Total sample – unsuitable or uncontactable units}} \times 100\%$$

- Variation in the population: if the population you are studying is highly varied, then the sample size will need to be larger than if you are studying a population with less variation (eg people who have chosen to join a membership organisation).

Assessing representativeness of samples and generalizability from samples

Even if we use probability sampling techniques, we can only hope to produce generalisable outcomes in relation to the population we were sampling. So if all questionnaire respondents are chosen from one company or organisation, the best to hope for is that our results can be generalised to the whole workforce of that company or organisation. We cannot assume that these results will in fact describe other workforces, as very different conditions and variables may apply in other organisations.

In a similar way, we could conduct a large sample study by random sampling a country's population based on official census statistics, and if the study was large and rigorous, we might propose conclusions, which apply to this country's population (with a specified degree of confidence in the statistics). However, we cannot then apply these conclusions to other countries without further research, nor can we apply these conclusions over time to the same country, as major variables could have changed over time. Think back here to what we discussed earlier about epistemology – what we can really know.

We find this kind of generalisation being made all the time in the media. For practical time and cost reasons, media production teams often take quota sampling research (or research done by more dubious methods) and suggest its applicability to everyone watching or listening to a programme. Look out for examples and try to find out what kind of sampling was applied to their research. Remember the ethics discussion about not causing "harm" – how does this relate to TV, radio or webcast research you come across?

If you are worried about the representativeness of your sample, in some cases it may be possible to check this by using a test of statistical significant difference to compare the profile of characteristics in your sample with that of another data list eg a census or company database. Clearly if there is no statistically significant difference between your sample and the full population data list, you have added more authority to the representativeness of your sample.

If you are using a non-probability sampling technique then even the flimsy size rules associated with probability sampling fall away. Your sample size for purposive or snowball sampling will really depend on your research questions and objectives. In qualitative research, the focus will not be on trying to estimate things about a population, but in trying to understand or relate the data to theory or ideas. How many people do you need to talk to, to understand their perception of something for example? It could be just one. Or it could be several or many. The question is here, what are you trying to find out and what sample size would give me confidence that my results had validity? We will go further into this when we discuss different qualitative methods, but often a good lead can be taken from research studies in peer-reviewed academic journals, where information has been given about sample size in relation to research question. Find one that is close to your area of study (which you would want to do anyway in your literature review) and check the sample size studied in this type of enquiry.

Questions for self review:

1. Why are random numbers useful for sampling?
2. Why don't academics consider convenience sampling more often?
3. How do you calculate a response rate?
4. What kind of minimum size would you need in a sample used for statistical inference?
5. What level of certainty is needed for statistical sampling in academic research?
6. What reasons would you give for not exceeding a sample size of 1000?

References

Bryman, A. and E. Bell (2003). *Business Research Methods* Oxford, Oxford University Press.

Saunders, M., P. Lewis, et al. (2007). *Research Methods for Business Students*.Fourth Harlow, England, FT Prentice Hall, Pearson Education.

Quantitative research methods: collecting and analysing quantitative data

Anticipating how the research design is affected by data collection and analysis tools

It is never too early to start to think about data analysis. A common problem with research studies is that we focus mostly on our research questions and finding samples, discussing methods etc and don't ask simple questions about what data we are looking for and how we will then analyse that data. Asking these questions early on, can avoid much disappointment later, when we realise that the data collected simply can't be analysed in a straightforward way.

Suppose for example that you want to know the three most useful management textbooks that a large group of 100 managers have found effective. The question might look like this:

Q1 What are the three management books which have been most useful to you so far in your management career?

You might leave three lines of space so that the respondents can write in their answers.
Think about how this might be coded as a question response for analysis. Since most managers will not choose the same three, you will have a wide range of different answers. We cannot code each book separately with a sample size of 100 and 300 potential books in the answer range. So can we make any useful data out of this question?
You might answer that you wouldn't ask this kind of question anyway! However it is a form of question which is quite common eg what five competencies are needed by successful salespeople?, what are the three most important experiences which have helped you to achieve your current senior role? What three benefits do you feel you have gained from mentoring? Etc etc.

It is possible to turn the question into a list of possible answers from which respondents have to tick three which apply to them. This means you can give each possible answer a unique code in advance and then count the frequency with which each code is used. However if you want your respondent to have a free answer choice, because perhaps you really don't know what you might find out, then we have to delay coding until we have received some answers. If we take the first 50 responses and make notes on the characteristics, which define the responses, it becomes possible to group the responses. Once grouped, a code can be assigned to each group and you can then go back and code each answer according to this pre-defined group. In our question, we might find that answers include classical management textbooks from the twentieth century (coded 1), simple How to… guides (coded 2), books by management "gurus" eg Tom Peters, Charles Handy etc (coded 3), books which are not about management directly but have given readers inspiration (coded 4) and books which don't fall into those categories (coded 5). We now have 5 unique codes and can go through all the responses collecting numerical data for each code. Now we have a data set for analysis.

A much more simple issue is the questionnaire which contains only yes/no answers. Think about analysing this data. A set of data results is going to look pretty boring, and how much is it going to tell you about your research question? In the next chapter we will investigate questionnaires further, but for now, we need to think about the data which will result from our questions, how useful it might be, and how we might analyse it.

Recognising different types of data for analysis

Interval variables

The highest form of measurement and the easiest to manipulate and analyse. There is a fixed space (interval) between each variable and this is a consistent space. For example if we ask for someone's weight in Kg, we are dealing with an interval variable as the answers will be expressed in a fixed scale: the difference between 70Kg and 80Kg is the same interval as that between 80Kg and 90Kg and so on. We could also include answers involving age, income, number of staff, revenue etc. There is an even more precise form of this variable which is sometimes called a ratio variable.

Ordinal variables

These can be rank ordered (as can interval variables: 1Kg, 2Kg, 3Kg etc) but the space between the variables is not equal across the range. For example, suppose we didn't ask for an exact weight but for which group of weights a person belonged to such as 50-60Kg, 60-70Kg, 70-80Kg, 80-90Kg, over 90Kg. This last category changes the entire set into ordinal rather than interval variables, and this will constrain what can be done with the data, although it is still useful. So why put such potential interval data into groups in a survey? There are good reasons.

Nominal variables

These variables can not be rank ordered at all. An example would be to offer alternative answers in a multiple choice question such as "hot" "spicy" "sweet" "salty".

Dichotomous variables

As the name implies these are answers which can only fall into one of two categories. The usual kind is a yes/no answer or a male/female gender. It is usually best to treat these variables as a special kind of nominal variable.

Coding and Entering data for computer analysis

Data matrix

In order to analyse quantitative data, once we have identified the kinds of variable we are collecting, we can then set out the data in a matrix. This can be done in Excel or another spreadsheet first, or put directly into a statistical package such as SPSS for Windows. To make the transition from, say, questionnaire to data matrix, answers will need coding. For example, nominal variables will be text names and will need to be given a unique number to allow entry into a statistical package. Non-responses will also need a unique recognisable number (which doesn't appear elsewhere in the data). Dichotomous responses such as Male/Female will also need a number eg Male 1 Female 2.

Coding

Most sources recommend that you keep a "code book" or list of exactly how the codes you devise for your data relate to the questionnaire or other research element. This is vital for two reasons. The first i that codes are often worked out on scraps of paper quite quickly; if the paper is lost and you have a break between entering your data and coming to make sense of it, it is possible you will have a hard time remembering exactly what the results mean.

The second is that it is important not to lose sight of the question when analysing the results of quantitative data. Unusual patterns in the data must be scrutinised and going back to exact coding and possible different interpretations of the question wording, which may have caused the response, will be vital. So keep a retrievable, clear and accurate record of coding as the link between respondent and data.

Using SPSS for Windows

Coding is a way of enlisting the help of computer analysis techniques – whether these involve using a spreadsheet, such as Microsoft Excel, or a package like the commonly used SPSS (Statistical Package for Social Sciences) for Windows package which is specifically designed to analyse quantitative data from social sciences research. SPSS for Windows is the most commonly used tool to produce all statistical tests and analysis outlined in the sections below. Using the package is very straightforward, provided you have access to it on a computer. Start the program, which should put you into the SPSS Data Editor, which has two components: Data View and Variable View. Screen tabs allow you to switch between these two views. Data View is the screen through which you enter your data (like a spreadsheet). You must enter your data so that each column represents a variable, and each row represents a case. For example, if you have information on the age, salary and qualifications of 100 employees, you enter the variable data for each employee along a row, with column headings of age, salary, qualifications.

It is probably obvious, but in data view you will not enter any text. To describe your variables, you go to Variable View. Text variable names can be a maximum of 8 characters with no spaces. This means it is helpful to make a rough plan of how you will enter data into SPSS – in which order you will show the variables and what variable names you will use. There is a field called "variable label" in which you can put more detailed text if needed. It is also possible to enter labels for Values (all except interval values), so for example you may have a variable labelled Gender, which has values labelled Male and Female, though you have coded Male as 1 and Female as 2 in the Data view. Value and variable labels will be used by SPSS in the Output charts.

When you perform an analysis with SPSS (by clicking Analyse and entering any relevant information about what you want done) it is held as Output in an Output viewer screen (which only appears after an analysis has been done).

Weighting cases

It is possible to weight cases when using stratified random sampling and when there is an unequal response rate for different strata. This is simple to do and researchers do this from time to time, but it does impose constraints on how statistical inferences can be drawn, since cases in the lower response stratum are treated as if there were more of them than there are (ie higher weighting in the dataset). Best avoided if possible unless you are really confident in statistics.

Choosing appropriate ways to present data through charts, tables and descriptive statistics

You may have a clear idea of what you are looking for in the data, but once the data is entered into either a spreadsheet or an analysis package like SPSS, other possible ways of analysing the data become apparent. The textbook recommends a useful summary of ways of looking at data on p421. We usually begin by attempting to describe particular values, their range, their central tendency, their dispersion around the mean. We can look at the data trends over time, and look for proportions in the data. This is called univariate analysis because we are looking usually at one variable at a time.

Once we have a clear picture of how the individual variables are behaving, we can start looking for relationships between variables – bivariate analysis. A range of methods is shown below for these two kinds of analysis.

Frequency tables – univariate.

Tables show a list of categories (types of response) and the numbers of people responding to each. Sometimes just as a number, sometimes a percentage of the total choosing this response. When building a frequency table for interval variables, categories will usually be grouped (if not the table would probably be too long). Make sure your groups of categories are exclusive eg for ages 21-30, 31-40 etc not 20-30, 30-40 as this leads to difficulties of coding for age 30.

Bar charts, histograms and pie charts – univariate

These are generally used for nominal or ordinal variables, so bars will be separated along the x axis. If using an interval variable, then a histogram would be used rather than a bar chart. It looks very similar but the axis shows a continuous interval range and adjoining "bars" are not separated. Note that pie charts should not show more than six segments – more than this will be very difficult to read, so either use a bar chart, or group the data before producing the pie chart.

Measures of central tendency - univariate

This will be mean (average), median (midpoint value in ranked list) or mode (most frequently occurring value) in a range of values. The measure is a single figure so is not representable in a chart, however, a series of means, medians etc can be charted or shown in a table. Mean is calculated only for interval variables. Median is calculated for interval or ordinal variables. Mode can be calculated for any variable.

Measures of dispersion - univariate

This will be the range (difference between maximum and minimum value in a list of interval variables), the inter-quartile range (data must be in rank order, then this will show the difference within the middle 50% of values) or the standard deviation (data should be normally distributed for this to be effective). The standard deviation is the average amount of variation around the mean (calculated by taking the difference between each value and the mean, totalling these differences and dividing the total by the number of values). A higher standard deviation therefore means greater variation around the mean.

We might use a box plot to look at both central tendency and dispersion in a chart format (SPSS can produce these from your data). The box plot shows where the median of the data lies and how the data clusters around that median or middle value. 50% of the data will lie in the "interquartile range" shown in the box plot as a rectangle with the median line cutting vertically through it. In this example, the median is off-centre to the left, so we can see that this set of values is "skewed positively", rather than showing a classic normal distribution (see notes on sampling). The plot shows with an extended horizontal line the extent of the lower quartile (ie the 25% of the data with the lowest values) and the higher quartile – same but for the highest values. There are two more values from the data set which sit outside the range of most of the data, called "outliers" – they are on the right of the chart. This kind of chart is useful when in your research you want to give an interquartile range ("half of the values are between x and y") and to see whether a normal distribution applies. This will also affect your later statistical analysis.

Charts, diagrams and tables – the detail

It is probably quite obvious, but all diagrams etc which are presented in a research report will need to be checked for detail. When you are putting the last minute touches to a report before a deadline (at study and at work) it is easy to imagine that everyone will know what this graph shows. This leads to a big problem if we leave it at that. You must check each graph to ensure it has a clear title, the units of measurement involved are shown, any data source is shown, the sample size is shown where relevant, the axes are labelled, the variables read in a comparable way if more than one chart uses the same axes and variables eg left to right or top to bottom and there is a key or legend which is readable (importing from Excel often leads to very tiny illegible legends – they must be reformatted). It can also be helpful to introduce a chart in the text with an idea for the reader of what it will show, then after the chart in the text, explain what you think it showed. Of course, readers will want to make up their own minds, but it is helpful to let them know what you think they should look for in the chart.

Trends over time

Usually shown in a line graph where time is on the horizontal axis, see Figure 12.7 p 426 in the textbook for an example. This is always a good first step. Then if you wish to look at a trend over time for a single variable, the most common method is the use of index numbers – such as the FTSE100 index of share movements over time based in London. The base period is usually represented by the number 100 (or 1000 as in FTSE).

