Training Needs Analysis

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Edited by Maurice Hayes
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ADELAIDE 1988
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PREFACE

Skill in analysing training needs has long been recognised as an essential component in the armory of trainers, training managers and those involved in curriculum design.

This monograph arises from the recognition of this situation in 1985 by the Research Committee of the National Training Council. At that time the particular needs of the Industry Training Committees (ITCs) and the Training Development Executives (TDEs) were highlighted. A research project was initiated with a two-pronged emphasis. As well as the analysis of training needs, a major study was conducted to establish a methodology for workforce planning. The plastics industry was the area chosen in which to develop and refine the methodology. The TAFE National Centre for Research and Development was appointed to conduct the research into different methods of occupational and training needs analysis, and in 1987 was contracted to prepare a larger manual incorporating both workforce planning and analysis of training needs.

When the National Training Council ceased to exist, the project was continued under the auspices of its short lived successor, the Australian Council for Employment and Training (ACET). Both projects were finally completed in conjunction with the Labour Economics Division of the Department of Employment, Education and Training (DEET).

The larger manual is due to be published by the Australian Government Publishing Service about the same time as this monograph. It is entitled *Training for Australian Industry* (Hayton et al. 1988) and covers Industry Analysis, Labour Market Analysis, Occupational Analysis and Training Needs Analysis. It also provides guidance on engaging and managing consultants. Some sections of the larger manual may be of only passing interest to planners and providers of training. At the last meeting of the Monitoring Panel, it was proposed that a practical monograph be prepared which summarises the methods of occupational and training needs analysis and provides guidance in choosing the most suitable method.

The research project was particularly fortunate in having a Monitoring Panel composed of experienced training designers each with a good knowledge of training needs analysis. Frank, open and often heated discussions and debates of the subject were a regular feature of the meetings. These served to bring into sharper focus the topic of training needs and the attendant ancillary or supplementary analyses which may be involved. As a consequence, all the members of the Monitoring Panel became aware of the importance of being precise in the use of different terms. This in turn may result in our appearing pedantic in this monograph. We ask you to bear with this because only by having a clear meaning for the various labels can this monograph be of value to a wide range of trainers, training managers and training providers.
The editors wish to express their gratitude to Dr William Hall, Director
of the TAFE National Centre for Research and Development Ltd, for his help
and encouragement throughout the project; to Terry Clark who helped write
the descriptions of each technique; to Hugh Guthrie who played an
important part in the early definitional work and the section on selection
of technique; and to the other members of the Monitoring Panel who made
significant contributions to the outcome. They are Viv Caulfield, Linda
McDonald and Peter White.
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1. INTRODUCTION

The term Training Needs Analysis means a variety of different things to different people. There is a good deal of common ground between the different meanings of the term and it is important to recognise that there is no right or wrong within the various meanings. Most contain some consistent relationships with other expressions used. Many, however, contain aspects irreconcilable with the essential meaning of the term.

For these reasons, in an attempt to advance knowledge and skills in the topic, we have found it necessary to include a section on Context as well as one on Definitions. These is to be hoped will increase our understanding of the term Training Needs Analysis.

The target audience for this monograph is Training Development Executives and Officers in the Industry Training Committees; TAFE curriculum designers; other training providers; and training managers and officers who have responsibility for developing training programs in their own organisations in both the private and public sector.

This monograph should be a useful tool for those involved in analysing training needs and the subsequent use of that analysis in developing training programs. It gives practical guidance in selecting the most suitable method or combination of methods for a particular training needs analysis problem. Knowing the methods to be used in the study will help decide whether outside consultants should be used. If consultants are to be used, only those experienced in the selected methods need be considered. However, this monograph does not give detailed practical guidance on how to use each method. The reader is referred to other sources for this information.

Many trainers will feel that they do not have the luxury of using all or any of the methodologies described here. Often they feel that it is necessary to do it all "out of their own heads". We recognise the urgency of many problems and the limitation of resources. However, an understanding of the various techniques will almost certainly provide trainers with other readily accessible resources, available at very little direct cost. These techniques will ensure that their training programs are better tuned to the needs of their organisations.