Then each value is converted to an index number by dividing the data value for the case by the data value for the base period and multiplying by 100. Why bother converting each value to an index number? Generally because it makes comparison across time or numbers much simpler – can be done at a glance.

Try to find an example (from the web or media) of a trend using index numbers.

Suppose we want to take the trend further and estimate where it will go after the actual data we have to hand? Here we are into forecasting and we will be covering this in our last but one chapter.

Selecting appropriate statistical tools for the research variables

Relationships between variables – bivariate analysis

Relationships between variables means the variation in one variable coincides with variation in another variable, it does not imply a causal relationship, ie it does not necessarily follow that one will be an independent and one a dependent variable. Though this can sometimes seem obvious – eg if the two variables include something like age or gender which can influence the other variable but not be influenced by other variables. (Presumably the amount you eat could be influenced by your age, but your age could not be influenced by the amount you eat!).

Contingency tables or cross-tabulations – bivariate

Set up as a frequency table including column percentages but showing both variables against the chosen categories. If one variable is suspected of being the independent variable, this is shown as a column variable not a row variable. Such tables are used to look for patterns of association in the data.

Pearson's r or Pearson's Product Moment Correlation Coefficient (PMCC)

Looks for relationships between interval variables. The strength of the relationship varies between 0 (ie no relationship) and 1 (perfect relationship) so the closer Pearson's *r* is to 1, the stronger the relationship between the two variables. Pearson's *r* will either be positive or negative, which indicates the direction of the relationship, ie +1 is a perfect positive relationship (as one variable increases, the other increases, -1 is a perfect negative relationship (as one variable increases the other decreases). Before calculating Pearson's *r*, it is worth constructing a scatter diagram for the two variables, as it should only be used when there is a broadly linear relationship, it will not hold for a curve relationship.

Regression analysis

A coefficient of determination (can also be called a regression coefficient) can be calculated by squaring the value of Pearson's *r* and multiplying it by 100. This produces a percentage, which describes the proportion of variation in one dependent variable accounted for by the other independent variable. So if we explored the relationship between age and weight in a sample, producing a Pearson's *r* value of -0.35, then the coefficient of determination would be 12.25%, which suggests that in our sample 12.25% of the variation in weight was accounted for by variation in age. A similar analysis where more than one independent variables are involved is called multiple regression analysis.

Spearman's rho (ρ) – bivariate

This is used when at least one of the two variables is ordinal, and the other is ordinal or interval. This calculation produces the same kind of outcome as Pearson's *r*, ie a positive or negative relationship between 0 (no relationship) and 1 (perfect relationship).

Phi (Φ)and Cramér's V – bivariate

Phi is used for exploring a relationship between two dichotomous variables, Cramér's *V* does the same for two nominal variables. Phi outcomes are like Pearson's r and Spearman's rho and can vary between 0 and + or –1. Cramér's *V* can only show strength of relationship, not direction (the coefficient is always positive).

Eta – bivariate

Eta is used to explore relationships between an interval variable and a nominal variable and like Cramér's *V* can only show strength of relationship, not direction. It does not assume a linear relationship.

Statistical significance

A way of testing the level of confidence we can have that a probability sampling technique has generated results, which can apply to the full population. Such a test can also estimate the chances of no relationship in fact existing between two variables, when bivariate analysis suggests that there is. We often use the word "significant" to mean the same as important when we are writing text. Your understanding of the phrase "statistical significance" should prevent you from now on from using "significant" in academic work, unless you are relating this to a statistical test.

To calculate statistical significance, we set up a "null hypothesis" ie that two variables in the sample are not related. Then decide the level of statistical significance we find acceptable, ie the level of risk that we would reject the null hypothesis (ie say the variables are related) when in fact they were not related. It is usual to say that the maximum level of 0.05 is acceptable (ie. $p<0.05$). This suggests that in no more than 5 cases out of 100, will we be wrong (ie suggest a relationship which is not there) – the same as saying we have 95% certainty that the relationship is correct. We can choose a more stringent level of certainty (e.g. $p<0.01$ where there is only a 1 in a 100 chance of our relationship not existing when we say it does). This would, however, increase the risk of a "Type 2 error", which means confirming the null hypothesis (that there is no relationship) when in fact there is a relationship.

We should bear in mind that the likelihood of a statistically significant result will increase with sample size – for the obvious reason that the bigger the sample in relation to the population, the less likely that any analysis on the sample will differ from the population by chance. So if we think there is likely to be low statistical significance, we should increase sample size if possible, to make the analysis more sensitive to statistical significance. Very small samples, below 30, are more likely to show an unacceptable *p* level ie above 0.05 probability that the difference is caused by chance.

We use a chi-square test (x^2) to produce our level of statistical signficance (*p* or probability level). This test looks at each cell in a contingency table and calculates the expected value if there was no relationship but the value was a product of chance, works out the difference between each expected value and the given value and sums the differences. This produces a single chi square value for the table, which is not important in itself, but is produced with a statistical significance level (*p*). This is the number we are looking for, to check against our desired level of certainty.

As well as applying chi-square tests to contingency tables, tests of statistical signficance should be applied to all bivariate analysis outcomes (coefficients) such as Spearman's rho and Pearson's *r*. This helps us to be sure that the correlation we expect from the sample, really does exist in the population.

Testing whether groups are different – multivariate analysis

If we want to test whether the distribution of a variable in a sample is similar to or different from the distribution of a population or census which is already known, then we can use a Kolmogorov-Smirnov test (only if data is ranked). The test produces a *D* statistic, which is used to calculate whether the sample distribution differs from the full population distribution by chance only.

Where we have a quantifiable variable which can be split into two groups of values using a descriptive variable, we can test the probability of the groups being different using an independent groups *t*-test. The lower the t statistic, the more likelihood of any difference in the groups being caused by chance.

Similarly a paired *t*-test can be used to measure pairs of variables, e.g. a machine's speed of operation before and after maintenance.

Differences between three or more groups can also be tested to see if they are likely to be occurring by chance or if there is really a "statistically significant difference" – this is done using one-way analysis of variance, ANOVA, and produces an *F* statistic plus a significance probability level. A high *F* statistic and a significance *p* level of below 0.05 should offer a "statistically significant" result, ie not one occurring by chance. An ANOVA example might involve members of three or more different groups of staff producing values for "degree of learning" after a training course. The ANOVA test can establish whether different results in degrees of learning after training which seem to be shown by the different staff groups could occur by chance, or whether there is a "statistically significant" difference between them. There are some data requirements for ANOVA, but broadly this can be used provided there are at least 30 values in each group and each value is independent of others.

This chapter has been very factual and is not easy to take in, unless you are already familiar with statistical analysis and find it easy to follow. It is intended just to give some revision pointers based on earlier reading or teaching you may have experienced.

You might like to consider the following question to think through this area. If I asked the question: "Please rank order the following benefits of a colour laser printer: speed, professional output, capacity for more than one ream of paper, faster speed on black and white print, capability to back copies, other". Then what kind of values will be produced if 100 people respond to this question? (a) how would we code each response, including the "other" response? (b) and what kind of technique could we use to analyse the response data, and here we could assume that we know whether the respondent actually uses laser printers or not (c).

Questions for self review

1. Why is it important to think through the data likely to be produced from your research at an early stage?
2. Why do you need to know the difference between interval, ordinal, nominal and dichotomous variables?
3. What is bivariate analysis?
4. What is the minimum number of cases you need to make a sample useful for statistical analysis?
5. What is the level of probability (p) needed to state in your research results you have found a "statistically significant" difference?
6. What is the purpose of using index numbers and an example from the web or media?

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Questionnaire design and testing

Difficulties associated with questionnaire design

What kind of difficulties and problems arise with questionnaires? Surely it is quite straightforward to write them? It is said that a person's wisdom can be judged by the questions they can compose rather than the answers they know! In fact, designing questionnaires is particularly difficult. What do we need to think about?

1. The format and design of the questionnaire – not too offputting, not too long, not too difficult to read, easy to know what you have to do to complete it
2. How much general information do you need to have about the respondent? If you need biographical data such as age and gender etc, why is that? What extra value will it add to your research question? Should you start with easy questions like gender or end with them?
3. What proportion of open and closed questions should be in the questionnaire? Closed questions start with a verb (Do you come here often?) and invite a simple yes/no answer. Or they may be "forced-choice" ie only a limited number of alternative answers are available to choose from. They are easy to code but limiting in detail. Open questions give much richer information but are widely variable across responses and therefore harder to code and analyse.
4. What kind of questions can we ask? Straight questions with a clear answer? Questions about which people must reflect? Tickbox questions or written answer questions? Likert scale questions? These are rating scale questions which allow the respondent to mark a numerical scale in response to a question; for example "How important is it to have a clear organisational policy on harassment at work?" Answers range from 1 (not important at all) to 4 (very important). Such scales may or may not have middle points which allow a neutral response.How do we lay out the questions? For example if they are scale responses – do we lay them out horizontally or vertically?
5. How much space on the page do you give someone to write an answer to an open question?
6. Should you include check questions, for example asking the same thing two different ways to ensure you are getting consistent answers?

7. How much information do you give the respondent about why you are asking the questions? Technical research detail? Just enough to know who you are and how data will be used?
8. How do they get it back to you? If email – what does that do to anonymity? Should you include stamped addressed envelopes, drop boxes?
9. Should you communicate with potential respondents before the survey itself? And after delivery to encourage completion? How many times could you prompt for a reply?
10. Should you use post, fax, email or online surveys?
11. What happens if the response rate is too small to be useful?
12. What if some of the questions are misunderstood? How can I prevent this happening?
13. Should I use incentives for survey return? How does that affect results?
14. How many surveys should be used for a pilot survey to test the questions? Can we use pilot responses in the results?
15. Where do I keep returned surveys?
16. How much do I have to spend on printing and/or designing and/or posting out and chasing questionnaires? Can they go out with other mailings to save cost, or will this lower the response rate?

You may like to search online for an article by Vidal Diaz de Rada on Questionnaire Design (Diaz de Rada, V 2005). This author discusses some of the formatting details for questionnaires which may affect completion and response rates,such as size, colour and cover page.

These are all practical questions which are best answered in the context of your specific research questions in relation to the actual population who will answer the questions. You probably already have views about the answers, but if not, these are all detailed practical issues which you will have to decide before sending out your questionnaire.

Choosing from a range of question formats

Textbooks generally list the following as types of closed questions used in questionnaires:

1. List – select any answer
2. Category – select one answer (also called multiple choice)
3. Ranking – put answers in order
4. Rating – score or give a value to answers
5. Quantity – respond with amount
6. Grid – complete matrix to provide more than one answer

We could add to the list above:

1. Personal factual attribute question – eg age, employment status, qualifications
2. "Likert" rating scale – strength of response (eg strongly agree through to strongly disagree) indicated against numeric scale
3. "Likert" rating scale – strength of response indicated against verbal scale
4. "Likert" rating scale – strength of response indicated against bipolar or self-anchoring numeric scale (opposite statements at either end of numeric scale)
5. Semantic differential scales – opposite adjectives at each end of numeric scale
6. Frequency scale – verbal scale or numeric between always and never
7. Fill in the blank
8. Yes/No
9. True/False
10. Agree/disagree
11. Match pairs

You may be able to think of more? Remember closed questions are designed to check facts or perceptions, confirming information and producing answers which either qualify the respondent in some way, or give comparable data across your sample.

Open question formats include:

1. Open list – number of answers required, type of answer free
2. Open essay – often used as a final option to let respondent comment
3. Personal question about opinion – free answer
4. Personal question about behaviour – free answer
5. Vignette or scenario – question is set in an example context, answer usually open

See if you can devise a business research question for each of the formats above. It is only by doing this, that we get an idea of any problems in wording. If any of them are difficut to write, then let's discuss this in livechat or ask about it in the general queries DF.

There is another kind of question in many questionnaires and that is a filter question, sometimes a whole filter section. This is used when some parts of the questionnaire are not relevant to all respondents. We may use a filter question such as "If your answer is no, please move to question x". Or we can clearly label sections "if x applies to you, please omit this section". The important thing will be clarity and avoiding filters if at all possible, since they are often a cause of error and non-response.

When designing questionnaires, it is worth referring to a book on this subject by A N Oppenheim, originally written in 1992. The latest (2000) edition of this classic work includes far more information on questionnaires than most of us will need, but discusses specific issues very clearly.

How to design, pilot and administer questionnaires

Remember that questionnaires are not just the self-completion kind sent through the post or email or found on the web. Questionnaires are also created for structured interviews and semi-structured interviews either face-to-face or conducted over the telephone (we will look at these in detail in the chapter on interviewing). Well designed questions are the skeleton of any good research study. Even when we don't ask them directly of respondents, we often have to prepare them to collect data – for example when preparing to conduct participant observation, it will help to have clear questions in mind and perhaps some kind of pro-forma for us to complete during the experience.

Here are twenty tips to avoid question pitfalls:

1. Keep checking back to your research focus – is this question really necessary and relevant?
2. For every question, aim to jot down the maximum number of ways in which you think it can be answered – this immediately shows up problems with wording and is even better done by someone else for you
3. Check you can answer the question "what do I want to know" for each of your questions. This should help to avoid ambiguity
4. Closed questions are easier to use for data but including only closed questions will provide you with limited data. Unless you believe you can anticipate everything a respondent will say, use some open questions as well.
5. Check for vague terms in the question eg often, usually, sometimes, this year, most, few – people will have different meanings for these terms so their answers will not necessarily coincide with what you intend.
6. If you are asking a "why" question, think about the frame of reference of your respondent – are they likely ever to have thought about this "why"? If not, can you make it easier to answer? Perhaps offer alternative answers with an "other" category?

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7. Check for "leading" questions where you lead a respondent to agree or disagree with something.
8. Have you checked for double questions? Look for the word "and" in your questions! Allow respondents to answer one thing at a time.
9. Check the questionnaire's spelling and grammar – both are vital to ensure transmission of accurate meaning.

10. Avoid technical words (e.g. management jargon such as incremental, optimum, marginal, strategic, motivation, ROI [return on investment] etc) unless you are sure the respondents are familiar with these words.
11. If you are using verbal scales for response eg poor, acceptable, good, excellent, check that every question using this scale does make sense when answered this way. What if it said "does the pay package meet your needs?" the response scale should be adverbial eg not at all, to some extent, well, extremely well. Or we should rephrase the question.
12. Should you use five intervals in a scale or four? Five intervals will encourage a central tendency, ie respondents find it easier to give a mid-point reply than an extreme reply. So given Very poor, Poor, Average, Good, Excellent, there are likely to be a lot of Average answers. Four intervals are better as they force respondents to commit themselves on the positive or negative side, but should also include a Not Sure or Not Applicable. This is usually at one end of the scale for ease of coding. For similar reasons, if using a large number of rating questions, switch some around (ie they should not all be expressed just positively or just negatively) so that respondents have to think, rather than running quickly down a ticklist. They will need switching back before coding.

13. If you are using yes/no or true/false questions, make sure that no-one is likely to want to give an answer which is not available (eg sometimes).
14. If you are asking for company information eg sales or customer profiles etc – are you sure all respondents will be able to answer this? Could you just find this out from a senior manager or contact, rather than asking everyone in your sample?

15. Are some of your questions the kind of things only staff with some considerable experience of the company will know? If so, do you have an attribute question to qualify whether they have that experience?
16. Can you make the layout and format easier to read?
17. Have you clearly shown how to respond to each question (eg tick or circle (difficult on email forms as this requires symbol, a X is easier) and how to send the form back?
18. Have you checked you have authority to send this questionnaire, if it is to an organisation's staff etc?
19. Have you piloted this questionnaire, and pre-piloted (an earlier draft stage) if you know you will only get one chance to get these questions answered by this sample?
20. Have you kept a note of all changes you have made to your questionnaire and why? This will be helpful when you are writing up your research method and should remind you of the learning you have achieved.

There are a number of articles on web-based questionnaires in recent issues of the International Journal of Social Research Methodology (Fox, J, Murray, C et al. 2003; Heerwegh, D, Vanhove, T et al. 2005) and the Electronic Journal of Business Research Methods (McCalla, R A 2003). Look through them and consider what you believe to be the most important differences between web-based and postal questionnaires. We know that the web offers us speed and often ease and convenience of use. We also know that some companies offer simple online questionnaire building sites which may be free or involve just a small charge (eg www.surveyMonkey.com) and this can help give a quick questionnaire a professional look and offer automatic response summaries. But of course the choice of a web survey or physical print survey (posted or emailed) will always depend on the population you are targeting and the context of your research. Clearly some populations will not have web access and/or may not like using the web interface. Others, for example people seeking a job online, would be ideal candidates for web survey.

Questions for self review

1. Why do most questionnaires for self-completion have a lot of closed questions?
2. What incentive would it take for you to answer a 20 item questionnaire, a 50 item questionnaire and a 100 item questionnaire? Think about your response in relation to how many items you might include.
3. What is a Likert scale? What different kinds of scale questions are there?
4. How many people does it take to design a questionnaire?
5. Why should a questionnaire always have a covering letter/email?

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Using secondary data

What to look for as secondary data and where to find it

What is secondary data?

Secondary data is data, which the researcher did not collect for themselves directly from respondents or subjects. This means that secondary data was not collected with the researcher's purpose and objectives in mind. It may have been collected

- by other researchers, perhaps in the process of academic studies (could be available in journal articles, or published doctoral theses or conference proceedings) or
- in the process of normal operations (e.g. an organisation's "grey" material – information it publishes internally such as sales figures, information about product launches, company minutes etc, or an individual's personal diary or learning log)
- by institutions, whose job is to collect data (e.g. government or regional offices of statistics and information, international bodies whose purpose is information collection eg OECD or academic, media and professional bodies set up for the purpose of collecting information and data directly and from these government or international bodies).

For many business research studies, especially qualitative ones, it will be difficult to find exactly the kind of data needed, since it is unlikely you would be doing the research were it not for the fact that it hadn't been done before! So most studies will need to design collection methods for primary data. However, there is a vast amount of secondary data out there, much of it surprisingly accessible over the web, which may save us considerable time or give us a useful benchmark or context in which to set up our research design or a way of triangulating our results.

Where your research relates to a national or international level of operation, it is likely that national and international statistics will form part or all of your study, since these studies take time and money to achieve. Much of this kind of data. e.g. census data will be available free over the web or free from Government offices. Secondary data may be documentary, survey or multiple source, ie a mix of documents and surveys.

Access to secondary data implies two things – first of all you know how to find it and second you have permission to use it.

Key business information sources:

EU: Europa website www.europa.eu.int/comm/eurostat
EU: Labour Force Survey – quarterly since 1998
EU: Europe's 15,000 Largest Companies (ELC International)
EU: Global Market Information Database www.gmid.euromonitor.com (companies, markets, countries, consumers)
UK: www.bized.co.uk (academic source of business and management information)
UK: www.statistics.gov.uk (census and other data surveys)
UK: Labour Market Trends via Office of National Statistics
UK: CIPD Recruitment Survey/Training & Development Survey etc www.cipd.co.uk
UK: Workplace Employee Relations Survey (WERS) available through UK Data Archive www.data-archive.ac.uk Periodic 1980, 1984, 1990, 1998.
UK: FT info http://news.ft.com (company information)
UK: UK Data Archive (Social Sciences & Humanities) www.data-archive.ac.uk (University of Essex) (charge payable)
UK: MIMAS national data centre for UK Higher Education www.mimas.ac.uk includes access to UK census data.
UK & other countries: Economic & Social Data Service www.esds.ac.uk

UK & other countries: Economic & Social Data Service www.esds.ac.uk
US & other countries: Hoover's Online www.hoovers.com (company information)
UN: www.un.org
World-wide: OECD www.oecd.org

You can probably add sources to this list which you may have found in earlier studies. The list is growing all the time and the web enables us to find new data sources around increasingly specific topic areas.

The contribution of secondary data to business research

Broad data groupings available

Survey secondary data will usually have been analysed for its original purpose and could be a national periodic compulsory census, a regular e.g.annual survey or a one-off survey. You should be aware that this may not be raw data, ie some filtering and data decisions will have had to be made (eg coding of non-responses, grouping of data etc).

Contextual background

Much business research will require an awareness of industry, national or sector context (for example if you are conducting primary research in a healthcare organisation, it will be useful to set the context for this by comparing national or international healthcare statistics, or you may be reviewing your local area's labour force and want to see how this relates to your country's or other country's labour force statistics).

If you would like to try out a search for some international labour force statistics on the web, then conduct the following experiment. Try Google first and note down what you can find in 10 minutes. Then try Eurostat (the European Union statistics website) and note down how long it takes to find labour force statistics for member countries and any other issues which arise. Then try www.esds.ac.uk which should give you access to OECD Labour Force statistics. Note down how long this takes and what kind of information seems to be available. This experiment should give you a clear idea of how complex some secondary data can be and the types of data, particularly statistical data, which is easily available to the researcher.

If you are likely to use such sources, think about:

1. How the three sources compared
2. How long didit took to use each source Would this be easier next time?
3. How the labour force statistics compared? Were you finding similar statistics?

Quick and cheap data

Secondary data is often cost-free and, especially if it can be gained over the web or from your local / university library, this should be quick to find. Since you are not in touch with the data respondents, you do not overload them with subsequent research questionnaires and you, as the researcher, cannot affect their responses (which may be the case in primary research).

Longitudinal and cross-cultural data source

Much national and international data is collected on a periodic basis over time, so allows longitudinal research studies – not normally possible through primary research in view of cost and time constraints. Similarly cross-cultural studies can use large survey data, when conducting this as primary research is particularly complex. For more information on cross-national studies and some of the problems which can arise see Lynn's article on this in International Journal of Social Research Methodology (Lynn, P 2003), available fulltext online.

You may also wish to explore the timeweb UK statistics source to find what types of statistics are available there. Start by going to www.bized.co.uk/timeweb/sample_data_codes.htm to see what is listed. Then request annual data on some aspect of prices or credit. This kind of data can be particularly helpfulfor business research.

Meta-analysis made possible

Meta-analysis (conducting research on other people's research, therefore at one remove from it) can also produce surprising fresh insights – partly on the basis that at this perspective it may be easier to see "big picture" patterns.

The disadvantages of using secondary data in business research and how to overcome them

Difference of purpose

Because the original researchers had a different purpose and constraints from your current project, there may be inconsistencies or elements of the research which are not compatible with your own. This could include currency, terminology, samples, market changes, boundary changes, new discoveries or technology since the research was carried out etc etc.

Cost or access constraint

For secondary data, this problem arises mostly when searching for corporate data, either directly from companies or via agencies for market research data such as Mintel and KeyNote. In some cases the latter may be accessible through university libraries – it is always worth asking.

Aggregation and presentation of data

Other researchers, working for other research purposes, will often aggregate data in a way, which is not useful for your own research, for example showing regional rather than city data, or street rather than household data, or not disaggregating by gender. The presentation of data will depend on the purpose of the original research too – especially if the research is done for a media purpose, where headline stories sell media. There may be some apparent distortion in the data because of this.

One more activity which is useful when considering secondary data: Visit the BizEd time web site using the following URL for your web browser:
www.bized.co.uk/timeweb/digging/dig_source_work2.htm

You should find the section "Census and Sensitivity" on your screen. This is a four page section with some online questions about the UK Census and issues about the actual data counted. Work through the questions (there are Hint buttons if you find the questions difficult). This activity should help you to understand the constraints which surround population census data. This can be very difficult to compare across countries and over time, although that is the reason it is collected. The reasons for this include the inevitable shift in question focus over time, and changes in technology which mean the format of questions and the flexibility of response changes over time too. Despite this, census data is a major helpful source of general population statistics and is collected in most countries of the world. So when you are trying to discuss a statistical background to a research issue, this can be a very useful source, provided you are aware of constraints of comparison.

Data quality

From this book, you will be getting an idea of the attention to detail and careful planning and thought, which goes into good quality research. This is one thing which is difficult to check when using secondary data. Instead, the best we can usually do is to ensure the credibility and professionalism of the source institution, rather than the data. Be particularly careful when using secondary data from internet sources, where organisations are not known to you, as anyone can put up false data on the web without challenge. This also leads us to be particularly cautious about references sources.

A further step in assessing data quality will be to critically evaluate the research methods used to collect the secondary data. It is often reasonable to contact the data source to establish their methods, if you are considering using their publicly available data. Government sources usually publish detailed technical background alongside the data to enable you to interpret the data appropriately.

Measurement validity

Think back to our discussions on epistemology – we cannot expect secondary data to be some kind of "truth". The data will reflect the purposes, and pre-conceptions, of the original researchers. It would also be useful to think back here to your reading on the taxonomy of facts (Bannister, F 2005).

Data coverage

Does the secondary data cover the exact population in which you are interested? Are there any unwanted exclusions or inclusions, which may affect the way you use this data?

8.4.7 Data use

Unless you are simply going to quote from the secondary data as background information, you are likely to want to download or enter secondary data to run statistical analysis of some kind. Some data will be in a format ready for this – eg from www.bized.co.uk/timeweb . Some may not.

Questions for self review

1. Why bother with primary research when you can use secondary data?
2. What are the potential problems of using national survey data?
3. What is a meta-analysis?
4. Where would you be able to find a range of OECD survey data reports online?

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Qualitative research methods: collecting and analysing qualitative data

Key issues in qualitative data analysis

Clearly qualitative research is a different kettle of fish from a quantitative study – we explored the differences in earlier weeks. At first sight, it may seem that qualitative research is more difficult to pin down, less precise. In fact, qualitative methods are usually governed by clear rules and offer a way of exploring issues, which cannot be expressed by number.

An article by Rowlands (Rowlands, B 2005) offers a detailed justification of a qualitative approach to research on SMEs and training practice. This is a useful read to discover the steps taken in justifying a qualitative method. Qualitiative methods are increasingly accepted in social science and business research as this branch of enquiry differentiates itself from a scientific positivist paradigm. Human organisations and human behaviour are difficult to hold still and isolate, since they change constantly and can offer different dimensions of themselves to different audiences. Think about the function of Public Relations and the different faces of an organisation which may be shown to shareholders, customers, staff, suppliers for example. So it rarely makes sense to look only at numerical measured evidence when trying to understand what is going on in an organisation or other group of people. This is not to rule out quantitative study – naturally there are financial data and other quantitative data which can be established and monitored around business organisations and which will be of vital importance in their study and their day-to-day management. But there is also clearly a place for perception studies, looking at what people think or feel is going on at work, as this will also affect day-to-day and strategic long-term practice in organisations.