Conducting a training needs analysis is not easy, particularly when one has to justify it to others. There are many traps. We hope that this short monograph will help new trainers to avoid most of these traps and enable the more experienced to put the problems into context. In addition, we hope that the grouping and descriptions of the various techniques for training needs analysis will assist most of us to enlarge our "repertoire". Finally, we hope that the section devoted to explaining when the various methods are most suitable will be of particular use.
2. CONTEXT

One of the problems often experienced in doing a training needs analysis is knowing where to start. This problem is often compounded by the literature which makes undefined assumptions regarding the level of knowledge already available to the trainer.

The research study showed clearly the need for the sequential context of labour force analysis to be understood. The sequence shown in Figure 1 represents the process starting from the macro view and focusing progressively on to the particular training activity.

In this publication we will be concerned with occupational analysis as well as training needs analysis components. The inclusion of occupational analysis may surprise some people. These topics are closely inter-related and are often referred to collectively as training needs analysis.

In the larger and more comprehensive manual an analysis which contains all of the components has been called a comprehensive study whilst one using a single component such as occupational analysis has been dubbed a fast stream approach. In other words, this monograph is concerned with training needs analysis as a fast stream approach or as one component in a comprehensive study. Training needs analysis would be undertaken if deficiencies in knowledge, skills or attitudes need to be identified. To address this issue, for a single job the following information would be required:

- an accurate job description
- a definition of the required performance in terms of knowledge, skills and attitudes for the job
- the current job performance.

The job description would be obtained from the occupational (or job) analysis whilst the other information would be collected during the training needs analysis. The main outcomes would be a description of the deficiencies in knowledge, skills and attitudes and/or a description of desirable changes to performance standards and/or job design.

If the training needs analysis does identify the need for a training response then the next step would be to specify the appropriate training response. Alternatively if a non-training response were identified by the analysis it would be necessary to specify the appropriate response e.g. changes to performance standards or job design. Sometimes it may be necessary to specify both training and non-training responses.
In this publication we will be stopping short of the training specification and design stage. We see this as the next step in the process. In most cases the training needs analysis will also provide the information needed for the training specification and design. If the needs analysis has been properly conducted, it should not be too difficult to define the training response as behavioural objectives in terms of knowledge, skills and attitudes. This provides the basic information for program design.

FIGURE 1: THE CONTEXT OF TRAINING NEEDS ANALYSIS
3. DEFINITIONS

Occupational analysis

Occupational groups may be broken down into their related jobs. The jobs in turn may be examined in terms of their individual duties and tasks.

Thus, occupational analysis is a process which is concerned with dividing an occupation or job into its major component elements and looking at each of the elements critically to determine their make-up and the relationships between them. Depending on what the analysis is aiming to achieve, the outcome of this process may be concerned with describing what is and what could be. We have deliberately specified "could be" in this preamble to the definition because many occupations are undergoing significant change, and in many cases it is this change which has triggered the need for analysis.

The definition of occupational analysis used in the larger manual and in this monograph is:

OCCUPATIONAL ANALYSIS IS THE IDENTIFICATION OF THE CURRENT AND LIKELY FUTURE JOBS WITHIN AN OCCUPATION, AND THE DUTIES AND TASKS WHICH COMprise EACH JOB, TOGETHER WITH OTHER RELEVANT JOB INFORMATION.

As you can see, this definition includes the identification of jobs within the occupation. This is particularly important when there is little prior knowledge of the range of jobs within the occupation.

It is important also to note that the term JOB ANALYSIS which is often used, is seen as a sub-set of occupational analysis. When the analysis has focused down to a single job within an occupation, the terms become synonymous and may be used interchangeably.

Training needs analysis

Training needs analysis may be defined from two viewpoints, the "macro" view and the "micro" view. The "macro" view is concerned with training requirements in the wider context of needs and problems. The "micro" view is concerned with the identification of performance deficiencies and their rectification through training.