Some key differences between quantitative and qualitative method are shown below (taken from Bryman and Bell (2003 p302)): some of these distinctions are arguable – for example "structured" vs "unstructured", macro vs micro. Also, we should bear in mind that mixed quantitative and qualitative methods can usefully be used, where elements of both approaches can be used both to triangulate results and to develop richer pictures still of the phenomenon under investigation.

Quantitative	**Qualitative**
Numbers	Words
Point of view of researcher	Points of view of participants
Researcher distant	Researcher close
Theory testing	Theory emergent
Static	Process
Structured	Unstructured
Generalisation	Contextual understanding
Hard reliable data	Rich deep data
Macro	Micro
Behaviour	Meaning
Artificial settings	Natural settings

It is helpful to reflect on the influence of the researcher in qualitative research. As we have already discussed, there is a researcher influence to some extent in all research and analysis, however qualitative methods are more likely to suggest subjectivity. For this reason, it is essential to reflect on ways in which your qualitative data and analysis could be affected by your standpoint and contextual understanding, as well as your expectations of the research, and to make this explicit within your research report. It will also be necessary to be very clear and explicit about the method of research and analysis adopted, just as we must be in quantitative research.

The range of qualitative research methods applicable to different research topics

Principal Qualitative methods

Action research
Case study
Ethnographic research / Participant observation
Focus groups
Interviews – structured, semi-structured, unstructured
Life history research
Participant diaries
Structured observation

Some quick web searching will give you plenty of information on these different qualitative methods. Action research for example will involve the researcher as an active participant in the situation under study. As an actor in the organisation in which they may be employed, an action researcher seeks to explore and understand the world of which they are a part, and action research can help all involved in that business situation to understand better what is happening through a time of radical change – for example business restructuring, redundancy etc.

Case study research will involve more than one way of deriving data about the case or organisation/unit under study. This may include collecting and analysing documents, talking to people, survey data, participant observation, consumer research and any other data collection techniques which offer qualitative information about the case.

Ethnographic research comes from the study of anthropology, where "tribes" are lived in and observed for purposes of research. This kind of research will raise ethical issues, especially about the impact of the research on the life and behaviour of the group studied. The presence of a researcher in any group is likely to affect how people behave to one another. In a less deep and sustained involvement, participant observation may offer similar researcher impact on results

Some approaches to Qualitative analysis

- Analytic induction
- Cognitive mapping

- Data display and analysis
- Discourse analysis
- Feminist research
- Grounded theory
- Historiography
- Narrative analysis
- Phenomenography
- Phenomenology
- Template analysis

These approaches may overlap in some cases: for example grounded theory is a very detailed iterative method of, usually, interview transcript analysis and thus involves some similar activities to phenomenography, where such transcripts may also be interrogated by the researcher in a very detailed and iterative way. The aim in both cases is to dig into the text to look for categories or themes in the data which may be built into rich ideas or theories. Both are examples of inductive research ie theory building rather than theory testing.

While these different methods of qualitative analysis are very distinct – any research methods textbook or website will give full descriptions – they all involve a rigorous attempt to look at qualitative data (descriptions, discussions, activities, ideas presented verbally, audio-visually or in text) which offer a range of research interpretations. It may be the case that different researchers using the same analysis method on the same data could find different ideas and theories. They will be interpretations and subject to debate and challenge. Qualitative analysis must therefore be as rigorous and transparent in method as possible, to allow readers of such research to understand how conclusions and findings are achieved. They may not be exactly reproducible, as would be expected in experimental science, but that does not invalidate such results. The outcomes of qualitative research, like those of quantitative research, may be disputed; which is why it is vital to detail the methods used for collecting and analysing the data, and to explain as clearly as possible the researcher's own paradigm or philosophy about research, so that readers may understand where the ideas come from and how they may be filtered by the researcher.

What are the key operations required in qualitative data analysis?

- Where data is derived from interviews – individual or group, structured or semi-structured or unstructured – there will be a need to transcribe the recording of that interview before analysis. This brings its own problems of time, cost, method and detail.
- Development of themes, categories or ideas (from the literature (which may then be used to offer a hypothesis for testing in the data- deductive approach) or from the data itself (inductive approach).
- Unitising, coding or finding units of meaning within the data, which relate to or add to or amend the categories
- Constant comparative method leading to saturation of categories – this terminology comes from grounded theory but the activity is not confined to this approach; a constant iterative process of checking how the data meanings fit the categories or themes
- Understanding the variation and role of language as an intermediary in the communication of ideas
- In many cases, the production of researcher summaries, log books, contextual notes to help provide further explanatory detail to transcripts or observations

How qualitative data can be prepared for analysis

In most cases, this will involve some kind of transcription. Although simply taking notes of observations, and in some cases in interviews, may be sufficient, a transcript is important for conversations in which the researcher wishes to play some part, so that they are not required to both write notes and conduct an interview or group discussion.

This will mean gaining agreement for recording, finding a suitable instrument for recording and transcription and undertaking the transcription itself. Suitable recording equipment will not be too intimidating for the interviewee(s), will be reliable (!), will have a reliable power supply, will have a microphone which can pick up every speaker clearly including the researcher, and will produce adequate sound quality for transcription. Remember that interviewees may begin by speaking clearly and loudly as they are aware of the recording, but voice tone and pitch may soften later, so set the recording level high. Always test the recorder at the start of an interview.

Increasingly, digital voice recorders are being used for this purpose as they are small, relatively inexpensive and can record longer sessions than many audio tapes. You may wish to use both a conventional audio tape recorder and a digital recorder to make quite sure a useful recording is made. Digital recorders are useful as interviews can be played back to the researcher through MP3 players or computers with speakers, removing the need for sitting by a tape player. Do not be tempted to voice record without gaining full agreement from the interviewees (as small digital recorders are now able to do this), clearly this data cannot be used ethically if collected without consent.

Beware voice-activated equipment (which switches off when there is nothing being said) as this can lose definition owing to the transition from off to on when a voice is heard. At the current time, there is relatively little reliable voice to text automatic transcription software, which does not take nearly as much time (or more) than simply audio typing the transcript directly. Current versions of this software usually require the researcher to "teach" the software each voice to be heard in the data – this is not usually practical in an interview situation. The alternative is to teach the software your own voice and play and re-record the whole interview in your own voice. The software is still unlikely to be wholly accurate. Transcription machines work usually with audio tapes and simplify transcription by providing foot-operated control of the tape, so that the hands can remain on the keyboard.

It can be possible to pay someone to transcribe interview data for you, which can be helpful if there is a great deal of interview data. However, this does deny the researcher the opportunity of getting to know the interview in great detail during transcription; sometimes it is preferable to do this personally – or it may be the only alternative available.

When transcribing, maintain a context sheet to record non-verbal interventions or interruptions, as this data may affect how the transcript is understood. Transcripts should ideally be double-spaced to allow for coding and other notes to be made on the document. Decide rules for referring to individuals in the interview (actual names are not usually typed up for reasons of confidentiality). You will also need to decide how to type up repetitions of words and phrases, as this is common in speech patterns but usually adds little to the data. Bear in mind that a good typist can take 4-8 hours to type up one hour of interview, this is a very time-consuming process.

Respondent validation: it may be helpful to send transcripts for checking by the interviewees. This helps to build credibility in the transcripts, but is not always acceptable to the interviewee. At minimum, you the researcher must check every transcript against the recording, as it is easy to make mistakes in transcription (sometimes a mind-numbing process) yet such errors may lead to considerable effects on analysis.

Computer based methods for qualitative data analysis

Computer aided qualitative data analysis software (CAQDAS) is increasingly available, though like voice recognition software, this will not necessarily reduce analysis time by a great deal and will not be that straightforward. A common program in use is "NVivo" and a number of research articles can be found discussing its use.

CAQDAS can produce quantitative data from qualitative method, for example by producing frequency data on particular events, words etc. However, its main use is the qualitative analysis of such data as interview transcripts or narratives. They do this by organising the data, providing instant access to all data once entered, searching and retrieving particular words or phrases, coding and retrieving data, interrogating data on the basis of language used, relationships between codes, allowing comments and notes to be written in relation to the data and producing output reports to other software packages (e.g. Microsoft Word™, Microsoft Excel™, SPSS™).

If NVivo is not available as a package on your computer, then visit the website of its supplier www.qsrinternational.com and download a demonstration of the software to investigate what it will do and how it feels.

Questions for self review

1. What are the key differences between qualitative and quantitative research methods?
2. What are the main activities involved in qualitative analysis?
3. What is action research – can you provide an example of how this might be used in business research?
4. What is the case for and against someone else transcribing your interview data?
5. To what extent is NVivo likely to produce different results from your qualitative data than analysing manually?

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Practical issues in conducting interviews, focus groups, participant observation

Practical considerations relating to participant observation

Ethnography or participant observation?

Both ethnography and participant observation involve submersion of the researcher into the context under study. As mentioned in the previous chapter, ethnographic research has a more social anthropological feel and may focus more on business "tribes" and organisational settings such as departments and functions, or different national sites of operation. The focus will be on the community described and its symbols, culture, interactions, rituals, language etc. Participant observation will be used to allow the researcher direct experience of a specific situation or event, perhaps working in a factory or office setting during a transition period. However, in some texts, the two terms will be used interchangeably, so when discussing practical issues, we can classify them broadly together.

Access

Both approaches involve intense involvement of the researcher in the field, in order to feel like an "insider" and try to understand and explain what that feels like. This is usually difficult to do in the short term, so a time commitment to the research will be the first hurdle. In some cases, where a researcher is also employed in the organisation being studied, this should not prove too problematic (but does raise other issues of covert research to be covered next). Where the researcher has no other role in the organisation being studied, there will probably be protracted negotiations to allow this kind of long-term access.

Think about how you might gain access to an organisation for this kind of study? Letters? Emails? Contacts? How do you convince them of your credibility and trustworthiness?

Covert or overt research?

If research is undertaken covertly, without authority, then problems of access and of reactivity disappear. However, a number of others appear instead. For example the sheer practical difficulty of taking detailed research notes when you are meant to be working on the job! Also being unable to use other research methods during this period such as interviews. There is anxiety about possible discovery of the researcher role and activities, anxiety which is well-founded, since if the covert research is discovered, there is a strong chance the study will have to be abandoned before completion. Most of all, however there is a problem of ethics, since participants in the research will not have the opportunity for informed consent and their privacy is violated. This can damage the research and researcher if it is discovered, but can also damage the reputation of research in general amongst those whose trust was betrayed.

Is there a happy medium? For example, is it possible to have senior management authority but not to divulge your intentions to colleagues? What kind of difficulties might this cause? Or could the broad purpose of "research" be discussed openly, but the specific focus and question be kept secret? Whichever conclusion you reach, your research report will have to show clear details of the overt or covert nature of your research, and there would need to be very good reasons for a covert approach.

Think about a scenario in which you would be tempted to try covert participant observation. For example, suppose your place of work was threatened by relocation to a new venue and you wanted to study the effects of this move on the team's performance. As part of the team, you are now in a double role – team-worker and researcher. Think about the challenges and constraints this imposes on you. You want to use covert observation because you feel that if you tell the team you are watching their reactions and conversations, they will either reject you as a team-worker or will change their behaviour because they are being watched. Could they get to know about your role as researcher somehow? That might seriously affect your chances of continued employment in the team, since, even with your manager's agreement to the research, your colleagues may feel they cannot trust you again.

Relationship-building

Whatever approach is taken to participant observation, the researcher will need to develop skills of relationship-building,

- to allay colleagues' suspicions about being a representative or spy from top management,
- to maintain a degree of objectivity while in the organisation (rather than helping to affect the very relationships being studied e.g. a particular view of management or other functions or companies) and finally
- to develop key informants who can be used to provide broad organisational background and check out stories you are told, or help you to find appropriate people to get to know.

For example, a recent student conducted a study on flexible working in her own organisation. As a representative of HR, her role actually precluded the hearing of much gossip and informal talk, as HR could be seen as "the enemy" in relation to contracts negotiation. However, her gender, together with strong interpersonal skills, enabled her to get to know about unofficial flexible working through informal networks built on trust over time. This research ultimately exposed serious double standards in the way flexible working was represented by some managers in the company.

Roles for participant observers

Bryman and Bell (2003 pp323-4) discuss research by Gold in 1958 setting out four roles for participant observers: complete participant (covert observer), participant-as-observer (complete participant but overt researcher too), observer-as-participant (primary role is researcher but can participate in work) and complete observer (no participation in work and little communication with those observed). Further views of the different possible roles are offered by Gans and Bryman & Bell. The sense of exchange is usually helpful, since research data can be gained in exchange for consultancy advice, survey work or straight labour. Perhaps the biggest temptation is to "go native" ie to become fully absorbed into the perspective of the participant role, and thus to lose the objectivity of the researcher role.

If you are interested in ethnography or life history research, you may wish to consult an article on these methods by Gordon and Lahelma (Gordon, T and Lahelma, E 2003).

Practical issues relating to interviews

Structured, semi-structured, unstructured

If an interview is fully structured in format, does this mean it is quantitative research? To some extent yes, in that clear questions are asked in a consistent way, similar to the administration of a questionnaire by telephone. However the mere fact that the interviewer and interviewee are face-to-face brings another dimension to the research method. When we can see our interviewees, we introduce the concept of non-verbal communication – not just from them (which helps us understand more about them) but also from us – which can steer or emphasise certain areas, mislead or explain further items which would otherwise be misunderstood or left blank and so on.

Semi-structured interviews will be based on a question guide, the contents of which will always be asked of respondents. However, since this is not fully structured, the interviewee is allowed to go where they want with the questions and to divert to other things which interest them. Since the focus of a qualitative interview is the interviewee, not the interviewer, this is fine.