This monograph has adopted the "micro" view of training needs analysis. It is seen as one of the four types of analysis which should be conducted to provide the "macro" view of training and non-training needs.
The four types of analysis are:

- industry analysis
- labour market analysis
- occupational analysis
- training needs analysis.

All four types of analysis may be conducted at an industry level. At an organisational level, all except the industry analysis may be conducted. The four types of analysis represent a way of focusing progressively on workforce problems. As the focus sharpens, the amount of information gathered about the problems progressively increases in volume and detail.

The definition of training needs analysis used here is:

**TRAINING NEEDS ANALYSIS IS THE DETERMINATION OF THE DIFFERENCES BETWEEN THE ACTUAL CONDITION (WHAT IS) AND THE DESIRED CONDITION (WHAT SHOULD BE) IN HUMAN PERFORMANCES WITHIN AN ORGANISATION OR GROUP OF ORGANISATIONS IN TERMS OF HUMAN KNOWLEDGE, SKILLS AND ATTITUDES.**

**COMPARISON OF TRAINING NEEDS ANALYSIS AND OCCUPATIONAL ANALYSIS**

The essential difference between these two types of analysis is that training needs analysis is concerned with knowledge, skills and attitudes whilst occupational analysis is concerned with jobs, duties and tasks.

Training needs analysis proceeds one step further than occupational analysis by examining the human abilities which are included in individual tasks, duties and jobs. These abilities are not confined to manual skills but also include the knowledge base required for an occupation or job. In addition, attitudes which will contribute to this process, and to effective training, need to be understood so that they can be appropriately developed or enhanced when training is specified and, later, when a training program is designed.
4. PREPARING TO DO A TRAINING NEEDS ANALYSIS

In conducting occupational or training needs analyses, good preparation is the keynote to success.

In Figure 1 we showed the full sequence of workforce analyses through to initiation and evaluation of a training program and feedback.

Figure 2 focuses on the activities described here but also alerts us to a major trap. As trainers we may be tempted to assume that all problems presented to us can be solved by training. As Figure 2 points out, if a problem exists and there is an accurate occupation or job description and there are no deficiencies in knowledge skills or attitudes, then a non-training response will be appropriate.

Figure 2 also shows that the purpose of the occupational analysis is to provide an accurate occupation or job description. This is the preparation needed to conduct a training needs analysis.

Occupational analysis is required if an accurate occupation or job description is not already available. The problem to be rectified may be confined to a single job or may apply to an entire occupation comprising a group of associated jobs. If a full occupational analysis is required, and industry analysis and labour market analysis have not been done, the steps in the complete process will be as shown in Figure 3.

The first two steps:

- define the boundaries of the occupation and structure of the occupation of concern
- identify the context of the occupation

will be necessary preparatory work. If the industry and labour market analyses have been done, these two steps will have been covered. Similarly if only a single job is under consideration then it is likely that the occupational boundaries, structure and context will be well established. Whatever the situation, it is necessary to have this information.

In defining the occupational boundaries and structure the following aspects should be included:

- name(s) of occupation
- range of jobs within the occupation
- structure of jobs within the occupation
FIGURE 2: FLOW CHART OF 'ENTRY AND EXITS' INTO OCCUPATIONAL ANALYSIS AND TRAINING NEEDS ANALYSIS

FAST STREAM APPROACH

COMPENSIVE APPROACH

INDUSTRY ANALYSIS

LABOUR MARKET ANALYSIS

IS AN ACCURATE OCCUPATION OR JOB DESCRIPTION AVAILABLE?

no

OCCUPATIONAL ANALYSIS

yes

DO THE REQUIRED KNOWLEDGE, SKILLS AND ATTITUDES NEED TO BE IDENTIFIED?

yes

TRAINING NEEDS ANALYSIS

no

ARE THERE ANY DEFICIENCIES BETWEEN THE REQUIRED KNOWLEDGE, SKILLS AND ATTITUDES AND THOSE AVAILABLE?