Unstructured or in-depth interviews can go right off the point – and that may be the point, ie to discover much more about the interviewee by what they say and think, than how they answer specific questions.

The interviewer's role is to manage the process (eg the time if a particular duration has been promised, the key questions are asked and the conversation stays broadly around the research question). The interviewee can be subject to very few constraints.

Many of the issues we raised around the design of questionnaires in an earlier session apply here to questions used in interviews (for example no leading questions or double questions). Where some are prepared in advance, it is advisable to give a copy to the interviewee in advance if possible, so that rather than "whatever comes into their head at the time", the interviewer will have the benefit of a reflective response. Some structured questions in an interview can help to provide consistency where multiple cases are studied or where more than one interviewer is used.

The issue of time

When setting up an interview, time booked will take on great importance to the organisation and the individual, who will be trying to fit this interview in around other duties of the day. However, it is normally the case that, once the interview has started, the interviewer will find difficulty in stopping the interview, as the interviewee enjoys the experience and begins to use it for personal reflection or simply the enjoyment of discussing a work issue with an adult in a way they cannot do with colleagues.

From the perspective of planning, especially if carrying out several interviews in one visit, the interview period should be realistic but not too long, whereas a considerable margin of time should be allowed between interviews in case of expected over-run.

As with any work interview, including a selection interview, it is vital that the visitor to the organisation (the researcher) turns up on time and in time to begin at the agreed start time, after getting to the right place and setting up and testing the recording equipment. So arriving at least 10 minutes early is usually helpful.

The interview guide

Preparing key questions in advance is very important if you aim to both achieve your research outcomes and be consistent and professional in your approach to interviewing. However, being over-dependent on the pre-prepared interview questions can be dangerous. A professional interviewer is genuinely interested in the interviewee's perspective and so will flex the questions to follow new directions suggested by the interviewee. Flexibility will make each interview more enjoyable to conduct, rather than feeling slavishly controlled by the pre-set guide. Finally, there is a common tendency for an interviewee to anticipate later questions, often without any prompts from the interviewer. It will be important to allow them to go there, rather than saying "I wonder if we could leave that point as it comes up later." Inevitably this will cause the interviewee and interviewer to forgot what was just said, so you probably won't get it later.

However, if later questions are covered early on, don't worry about running out of questions. Confident interviewers, by demonstrating empathy and genuine regard for the interviewee, can always facilitate further discussion by simple prompts such as "can you tell me more about…?" "that's an interesting point, I hadn't thought of that, so what exactly do you mean by…", "I'm not sure I have fully understood, can you explain that a little further…or give me an example?". (Such questions assume you have not run out of time, and the initial questions are all answered.)

Interview behaviour

Research cited in Bryman and Bell (p350) by Kvale suggests that an interviewer should be:

- Knowledgeable
- Structuring
- Clear
- Gentle
- Sensitive
- Open
- Steering
- Critical
- Remembering
- Interpreting

They also add the adjectives: balanced and ethically sensitive to the list. To this list, we can add interview competencies suggested by Saunders, Lewis and Thornhill (2007):

- Opening the interview
- Using appropriate language
- Questioning
- Listening
- Testing and summarising understanding
- Recognising and dealing with difficult participants
- Recording data

After the interview

Urgent action is needed to make notes about what happened. These are contextual notes, which will later shed much light on the event. You might note down personal impressions of how it went, where it happened, specific comments on the outcomes, the setting in which it took place, the state of mind of the interviewee from your current perspective etc. It will also be necessary to arrange to transcribe the interview from the recording as quickly as possible. Within a day or so, it is easy to remember what an interviewee was trying to express, even if the recording is not good. Later on, this will become very difficult.

You may wish to search for an article on interviewing (Carter, J 2004) which offers some useful ideas about the practical challenges.

Practical issues relating to focus groups

A focus group method is a focussed group interview. There will be several participants, the researcher as facilitator and a method of recording what is said, preferably video recording, as audio can be difficult to follow when several people are speaking. Video recording will also give much richer contextual evidence about how people interact. However resistance to video recording is much greater than audio recording.

Another key difference with a focus group is that there is usually a specific topic on which discussion is to be held, rather than a whole series of questions. The point of interviewing in this way is to explore the joint construction of meaning around a topic and to see how group dynamics and interaction work in this process.

They are not easy to run, although get easier with practice. Focus groups can be creative places, but can also be full of challenge and conflict – this needs a light touch of management from the researcher, only to ensure good standards of communication and respect are encouraged, not to stop conflict since this can be a productive source of creativity and meaning development. Issues can surface in a much freer way in a focus group than in an individual interview, and can be considered a more naturalistic context for testing and developing ideas.

In order to decide how many focus groups to hold and who should attend, some of the sampling issues discussed earlier should be discussed, such as random or snowball sampling. For example, are there variables, which must be represented in focus group membership (e.g. different departments, levels of work, length of experience etc) – this may increase the number of groups held. Broadly however, focus groups can continue to be held until the ideas and themes raised become familiar and can be anticipated by the researcher (saturation of categories). To some extent, feasibility and cost/time issues will also dictate number of groups held.

Size of groups will depend on practical factors, including size of available rooms, but ideally six to eight will be the easiest number to manage. While attendance may be easy to control within an organisation, inter-organisational studies will prove harder to schedule, with no-shows a common feature if people have to travel to attend the focus group.

The facilitator role varies greatly in focus groups, partly depending on the understanding of the process by participants. Too much control from the facilitator will make it difficult for a free flowing discussion to construct meaning and reveal new insights. Too little control from the facilitator may lead to lack of time discipline and the ignoring of some of the key issues. Some greater control is usually helpful at the outset, in setting ground rules for the session and explaining that the facilitator does have the right to intervene for time or agenda reasons, or perhaps to request an explanation. Once this is set up, the group can be encouraged to warm up on its own, and will soon get going, provided they trust the researcher. Where steering is needed, the facilitator can then intervene as needed.

Hyden and Bulow have produced a useful account of focus group methodology (Hyden, L-C and Bulow, P H 2003) which may help you to review this approach.

Questions for self review

1. What are the (small) differences between participant observation and ethnography?
2. How could you adapt a semi-structured interview process to be conducted by email?
3. What do you think would be your biggest challenge in conducting research interviews? What could you do about this?
4. Why do you think focus groups are so widely used to test new products and new policy ideas?

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Forecasting trends

Why forecasting is not widely covered in the business research methods literature

Surprisingly few research methods textbooks contain sections on forecasting trends. Why surprising? Because, in business, this is a key activity. We can see that the main business of a researcher is to look backwards and try to see what was happening in a particular situation involving particular variables and people. If research is rigorous, then it may be possible to apply lessons from the past to a current situation. But it is not seen as the job of an academic researcher to try to predict the future. Attempts to do this are found only in concluding paragraphs of research articles, and they will often be suggesting more research in what appear to be developing trends.

This is not coy. It is simply because predicting and forecasting trends is a very risky business, and rigorous research aims to avoid very high risk strategies. Yet people do, of course, predict trends. Management gurus and writers frequently aim to identify what is about to happen in business. If we see them as credible people, we may be persuaded by their predictions. But reality often proves them wrong. Some predictions in business will be about the next wonder product. New Product Development is always highly risky but is engaged in order to develop profit streams, deal with product life cycles and develop businesses. The risk is clear if we think about the current split between companies developing two different technologies for enhanced DVD performance. In early 2007, the market was impossible to call – would we be buying High Performance or Blue? Some companies are producing equipment compatible with both systems to avoid what happened when the last major split in this market caused the death of Betamax video systems in favour of VHS.

But surely we can do better when forecasting something we know about – such as next year's company sales figures? The evidence shows us that in fact we are poor at predicting even figures with which we are intimately involved and which directly affect our company's future. To start with, we confuse personal views and impacts with professional forecasts. If we ask a sales person to predict the level of her/his sales next year, that prediction will be partly based on market knowledge, partly on protecting their own position in the company, partly on an estimate of the outcomes of getting it wrong. People, unlike machines, are complex and unpredictable. For example, if sales people predict a high increase in sales, targets are likely to be set high, making it hard for them to achieve targets. On the other hand if they set them to show any kind of downturn, the sales people themselves will probably get the blame. So predictions tend to be cautious when personal targets and responsibility could be at stake. Equally if we have a new business idea and want to borrow money from the bank, it is likely that we will over-estimate potential sales, and the time at which our cash flow will turn positive.

Even when we are simply trying to predict sales forecasts, there will be many different people and departments of a business involved in this prediction. Information from inside and outside the company is relevant, and the quality of both may vary. Since many people are involved and different variables studied, any errors or inconsistencies or communication failures will make this a very imprecise activity indeed.

To quote a larger example cited by Makridakis et al (p 491), look at the Eurotunnel project involving major engineering work between UK and France to build a rail link under the sea. In 1986, passenger estimates were 16.5million for the first year of operation. In 1993 this forecast was reduced to 13 million. In 1994 it was reduced to 6 million. The first full year (1995) produced 3 million passengers. The actual cost of building was also more than twice the initial estimate and the intended data of opening was missed by almost two years. Such big projects as this, and for example bids to host the Olympic games (as in UK 2012) are frequently subject to major revisions as more actual data becomes available.

Just because the idea or technology is possible, it isn't necessarily feasible or implementable; and just because it is feasible, doesn't mean people will want to do it. Can you think of examples of possible technologies, which are not feasible and feasible technologies, which are not wanted?

Forecasting is nonetheless an important business activity underpinning the determination and acquisition of resources (human, capital, buildings, money, energy, materials etc) and the scheduling of their use.

Clearly this chapter is more focussed on research in business, than on academic research about and for business. But as we discuss the issues in forecasting, the debates we have been having will begin to recur; for example the extent to which the researcher's assumptions affect the outcomes of that research, the opportunities and risks associated with quantitative data and its analysis, and an attempt to understand how qualitative research can contribute to this field. All these ideas apply to forecasting trends.

Existing methodologies for forecasting

Forecasting methodologies can be divided into

1. quantitative techniques, which generally use historical time series data as the basis for projection, and regression analysis to determine the relative importance and relationships of variables,
2. qualitative techniques, using scenarios which are known to explore the unknown, and
3. creative techniques, which aim to suggest possible alternatives where there is no factual basis of information.

Quantitative techniques

Managers frequently use numerical data in an intuitive way, using their judgement and experience (or the toss of a coin!) to predict how trends will move. This is so widespread as to be a norm in much business practice – why is this, when formal quantitative techniques using statistics both exist and can tell us more about the possible trends? It seems that we are seduced by number and react emotionally to it – usually seeing it as important because it is a number, whether it is or not. (Which is why spurious research studies can get great media coverage by producing shocking statistics). We can talk about this in livechat.

Time series forecasting

This is about finding patterns in historical data and extrapolating them into the future. This approach does not attempt to understand why the data behave as they do, because the data is seen as too complex to understand or difficult to break down and use, or because we don't need to know what affects the data pattern, only the outcome of the data values. Such techniques are used to plan and schedule outcomes in business.

Explanatory models

Here we do look at why the data behave as they do, and attempt to identify the key variables affecting the data values. It is unlikely that the variables we investigate will account for all the change in the data value, so an element of error is introduced to represent what we cannot explain. Such models are used for policy formulation.

Qualitative techniques

These may be used alone or in conjunction with quantitative techniques and involve the contribution of experts. Such experts may be professional forecasters and planners, or consultants with a deep knowledge of an industrial sector, or facilitators who know how to harness the knowledge of in-company talent to produce forecasts for the medium and long term. Qualitative approaches may be used for strategy formulation and product development.

Creative techniques

These are used broadly when neither of the other sets of techniques can help because there is a lack of historical data. For example, how do we extrapolate trends for new technologies, which have only just arrived? How do we predict macro level changes such as climate change, when vast computing power is needed for the number of potential variables, and much of what is known is estimation not proven knowledge.

The answer is to use the power of the human brain to make connections between the forecasting problem and other knowledge. The use of analogy, for example, ie finding a storyline, which may be made to fit the problem in order to explore possible outcomes or add to possible predictions, dates back at last to Aristotle. Analogies may be taken from a different discipline (eg biology related to engineering) or fiction (well known plotlines which can be applied to a situation to develop possible outcomes), or simply factual stories of other products, or business decisions. Makridakis in Chapter 9 describes three helpful characteristics, which seem to apply to long term predictions:

- Accurate over the long term but impossible to identify when (eg Roger Bacon predicting submarines in 1260)
- Disbelief from most people, even those directly affected, about the potential of new inventions (famous example of the chairman of IBM predicting a maximum demand for computers of 100 in the early 1950s, similar reluctance to predict the spread and use of mobile phones)
- Over-prediction of the benefits and volumes associated with new technology once it has started to spread (this is the "paperless office" type prediction).

Scenario-building is another creative technique in future forecasting, in fact for many global businesses, there are departments specialising in this area

Scenarios are built on some historical information, plus subjective interpretations, hunches and specific assumptions. Their purpose is not necessarily to provide accurate predictions, but to challenge linear models of prediction, since actual change is not usually linear, but most predictive methods produce linear outcomes. Big business must invest in this type of activity to protect its territory and find opportunities before the competition.

Forecasting stages

1. Define the problem and the need
2. Collect information – quantitative and qualitative data
3. Exploratory analysis – look for patterns in the data, possible trends, seasonality, cyclical patterns, relationships in the variables
4. Select forecasting techniques e.g. exponential smoothing, regression and more advance statistical models or opting for qualitative or creative techniques
5. Use the model and evaluate the forecasts produced.