yes

SPECIFY TRAINING RESPONSES

no

SPECIFY NON-TRAINING RESPONSES
FIGURE 3: FLOW CHART OF OCCUPATIONAL ANALYSIS

1. DEFINE OCCUPATIONAL BOUNDARIES AND STRUCTURE
2. IDENTIFY OCCUPATIONAL CONTEXT
3. IDENTIFY RANGE OF DUTIES AND TASKS
4. DETERMINE DUTIES AND TASKS REQUIRED FOR EACH JOB
5. CONFIRM OCCUPATIONAL STRUCTURE
. typical career paths
. major job functions
. occupational trends.

Occupational context would include the following aspects:
. overlap with related occupation
. industry trends
. number of people employed
. education and training
. legal requirements.

Having this information will help to obtain a closer definition of the problem. If occupational boundaries, structure and context have not been obtained from industry and labour market analyses, they can be collected as part of the occupational analysis. In this case, therefore, it is important that all of the five steps described in Figure 3 be included in the occupational analysis.

In the next step of Identifying the range of duties and tasks, it is important that all duties and tasks are listed. When changes are likely, it is wise to list the future tasks envisaged at the same time.

Following this it is necessary to determine which duties and tasks are required for each job together with other relevant task level data such as relative time spent on each task. A wide range of task variables may need to be considered. For example:

. performed/not performed
. relative time spent on each task
. frequency of performance
. actual time spent on task
. contribution of task to job
. importance of task
. consequences of inadequate performance of task
. difficulty of learning task.
A check needs to be made that the data collected on the various jobs and tasks which constitute the occupation do, in fact, confirm the occupational structure as identified in the first step.

In this section we have dwelt upon the importance of preparation for a training needs analysis by conducting an occupational analysis. This is because the existence of an accurate occupation or job description is, in our opinion, absolutely essential for conducting a successful training needs analysis. We believe that many of the disappointments which trainers have experienced when conducting training needs analysis are due to inadequate preparation. By this we mean that the occupation or job description was inadequate. Some typical problems even when a job description exists, include:

- inaccuracies
- failure to cover the whole job
- lack of detail (i.e. superficiality)
- out-of-date.

As well as providing the base from which the training needs analysis can proceed, careful occupational or job analysis gives us greater insight and understanding of the occupation, jobs and tasks.
Occupational analysis and training needs analysis techniques may be similar, and sometimes the same techniques can be used for both types of analysis. For example, questioning techniques are useful for both types of analysis. For occupational analysis, the question would be concerned with the tasks performed. For training needs analysis, on the other hand, the question would be concerned with the knowledge, skills and attitudes required to perform the job to the desired standard.

Some of the methods described here are straightforward and relatively easy to undertake, whilst others are complex and require special expertise and experience. Further more they may differ in the time taken and in the costs of the exercise. Fortunately there is a range of proven methods to suit most needs and budgets. In some cases the choice will be clear: time, money or particular need will determine the methods to be used. In other cases it may be necessary to select from a number of methods.

Those conducting a training needs analysis should have a good knowledge of the industry, firm, jobs and workers under study. This should be acquired or consolidated during the prior occupational analysis. Inadequate information about an occupation, for example, could lead to a training needs analysis overlooking key duties.

The different techniques for undertaking a training needs analysis or occupational analysis have been grouped under five headings:

- organisational knowledge and records
- observation methods
- interview methods
- questionnaire-based methods
- group process methods.

It is likely that even the briefest, in-house study will include a combination of two or more techniques from more than one of these groups. For example, a group method may be used to identify the key knowledge, skill and attitude components required for the job; while an interview method may be used to develop more detailed information on each component. However, the grouping does help us understand the context of individual techniques.
ORGANISATIONAL KNOWLEDGE AND RECORDS

This is an obvious starting point for a study being undertaken for any single organisation. Whether the study is being conducted by an internal training specialist or by an external consultant, something has triggered the decision to conduct a study.