Basic forecasting tools

Here are the popular ones:

- Time series – much of the secondary data discussed in our earlier chapter is produced in this format, so could be used for prediction. Clearly cross-sectional data is all from one time period so cannot be used for time series.
- Graphical summaries – line graphs of a variable against time (horizontal axis), shows trends in historical data, special events, cyclical or seasonal patterns (latter from monthly data). A seasonal plot will use a line graph over the period of a year, with different annual data plotted together to show similarities and differences. A scatter diagram will be useful to show cross-sectional data in how one variable relates to another, this may be of use for explanatory modelling. Where a linear trend can be seen in a graph, a "straight line" forecast can be made (though will not necessarily be accurate!).
- Numerical summaries – univariate statistics eg mean, median, mode, standard deviation and bivariate statistics eg co-variance and correlation have been discussed in our chapter on quantitative techniques. All help to get to know the data in preparation for forecasting. All statistics can be shown over time. Time series data can compute autocorrelation, which can be shown clearly in a graphical way eg correlogram .

- Averaging –a simple forecast method uses an average of monthly data over a time period of some years to be the predicted forecast figure for that month in the next year.
- Prediction intervals – used to give an estimate of the range within with the actual value will fall, if the forecast value and Mean Squared Error has been computed. The formula uses a standard z-value, which is associated with a particular probability level – ie in the example z=1.645 is associated with a 90% probability level.

$$Fn+1 \pm z\sqrt{\text{MSE}}$$

- Least squares estimates – a way of estimating values for which the mean squared error (MSE) is at a minimum. It is an estimation of goodness of fit of a relationship between variables.

- Simple linear regression, when using an explanatory model and a particular variable has impact on the forecast. In other words this is about working out the relationship between one dependent variable (to be forecast) and another variable (independent) which could explain how the first variable changes. If there is more than one explanatory variable, multiple regression is used. Forecasting is done by understanding the relationship between the dependent and independent variables, such that we can use new values for the independent variable and predict corresponding values for the dependent variable.

- Transformations and adjustments – include mathematical transformation of the data values (eg square root or logarithm) of each value to smooth the variation and make forecasting simpler, calendar adjustments to take account of different lengths of months in some data given per day, adjustments can also be made for numbers of trading days in a month or for inflation or population change. A simple moving average (eg averaging the value before during and after the period and using this as the new data value) will provide a simple and understandable smoothing technique to allow patterns in the data to be more visible.

Non statistical tools for forecasting include: asking expert panels (in particular we can usethe "Delphi" method where a number of experts can be asked for predictions, which are then shared amongst the group and they are asked to predict again, and so on until the predictions cluster around a particular forecast). We can also ask those in the company closest to the data (could be the salesforce for sales predictions, but see the problems raised above in Section A), or we can ask customers. Creative techniques can be added to this list.

Measures commonly used to evaluate forecasts

Statistical measures

Comparing forecast and actual figures per time period will give a data series which can be averaged to give mean error of the forecast. However, positive and negative errors will tend to cancel each other, so mean error is likely to be quite small. It should, however, tell us of systematic forecasting error. Mean Absolute Error is computed the same way but taking all differences between actual and forecast as positive. Mean Squared Error squares each difference and produces a similar clearer picture of the error in forecasting, than the Mean Error.

A more useable error can be calculated through Percentage Error (PE), where each value of the difference between actual and forecast is divided by the actual value, giving a percentage error value. From these PEs, a Mean Percentage Error can be calculated, which is a useful meaningful estimate of error provided there is a meaningful origin to the scale used and the time series does not contain zeros.

Out-of-sample accuracy measurement

This simply divides the data set and uses part of it to estimate parameters and set up the forecast method, which is then tested on the second part for accuracy.

Comparing forecast methods

Uses naïve methods of making forecasts (eg using the latest data as the prediction, or doing the same but with seasonally adjusted data) and computes the Mean Absolute Error and Mean Absolute Percentage Error of these naïve predictions when compared with actual data.

Theil's *U*-statistic

The Makridakis text suggested offers a good description of this calculation.. Note that the value of the *U*-statistic suggests the forecast accuracy as follows:

$U=1$ then the naïve forecast is as good as the forecasting technique being evaluated
$U<1$ then the forecasting technique is better than the naïve method
$U>1$ then the naïve method is better than the forecasting technique.

Autocorrelation Function(ACF) of forecast error

To determine a pattern in errors after a forecasting model has been used. Ie calculate the autocorrelation function to see if there is still a pattern of error which could be avoided. Again the Makridakis text provides a good explanation of detail.

Exploring the value of forecasting methods in business practice

Statistical methods of forecasting are not nearly as widely used in business as we might expect. Moving average and exponential smoothing, plus regression, are the most widely known methods of quantitative technique for forecasting.

While time series methods are generally found to be more accurate in prediction than explanatory models eg using regression, it is the latter which is seen by managers to be the most effective technique.

Makridakis, et al conclude that:

- Simple methods for forecasting are at least as good as complex statistical methods
- Some methods are better for short time horizons than others.
- Different methods vary in accuracy depending on the method of evaluating accuracy
- Averaging of forecasts using more than one method results in more accurate predictions.
- Short term predictions can take advantage of inertia in business phenomena and use this with seasonality and cyclical patterns to make useful forecasts
- Medium term predications are likely to be affected greatly by economic and environmental changes, so may vary in effectiveness depending on assumptions about the direction and speed of these changes.
- Long term predictions will decrease the effectiveness of statistical modelling at the business level and the use of creative technique may be the way forward here.
- Key advice for improvements in forecasting includes the keeping of accurate records – without these we have only intuition.

Questions for self review

1. What are the three main approaches for forecasting in business?
2. What is the Delphi method?
3. Why is it useful to smooth data values?
4. What different naïve methods of forecasting can you suggest?
5. Describe two ways in which forecasting accuracy can be evaluated.

References

Makridakis, S., S. C. Wheelwright, R.J.Hyndman (1998). *Forecasting: Methods and Applications*.Third New Jersey, John Wiley and Sons Inc. .

Presenting research reports

Your personal approach to writing a report

Which parts of a research study appeal to you most?

1. Exploring and defining a research problem
2. Reading and reviewing the literature
3. Designing the research methods

4. Conducting the research
5. Analysing data
6. Writing the research report

Did anyone answer "6"?

For most of us it is other parts of the research process, which appeal most, yet without stage 6, no-one else will ever reap the benefit of our work. It is a fundamental principle of research that we must publicise what we find in some way, and that way usually involves writing reports.

One of the big issues with writing reports is that we leave it until near the end, believing it to be a simple part of the work, which can be sorted at the last minute, before a deadline. Of course, we are too intelligent really to believe this, but this is how we behave. One good answer to this problem is to plan. Not a rough idea of stages, which gets lost during the research and quickly becomes meaningless, but a proper Gantt chart of activities, showing:

1. how long we expect each activity to take,
2. which, if any, are dependent on the completion of other activities,
3. what resources are needed for each activity,
4. any help needed from others and
5. by when each activity will be completed.

My best students, who complete detailed Gantt charts, are the ones who give me a new updated copy showing actions achieved at every supervisor meeting, who include those supervisor meetings as milestones in the chart, and who plan to start writing way ahead of deadlines. As a supervisor, this works well for me, as it allows me to decide how comfortable I am with their level of writing, and enables me to make vital improvement suggestions at an early stage if they are necessary.

The textbook has an interesting mention of an idea from Phillips and Pugh (2005 cited in (Saunders, M, Lewis, P et al. 2007 p519)) that "writing is the only time when we really think." Do you agree with this statement? I am not sure I do, but I do know that writing and thinking are inextricably bound together, so if no other thoughts are happening, start writing.

How you write

Do you have particular rituals and routines to get yourself started on writing? Most of us do. There is no one right way, we are all different. Some people just write, others need to collect everything they need together first. Others start with a coffee or sit in a particular place to write. What about you?

When you write

Do you need to set chunks of time aside? It is rare to be able to write in a sustained way in short pieces of time such as half an hour. Most of us need at least an hour or two to think ourselves into the piece of writing and make some progress. It can then take another half hour of immersion each time you start after a break. It is also important to make sure you are physically and mentally fresh to write. Whether you write best at night or in the day, there will need to be some energy and sustained focus, which usually only comes when you are in good form. The alternative is to wait until pure adrenalin forces you to write at the last minute, when there is no option. Not a great idea, especially for a piece of work like a research report, where, if you are fresh, new and often valuable ideas will come to you as you write.

Tools to help you write

Simply understanding everything you can do with your word-processing software is a good start. That particularly includes using heading styles in Microsoft Word™, since this saves time if you have to produce a table of contents for your work. If you haven't used this feature, check it now before you have to write your report.

Other tools include those which can help you get your ideas together, such as mindmapping software (e.g.Mindgenius™, or www.bubblus.com). If you haven't come across these pieces of software, don't worry, they are not essential. They are a great aid if you regularly have to produce written work of some length and like the creative approach of mind-mapping. However it is also very easy to produce a mind map on paper!

Finally specific citation software programs can be a great help if you intend to research on a regular basis and need to build a good retrievable archive of references. Packages include Endnote™ and Procite™ – all the packages mentioned can be found on the web. A citation software package is simply a tailored database, which prompts you to record all the relevant details of a reference as you enter it, has space for notes on your reading of it, and can automatically work alongside Word to insert text references and an automatically generated bibliography. All you have to do is choose the format.

Student versions of these packages are available. If you do not want to go this far, think about how you will keep your references in a retrievable format to save time when writing up.

The differences between writing a report for a business audience and for academic purposes

Business reports

Here there is a need for clarity, brevity, simple, useful terminology, an executive summary which focuses on the problem and suggested action. Sometimes there will be a corporate house style to adopt.

Academic reports

There is still a need for a clear, succinct style but using appropriate terminology, for example on research methodology, which will not be everyday language. Avoid using description wherever possible and instead take a critical analytical approach (discussed in the chapter on literature reviews). Pay special attention to academic referencing and the avoidance of plagiarism. Read and use peer-reviewed academic journal articles to set the tone of academic writing.

Find a good academic journal article and consider trying to rate the suitability of the writing, the sections used and the persuasiveness of the article. Remember that in articles there are very strict and short word limits, which means we rarely see a detailed research method description, except where this is the point of the article, and we also rarely see a full literature review, which would be expected in work written for academic assignments or research reports for funding bodies.

Elements of an academic research report:

Abstract, - written last as this must include a flavour of results, don't repeat phrases from the main text. If we don't get the reader's interest in the short abstract, they are unlikely to read the rest of the report.

Introduction, - must immediately grab the reader's attention, often by a dramatic statement of the problem or situation to be researched.

Background, - usually starts with a broad picture and gradually refines it to the narrow focus of the research (a filter)

Literature review, - see the earlier chapter on this subject

Research objective and method justification, - most of this book has been about this section, but it must not appear as a stand-alone section. Every section including this one should follow logically from the previous one and lead naturally to the next. So, for example, the literature review section should end with a direction for the primary research, which is then picked up in the research method section.

Findings, try to offer the findings of your research in as pure a form as possible. This doesn't mean giving raw data, it means finding a way to present that data so the characteristics of the data are clear to the reader, without interpreting the data, so that the reader is dependent on your view and cannot see the data for themselves. Visual methods such as charts and tables can summarise and present data effectively, but not pages and pages of them which soon cause overload.

Discussion and analysis, this is the real test of your ability to synthesise what you found in the literature review and in your primary research and to pull out from that synthesis what seem to you to be the most important points. It is not a place to put any description. Writing should be clear but intense – all sentences must add value.

Conclusions, not just a summary of what you found and have already said in the analysis, the conclusions section should step back a little and take an objective view of the outcomes – theoretical and practical – from the whole project – there should be no new references at this stage, but a clearly persuasive account of what has been achieved

Recommendations. – may be detailed and practical or may simply urge further research in an area which has been uncovered by your research. Where practical suggestions are made, they must be feasible, not "blue sky" ideas. Preferably there should be suggestions about how they could be taken forward – sometimes with a tabular implementation plan.

Appendices. – in an academic piece of work, the appendices are not there to gain extra marks. They are there for two possible reasons: a) to add information to the main text where word length or focus did not allow their inclusion or b) to maintain a complete record of relevant information, particularly for your future use of this document. Keep appendices to a minimum.

Style and grammar

This is important whether you are writing in your first or a second language. In both cases it will be wise to ask someone you trust to sub-edit your text. None of us is our own best editor, as many errors can easily slip through. If you are submitting an initial draft section to a supervisor, then errors are not so critical, but they must not be at a level, which obscures the meaning!

If you are concerned about points of pronunciation and grammatical style, the best place to check is an English language national newspaper style sheet. These are available online at the paper's website eg The Times, or The Telegraph in UK. These are often better than out of date grammar textbooks, as they incorporate current changes of accepted style, but do not lead change, reflecting acceptable style in the world of the reader.

Bullet points

This is a key issue for academic work in the 21st century, as students increasingly find bullet points acceptable, and modern business favours the use of bullet points to encapsulate an argument quickly and clearly (in Microsoft Powerpoint™ style). There is nothing wrong with using bullet points in business reports, they can often cut wordy paragraphs and get straight to the point. However, in academic work it is usual to avoid them if possible, using them only when giving a list of examples which require no further explanation, or summarising the points which are then explained in more detail below. Why? Because an academic reader, specifically a marker of academic work, cannot tell from a bullet point whether you have understood something or merely copied out a list.

Use of first person

Whether you use the word "I thought or I did …" in your academic writing will vary according to the purpose of the section of writing. However the general rule is not to use the first person except in two specific cases: first in a reflective section, where it is entirely legitimate to speak in the first person about your learning and experience, and second, in narrative accounts or certain types of qualitative data analysis, where this is a usual convention.

In all other cases, it is best to write objectively from the standpoint of a third person, provided you don't have to tie yourself up in knots stylistically to achieve this!

A few more words of wisdom

A common issue in academic writing is the use of verb tenses, as much of your writing may be taking place as things happen, results come in etc, thus encouraging you to use the present tense. However, as a general rule, it is better to use a consistent past tense as you are writing up a report of something, which has happened. Again, certain types of qualitative writing will demand a current tense, and of course quotations and transcripts should reflect exactly what was said, however it is usual to spend some time converting text to a past tense so that it reads consistently.

Length of sentences and paragraphs can be something, which gets in the way of meaning. Try to ensure that sentences introduce only one idea, and paragraphs group around one idea, rather than letting them include many, which makes it harder for the reader to understand.

Subheadings can also help to break up long areas of text on a page and should be used where sensible. Most importantly, your academic writing is for a particular purpose: to persuade the reader of your ideas, which requires an engaging, clear and rhetorical style.

Logical structure of research reports

A final point: the logic of your written report. For any audience, logical argument and flow from one section to another is vital. In an academic research report, it can be helpful to draft an audit of how specific findings in your research relate to particular literature and particular ideas, which then feature in your conclusions. In this way, all conclusions should be traceable back to the findings they came from and a logical flow established.

If you are not regularly used to writing such research reports or dissertations, then consider logic this way: in a really good piece of fiction writing, the reader is led along by always wanting to know what happens next. How can we apply this to your research report? The introduction should cause the reader to understand why you looked at the literature, what problem you wanted to solve or question you wanted to answer. When we read the literature review, we find out what that told you, but are left understanding that the literature didn't fully answer all your questions, or perhaps raised new ones. We find this out in the conclusion of the literature review and are left wanting to know how you are going to answer those remaining questions. So we read on to the research method, in which you tell us why you chose this particular way of finding answers to your research questions, and then, in the findings, what you actually found as the answers.

But that isn't enough. We are left at the end of the findings section thinking – but how did that relate to what we heard about in the literature? So we want to read on to the discussion to find out. By the end of the discussion, we know what you found and how it stacked up with the literature, but we are tempted to say "so what?" and you answer us in the conclusion and recommendations by explaining what that means for the big questions you raised in your introduction, and what else remains to be done if there are unanswered questions which your research triggered.

All this means that each section concludes with a "cliff-hanger" – an unresolved question or problem which makes the reader want to read more in the next section. Putting in conclusions like this to each section, helps the reader to see the logic of your work.

Logic as a "U" shape.

You may also think about a "U" shape pattern to this structure, where the introduction and context begins at high level with "big picture" issues – maybe about the economy or the state of an industry sector. As you proceed through your research report, you dig down into more detail, so that by the time we read the findings, we are reading very detailed information in a particular context of your research, which you have found at the bottom of the hole you have dug to find out more about your question.

Then you start to take us back to the surface as you relate this detailed set of findings to the published literature, climbing back up eventually to conclusions at "big picture" level. Now we can see the whole problem again, but now we have your original primary research to add to our knowledge about that problem, and guide us where to go next in further research.

Producing an oral presentation of key findings

In business, it will be usual practice to present an oral presentation of a report, possibly using the report itself as a "leave-behind" for readers to follow-up their undoubted interest in your subject! If using Microsoft Powerpoint™ software to present the gist of your ideas, then it is simple to produce clear and professional-looking slides for projection which set out the background, your objectives,

your understanding of the context, your method(s) and your results, together with next steps/ recommendations for action. Remember that when presenting orally, we must speak directly to the audience and encourage their involvement. At the least this will involve a pause at some point for questions, but for preference time will be designed in to get some audience participation at an earlier stage. Unless you are very familiar with the audience, it is good practice to ask something early on, which tells you a little about their experience of the topic, so that you can involve them in your talk.

Any presentation will be enhanced by visual aids rather than endless bullet-style slides. Writing the bullets can be helpful for us to remember what we want to get across, but the actual presentation may keep the bullets only for us, and for summary use, and focus on simple and dramatic visuals (photos for preference) which relate to your research, the problem or the outcome. Presenting to an in-company audience means not only a house-style (often branded slides) but also using your researcher's objectivity to add depth to a focussed corporate message. This is quite different from an academic presentation, which will use your objectivity to show your academic credibility and focus on the extent of your knowledge of published sources as well as the research you have achieved yourself.

Whether in the academic written report, the business report or a presentation, well-selected quotations from your research data, which reveal and give a flavour for your findings, are of high value. Not too many, just a few to show your connection with the "real world" in which your research was conducted and how it relates to your findings and recommendations.

Questions for self review

1. Why do we have to write research reports?
2. What are the key differences between writing a business report and writing an academic report?
3. What should be included in a research method section?
4. How long should a Powerpoint™ presentation be when delivering the results of your research study to an academic audience? Why?

References

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Organization of a Research Paper: The IMRAD Format

Most scientific papers are prepared according to a format called IMRAD. The term represents the first letters of the words Introduction, Materials and Methods, Results, And, Discussion. It indicates a pattern or format rather than a complete list of headings or components of research papers; the missing parts of a paper are: Title, Authors, Keywords, Abstract, Conclusions, and References.

Additionally, some papers include Acknowledgments and Appendices. The

Introduction explains the scope and objective of the study in the light of current knowledge on the subject; the Materials and Methods describes how the study was conducted; the Results section reports what was found in the study; and the Discussion section explains meaning and significance of the results and provides suggestions for future directions of research. The manuscript must be prepared according to the Journal's instructions to authors.

The IMRAD Format—Main Sections of a Scientific Paper

Section	Purpose
Title	What the paper is about
Authors	Names and affiliations of authors
Keywords	Words other than those in title that best describe the paper
Abstract	A stand-alone, short narrative of the paper
Introduction	***Why this paper?*** The problem, what is not known, the objective of the study
Materials and methods	***How was the study done?***
Results	***What did you find?***
Discussion	***What does it mean? What next?*** Interpretation of results and future directions
Conclusion	Possible implications
Acknowledgments	***Who helped and how; what was the funding source?***
References	Details of papers cited
Appendices	Supplementary materials

An important point to keep in mind is that there is no standard or uniform style that is followed by all journals. Each journal has its own style; but they all have their own Instructions to Authors (or other word combinations to mean the same thing).

Once you select a journal to which you wish to submit your manuscript, please

FOLLOW THE JOURNAL'S INSTRUCTIONS TO AUTHORS, which can usually be found in each volume of the journal (note that a volume may contain several numbers, and there could be multiple volumes in a year), or easily accessed from the journal's webpage. Some authors may not be fully convinced about the logic of some of these instructions, but it is a futile effort to argue with the journal

or complain about its instructions. Remember that authors are free to choose from a number of journals in which to publish their papers.

Most scientific papers are prepared according to a standard format called IMRAD, which represent the first letters of the words Introduction, Materials and Methods, Results, And, Discussion. These do not represent the complete list of headings or components of research papers; the missing parts are: Title, Authors, Keywords, Abstract, Conclusions, And References. Additionally, some papers include Acknowledgments and Appendix (Appendices). Sometimes, some sections might be represented and/or amplified by others; e.g., ‘‘Theory’’ instead of Materials and Methods. Other modifications include combining Results and Discussion into one section, and including ‘‘Conclusions’’ as the last part of Discussion. A recent trend is to give only the main aspects of the paper and post all the additional or ‘‘less important’’ aspects as ‘‘Supplemental Materials’’ on the journal’s website.

Review papers do not have ‘‘Results and Discussion,’’ and they usually use other headings instead of IMRAD headings. The term IMRAD indicates a pattern or format more than the words covered by the abbreviation. With the American National Standards Institute (ANSI) adopting the term as the standard, first in 1972 and again in 1979 (ANSI 1979), it has become the choice of most research journals.

2.1 Title

The title of the paper will be read more than any other part. The way in which a paper is ‘‘browsed’’ by readers is in the order: Title—Abstract—Results (Tables and Figures)—Full paper. The prevailing trend is said to be that, on average, the number of readers from one section to the next in the above sequence decreases by a factor of 10. That means for every 10 readers who look at the title, one reads the Abstract; for every 10 who read the Abstract, one goes to the Results section, especially Tables and Figures; for every 10 who read the Results, one reads the full paper. Thus, for every person who reads the full paper, 1,000 read the title. Titles are read both by scientists scanning the contents of a journal and by

those depending on searches through secondary sources, which always carry the title and author but may or may not carry abstracts. The title may be reprinted in bibliographies and subject indexes, stored in bibliographic databases and cited in other articles. Therefore, the title is an extremely important component of the paper. A good title will attract readers who might not otherwise read the paper and may help future researchers find important information.

A good title of a research paper should:

• Contain as few words as possible: many journals limit titles to 12 words

• Be easy to understand

• Describe the contents of the paper accurately and specifically

• Avoid abbreviations, formulas, and jargon

• Not include any verb

• Not contain low-impact words such as ‘‘Some notes on …,’’ ‘‘Observations on …,’’ ‘‘Investigations on …,’’ ‘‘Study of …,’’ and ‘‘Effect of …’’

• Not be flashy as in newspapers (e.g., avoid statements like ‘‘Agroforestry can stop deforestation’’)

• Report the subject of the research rather than the results

• Follow the style preference of the target journal.

An important point to remember is that the title, being the first part of the paper, will be browsed by the busy reader, and therefore must be neat, crisp, and coherent to attract the reader’s attention. The important words should be placed first and appropriate words should be used to highlight the significant content of the paper.

The words chosen should also be in a form suitable for abstracting and indexing services. Jargons and abbreviations should be avoided and, to the extent possible, common names instead of the Latin names of plants (and other living organisms) should be used in the title.

It used to be a common practice to publish a series of papers on a subject with a main title and several individual papers with separate sub-titles, often designated as parts 1, 2, etc.

2.2 Authors

The authors of a paper are individuals who have made an important contribution to planning and carrying out the research reported, and anyone listed as an author should also have helped in the preparation of the paper. Technicians and other helpers are usually mentioned in the acknowledgments.

The authors are listed in the logical order of importance of their contribution to the work. The person listed first is considered the senior author (unless otherwise specified); others may be listed according to the importance of contribution to the effort. Listing authors in alphabetical order is an old practice that is not followed by journals anymore. It is customary to list the graduate student whose thesis or dissertation forms the basis of a paper as the first author followed by his or her major supervisor as the second author. In some disciplines, however, the major supervisor of a graduate student whose research is published is listed as the last author. The person to whom correspondence concerning the paper may be addressed is marked by an asterisk or some other notation.

Author line-up (who and in what sequence) can be a thorny and contentious issue leading to awkward battles and breach of the high ethical standards that scientists are expected to uphold. Sometimes, the head of a laboratory or institute where the work was done may insist to be listed as an author of all papers coming from the organization. Although this is an objectionable practice, if it has to be done, that person should be listed as the last author. Also, it is not uncommon that some exchange visitors (trainees, exchange scholars, etc.) to overseas institutions publish papers upon their return to home institutions, based on their overseas work, listing their foreign supervisors as coauthors without the knowledge and approval of the latter. In order to avoid such situations, most journals require the final approval of each coauthor before the paper is published.

Author names should be complete enough to ensure proper identification, and be followed by an address including email, presented according to the journal's style. The institution to which the author was attached when the work reported in the paper was conducted should be listed against the author even if the author has left the institution after completing the work (which is common for graduate students and trainees); in such cases, the author's current address could also be listed and properly identified.

2.3 Keywords

These are words by which the paper should be indexed by abstracting services. Words that appear on the title should not be repeated as keywords because titles and keywords are listed together by abstracting services. Most journals allow not more than six keywords; some journals do not allow any keywords; and some journals allow a string of several words as keywords. In any case, the keywords should be specific to the article; common words such as plants, soils, models, and people are too general to be of any value as keywords.

2.4 Abstract

An Abstract is a mini-version of the paper. The American National

Standards Institute says ''A well prepared abstract enables readers to identify the basic content of a document quickly and accurately, to determine its relevance to their interests, and thus to decide whether they need to read the document in its entirety'' (ANSI 1979). Therefore, it is extremely important that the Abstract be written clearly.

The abstract should be definitive rather than descriptive; i.e., it should give facts rather than say the paper is ''about'' something. Since an abstract will usually be read by an average of 100 times more people than will read the full paper, it should convey the information itself, not just promise it (Luellen 2001). For example, avoid phrases such as ''… are described'' or ''… will be presented'' in an abstract; instead, describe them, present them (except in Abstracts for conferences or annual meetings, written several months in advance of the event).

As Ratnoff (1981) stated, ‘‘Reading a scientific article isn’t the same as reading a detective story.’’

Journals have strict limitations on the length of abstracts, usually in the range of 150–250 words, and written in one paragraph (multiple paragraphs for review papers). The Abstract should stand on its own, i.e., be complete in itself. It starts with a statement of rationale and objectives and reports the methods used, the main results including any newly observed facts, and the principal conclusions and their significance. If keywords are not listed separately, the Abstract should contain the keywords by which the paper should be indexed. Because the Abstract is a short version of the full paper, it contains a mixture of tenses representing the tense used in reporting the respective sections of the paper. Thus, in the Abstract, statementsreferring to the rationale and introduction, interpretation of results, and conclusions are in present tenses, whereas materials and methods and results are in past tense.