There has been a recognition that a difference exists between the "what is" and "what should be". Careful questioning of the person or persons who identified the anomaly will provide valuable information.

Other sources of information include first line supervisors, work study officers, industrial or systems engineers, quality control records, departmental logs and of course, the people who actually do the job. These resources can usually provide the information required for the occupational analysis. Job descriptions can then be prepared and agreed upon. The training needs analysis can proceed.

To many trainers with limited budgets this is a preferred methodology. The step-by-step process described here can help simplify the task.

OBSERVATION METHODS

Informal observation will be an essential component of almost any study. It will usually be incorporated with any of the other techniques described to ensure that contact with reality is maintained. In observing any job or occupation we rapidly establish some parameters concerning the component tasks. How varied are they? How much time is spent on each? Are most tasks single person tasks or do people usually work in pairs or teams?

Whilst this does not give us definitive data, it provides us with a 'feel' for the job and its tasks. This enables us to ask the relevant questions at a later stage.

More formal observation methods such as, task analysis, method study and work measurement can provide accurate information. They are particularly useful for studying operator jobs. If these methods are to be used it is necessary to explain your purpose to all concerned!

In task analysis a task can be regarded as a hierarchy of operations and sub-operations. While a description of the execution of a task will include information about the training requirements for that task, it will also include many other things. There are a few rules to guide the collection of information required for training purposes and the amount of detail necessary.
Many task taxonomies are based on the premise that optimum learning takes place when different components are learned separately (i.e., different tasks are best learned in different ways and under different conditions). For example, if training is attempted across several levels in the hierarchy simultaneously, delays will be likely if mastery at each level depends on prior mastery at a lower level.

The analysis then normally proceeds to divide the specific task into cognitive (knowledge), psychomotor (skill) and affective (attitude) components.

Although task analysis is popular because of its low cost, relative speed and apparent simplicity, it is a much more complex method than many researchers realise.

Informal observation will suit many companies with limited objectives and research capabilities.

Training needs can be readily determined by astute observation in the workplace. To ensure validity, the research should be unobtrusive and care should be taken to document observations objectively. Clearly the success of this method will depend on the experience and perceptual ability of the observer. A larger number of observations taken over a longer period of time will increase the reliability of the findings.

INTERVIEW METHODS

Interviews are the most easily applied occupational analysis and training needs analysis methodology. The informal, unstructured one-to-one interview is useful for obtaining information quickly and inexpensively, provided that the interviewees are few in number and readily accessible. Formal, structured interviews involving a large number of geographically dispersed respondents, can be expensive and time-consuming. Telephone interviewing may be a less expensive alternative, but requires special interviewer skills.

The unstructured interview

Because of its frequent informal application, this is probably the most common of all occupational and training needs analysis methods. It is characterised by the use of flexible open-ended questions, non-judgemental responses and prompting. It is employed when the researcher needs to get quick firsthand occupational or training needs data, PLUS background information on sensitive issues such as attitudes, personalities and industrial relations matters.
Strengths and weaknesses of the unstructured interview

The advantage of this approach is its ability to explore broad issues and its ability to provide a situation where issues can be explored in a non-directive, non-threatening manner. The interviewer should be able to create a climate in which the respondent freely offers candid information.

The main problems with this approach relate to its:

- generation of opinion rather than fact;
- lack of consistency when applied to larger populations.

To minimise potential difficulties, the researcher can use the unstructured interview in conjunction with a more rigorous method and in addition, ensure that interviewers are trained to a consistent standard.

The structured interview

The introductory comments and questions are similarly applicable to this technique.

Its strength therefore is its ability to give more consistent outcomes than its unstructured counterpart, especially when administered by different interviewers. Responses to a structured interview will normally be easier to quantify and interpret, since uniform questions tend to yield a narrower range of responses.

Its drawbacks are that:

- it usually takes longer to prepare; and
- it may fail to yield the full range of possible outcomes.

While precautions should be taken to "debug" questions (e.g. remove ambiguity, explain terminology), the interviewer nevertheless has the opportunity to deal with respondents' difficulties.