The Abstract should not contain:

• Abbreviations or acronyms unless they are standard or explained

• References to tables or figures in the paper

• Literature citations

• Any information or conclusion not in the paper itself

• General statements

• Complex, winding, verbose sentences.

Furthermore, in order to facilitate smooth reading, excessive quantitative datawith statistical details and long strings of plant names should be avoided in the Abstract. Experienced writers prepare or fine-tune their title and Abstract after the rest of the paper is written.

Introduction

A good introduction is relatively short. It tells why the reader should find the paper interesting, explains why the author carried out the research, and gives the background the reader needs to understand and judge the paper. Specifically, the Introduction defines the nature and extent of the problems studied, relates the

research to previous work (usually by a brief review of the literature clearly relevant to the problem), explains the objectives of investigation, and defines any specialized terms or abbreviations to be used in what follows. Remember that the Introduction leads logically to, and clearly states, the hypothesis or principal theme of the paper.

The Introduction should be relatively brief; most journals recommend less than 500 words. Avoid repetition: do not repeat the Abstract in the Introduction (and Introduction in the Discussion). Do not go into an extensive literature review; two to four most relevant and recent citations should be adequate to corroborate a statement. Do not repeat well-known facts nor state the obvious.

The Introduction section also may use different tenses: justification and motivation of the study is presented in present tense, whereas the review of literature is presented in past tense (‘‘Studies showed that …’’), or in present perfect tense if it is common knowledge (‘‘Studies have shown that …’’).

The objective is written in past tense (‘‘The objective of the current study was…’’).

Different journals follow different norms and styles. Some want discussion of literature in the Introduction while some want it in the Discussion section. Some journals require a brief account of the Materials and Methods to be included in the Introduction section, and some may want even the important conclusions presented in the Introduction section, although that tendency is now disappearing.

2.6 Materials and Methods

The purpose of this section is to present in a simple and direct manner what has been done, how, and when, and how the data were analyzed and presented. This section should provide all the information needed to allow another researcher to judge the study or actually repeat the experiment. The simplest way to organize this section is chronologically; include all necessary information, but avoid unnecessary details that the readers are supposed (ought) to know.

The section should include the following though not necessarily in this order:

• Description of the study location

• Design of the experiment with number of replications and sampling procedures used

• Plants or animals involved, with exact descriptions

• Materials used, with exact technical specifications and quantities and their source or method of preparation. Some journals as well as companies require that the company's name is included in parentheses after the material is mentioned

• Assumptions made and their rationale

• Statistical and mathematical procedures used to analyze and summarize the data.

Methods followed should be described, usually in chronological order, with as much precision and detail as necessary. Standard methods need only be mentioned, or may be described by reference to the literature as long as it is readily available.

Modifications of standard techniques should be described. If the method is new it should be described in detail. Do not include excessive description of common procedures. Keep in mind and respect the general level of the readers' understanding and familiarity with your procedures. For example, in a manuscript for a journal targeted at researchers in biophysical aspects of agroforestry, it is not necessary to narrate all minute details of how sampling materials/sites were selected, and how samples were drawn and prepared for analysis, and so on. Remember, however, that the journal's editors may ask for additional details of any item.

Special attention may be paid to ensure that:

• Ambiguities in abbreviations or names are avoided

• All quantities are in standard units

• All chemicals are specifically identified so that another scientist can match them exactly in repeating the work

• Every step is explained, including the number of replications

• All techniques are described, at least by name if they are standard, or in as

much detail as needed if you have modified a standard technique or devised a new one

• Irrelevant and unnecessary information that does not relate to the results or confuses the reader is avoided.

The Materials and Methods section is presented in past tense. There is no standard ‘‘rule’’ on the use of active or passive forms (‘‘I/we took ten samples’’ vs. ‘‘Ten samples were taken’’); follow the journal’s norms, and if the journal is not strict about it, use your personal preference.

The SI system (Le Système International d’Unités) is used for reporting measurements in all research publications. But this general rule has some exceptions especially when it comes to applied disciplines such as agroforestry. For example, in scientific publications with a regional focus, locally popular, non-SI units may be used if that would help clarify interpretation or understanding of the data, butsuch units should be explained in relation to SI units at their first mention in text.

2.7 Results

This section presents the new knowledge; therefore, it is the core of the paper. Note that the Introduction and Materials and Methods sections are needed and designed to say why and how the author/s arrived at what is presented in this section, the meaning of which will then be explained in the Discussion section. Thus, the value of the paper depends on what is contained in this (Results) section, and it must be presented in an absolutely clear manner in just the right number of words, neither more nor less. It is usually easiest to follow the results if they are presented in the same order as the objectives are presented in the Introduction.

Some guidelines on presenting the results are given below:

• Present the results simply and clearly

• Report only representative data rather than (endlessly) repetitive data

• Do not report large masses of data; reduce them to statistically analyzed summary forms and present in tables or figures along with essential statistical information to facilitate understanding and comparing them

• Repeat in the text only the most important findings shown in tables and graphs; in other words, do not repeat in the text all or many of the data presented in tables and figures

• Include negative data—what was not found—only if useful for interpreting the results

• Cite in the text every table and figure by number

• Include only tables and figures that are necessary, clear, and worth reproducing

• Avoid verbose expressions: e.g., instead of saying ‘‘It is clearly shown in …,’’ say ‘‘Light transmission to ground was reduced by the presence of tree canopy

Tables and figures are an integral part of a well-written scientific paper, and they appear in the Results section (but there are exceptions). While tables present accurate numbers, figures show trends and features. Do not present the same data in tables and graphs.

2.8 Discussion

This is the section where the authors explain meanings and implications of the results. The section pulls everything together and shows the importance and value of the work and is therefore the most innovative and difficult part of the paper to write. The authors' skill in interpreting the results in the light of known facts and using the results as evidence for innovative explanations of the observed behavior should push the frontiers of knowledge and arouse the readers' enthusiasm.

Without such an engaging discussion, the reader may leave saying ‘‘So what?’’ and move on to other, more interesting papers.

A good discussion should:

• Not repeat what has already been said in the review of literature

• Relate the results to the questions that were set out in the Introduction

• Show how the results and interpretations agree, or do not agree, with current knowledge on the subject, i.e., previously published work

• Explain the theoretical background of the observed results

• Indicate the significance of the results

• Suggest future research that is planned or needed to follow up

• Deal with only the results reported in the study

• Stay away from generalizations and conjectures that are not substantiated by the results presented

• State conclusions with evidence for each.

The Discussion section is written in both present and past tenses. Current knowledge (from literature) is stated in present tense, whereas the work being reported and discussed in the paper (your own work) is presented in past tense; e.g., ‘‘Treatment A was better than Treatment B, which suggests that ….’’

Mismatch between stated objectives and discussion/conclusion is a very common problem in many manuscripts. Analytical insight is what we should strive for in the Discussion section, but unfortunately, it is difficult to describe how to accomplish that. Lack of such insight is evident when authors simply state—often repeat—the results, and make superficial statements such as ‘‘this work agrees with the work of author X (some unknown author’s work, published several years earlier)’’ as though the objective of research was to see if the results agreed with some other author’s (obscure) work published 20 or more years earlier.

Another common problem in Discussion sections is the tendency to move away from the stated objectives and try to ‘‘solve all problems.’’ Admittedly, agroforestry and natural resource management researchers are often under pressure from funding agencies and administrators to produce fast and easy results and technologies for immediate dissemination. Authors therefore tend to ‘‘please’’ the authorities by indulging in pedantic discussion and conclusions that do not emanate logically nor are substantiated by the results presented. For example, if the title suggests that the study is on insect populations in a mixed-plant system, the paper should focus on that, not on, say, reporting and discussing yield of crops and elucidating how adopting such a practice can reduce deforestation. Some amount of speculative discussion, however, is in order to elicit excitement and motivate

future research. The line between ‘‘optimum’’ and ‘‘excess’’ is often faint; the scientist has to do some balancing to separate rote from reasoning.

2.9 Conclusions

Conclusions should, rather than just repeating results, state well-articulated outcomes of the study and briefly suggest future lines of research in the area based on findings reported in the paper. In poor writing, it is not uncommon to find conclusions such as ‘‘more research is needed before conclusions can be drawn.’’ In that case, why publish a paper from which conclusions cannot be drawn? Some journals do not allow a separate Conclusion section. In that case, the last paragraph or a few sentences of the Discussion can be used to state the conclusions.

2.10 Acknowledgments

This short section is for thanking the institutions and individuals who helped significantly in the work reported in the paper. This may be in a general way to a granting agency that supplied funds or a laboratory that supplied materials, or in a specific way to a person or persons who gave you advice or helped you in data collection or analysis, or any other significant manner. This is also the place to mention the genesis of the paper, i.e., if it arose from a thesis or dissertation. If there is no separate acknowledgments section, such material and appreciation could be introduced at the end of the text, or in the Introduction or as a footnote or endnote.

2.11 References

Preparing a proper reference list is one of the most tedious aspects of finalizing a manuscript for publication. Part of the problem is that there is no standard or uniform format for citing literature, except that ‘‘All citations in the text, and only those, must be listed in the References.’’ In other words, the References section and text citations should match perfectly. Although the saying that ‘‘there are as many reference-citation styles as there are journals’’ is an exaggeration, there seem to be as many reference-citation styles as there are publishers. Standardization of reference-citation style has been talked about for a while, and some progress has been made. The best rule to follow—as for many

other aspects of scientific writing—is: follow the journal's instructions! Some software programs are available that aide in creating/formatting reference sections.

2.11.1 Common Styles of Literature Citation

References in biological and natural resource sciences are presented in one of the three common styles: name and year system, numbered alphabetical list, and citation-sequence system; the last one is used most frequently in medical sciences.

Name and Year system (''Harvard system''): The first author's last name and year of publication are given in parentheses in the text; the list is arranged in alphabetical order. In this system, it is easy to add or delete the references, which is an advantage to the author. To the reader, however, it is tedious when several citations are listed in the same sentence or paragraph, as in the Introduction and

Discussion sections. It also adds to the word count: if ''Scientist and Reader

(2013)'' can be replaced by ''(6)'' (a number), it saves space and printing cost.

Numbered Alphabetical listing: The list in the numbered alphabetical system is arranged in the same order, but the references are numbered. The citation in the text is by number in parentheses rather than name and year. The disadvantage—objection, rather—of the system is that many authors would like to see the author's name and year of publication right away while reading a text without having to sift through the reference list at the end. Some of this problem can be overcome by incorporating such details in the text for selected citations that are deemed more important than others:

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Citation-Sequence system: Each citation in the text is given a number, usually as a superscript, in the order it is first mentioned in the text; the reference list is arranged sequentially by number and is not alphabetical. Obviously, addition or deletion of references is not easy and that could be a big problem for authors of papers with several references. The numbering in the order in which citations are listed will also separate out various references by the same author, which could also be a disadvantage.

Manual of Style, two powerful and respected style manuals, have opposing views on style: the former adopts the number-alphabet system, while the latter endorses the alphabetical order of listings. In any case, the style being recommended by most science editors is to produce easily understood citations with a minimum of punctuation marks. Thus journal abbreviations are becoming almost uniform.

Nowadays, ‘‘J’’ with or without a period after the letter is the accepted abbreviation for ‘‘Journal’’ (which used to be listed as ‘‘Journal’’ or ‘‘Jour.’’), and all ‘‘ology’’ words are abbreviated deleting the last ‘‘ogy’’ part (‘‘Bacteriol’’ for ‘‘Bacteriology’’; ‘‘Physiol’’ for ‘‘Physiology’’; and so on). Note, however, that oneword titles of journals (Science, Biochemistry) are not abbreviated.

Some Other Issues of Reference Citation

• With the same name(s) and year, use ‘a’, ‘b’, after the year (example: Scientist

2009a, 2009b, etc.)

• Alphabetize ‘Mc’ following the order of the letters, not as if it were written out ‘Mac’: MacBrayne, Mackenzie, McDonald

• Alphabetize ‘‘St’’ in the same way, not as if it were written out ‘‘Saint’’ (or

Street!): List ‘‘Stanley, St. Vincent, Sundar …’’ (not ‘‘St. Vincent, Stanley, Sundar …’’)

• While listing names with prefixes such as ‘‘de,’’ ‘‘van,’’ ‘‘von,’’ and so on, use the form in which the name is listed by the author concerned, or follow the journal’s directives

• Be specific and clear when referring to somebody’s work or opinion (avoid the so-called ‘‘hand-waving reference’’): do not refer to ‘‘Smith’s classic work’’ without specifying what Smith’s work was or how it is related to what is being reported

• When multiple authors are cited in a sentence, each for a specific work mentioned in the sentence, the relevant author should be listed against that

specific work, rather than putting all citations together at the end of the sentence; for example ‘‘During the 1980s and 1990s, significant progress was made in identifying the numerous multipurpose trees used in indigenous

2.12 Appendix

Any additional information that is relevant to the paper, but is of secondary importance, may be added as Appendix, subject to the journal’s policy. These include details of ecological factors such as weather, soil, and plants; socioeconomic data; survey instruments such as questionnaires; procedures of any special laboratory analyses and statistical treatment of data; computer programs; and such other details that are useful for full explanation and understanding of the results, but are too bulky and complex to be included in the main text of the paper. Some journals encourage authors to present such data as ‘‘Supplementary Information’’ on the journal’s webpage with due reference to the paper.

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