Conducting the interview

The following points should be addressed if an interview-based survey is contemplated.

1. Preparation:

   - Obtain available background information about the industry, firm, job, personnel, etc. If appropriate, obtain samples of the work, job descriptions and any other material to give the interviewer a "feel" for the respondents' situation.
Devise an introduction to the interview and the questions. If at all possible, test them on a person who typifies the interviewees. Get someone to test it out on YOU! Anticipate problems and objections that the respondents may raise and devise strategies for handling them.

Inform the respondents in advance, of the time, place and purpose of the interview. This is especially important if the respondents need to obtain data in advance. It may be useful to send out a copy of the structured interview schedule prior to the meeting.

Arrange a suitable location, i.e. one that is private, quiet and free from interruptions.

Arrange the meeting place in a manner that will facilitate rather than inhibit the flow of information.

Choose an appropriate time, e.g. late Friday or payday may NOT be the best time for a long interview!

2. Conducting the interview

Ensure the respondent is relaxed and not apprehensive. You may need to reassure the person that their answers will be treated confidentially.

Explain clearly the purpose of the study. Be prepared to explain to the respondents the advantages of answering the questions, e.g. better use of their skills, work made easier or safer, company made more competitive.

Discuss any general questions relating to the survey at the start of the interview. Deal with further points of clarification as they arise.

Listen attentively. Prompt only when necessary. Use silence effectively, don't rush the respondent into an answer.

Distinguish between FACTS and OPINIONS, accept opinions (including criticism) with candour.

Keep control over the direction of the interview. It is easy to get sidetracked on to unimportant issues.

Go over any issues which require clarification. If summarising a lengthy discussion, read the summary back to the interviewee to ensure notes have faithfully captured the essence of their comments.

At the end THANK the respondent and indicate whether any feedback will be provided.
The telephone interview

This method is most cost-effective when respondents are geographically dispersed or difficult to contact during normal business hours. It is more suited to non-complex studies or as a follow-up on a previous face-to-face interview or mail survey.

Its advantages include, savings on travel costs, more personal than a mail survey but less confronting than a face-to-face interview, and speed. It will usually produce a better response rate than a mail survey and may cost no extra if the numbers interviewed are small (say <50). Its drawbacks are: harder to gain respondents' co-operation over the telephone, more difficult to ensure the availability of the chosen respondent (may require several return calls) and explanations may take longer. Furthermore, many interviewees may wish to carry the conversation well beyond the boundaries of the formal interview. In addition only those who have access to a telephone can be interviewed!

Telephone interviewers must be trained. Handling respondents' questions and objections on the phone requires special skills.

The telephone interview is well worth considering for shorter, simple investigations. It is often a good way to begin a study, rather than proceeding immediately into the field. Sometimes it may be the ONLY method whereby information can be obtained from very busy or isolated people.

QUESTIONNAIRE-BASED METHODS

Survey methods for research are commonly used in occupational analysis and training needs analysis. They are used to collect quantitative data on occupations (including duties and tasks performed) and training needs (including knowledge, skills and attitudes required). When using questionnaire-based methods, you will need to:

- define the population;
- select the sample;
- develop data collection instruments;
- collect data;
- process and analyse the data.
Questionnaire-based methods, like other methods, have a number of strengths and weaknesses. A single study may therefore combine two or more methods to yield optimum results. For example, a survey conducted by mail may be integrated with a set of interviews. The interviews could be used to refine the mail questionnaire in a pre-test phase, and/or the interviews could be used to supplement the quantitative data from the mail survey with qualitative data.

If a survey questionnaire method of occupational analysis and/or training needs analysis is chosen, a further choice is required between:

- a general questionnaire-based method; or
- a specific method.

By definition, the general questionnaire-based method is adaptable and may be applied to almost any research problem, whereas the specific methods are more restrictive and are usually applied to standard occupational analysis or training needs analysis research problems. The specific methods have the advantage however of a proven usefulness in occupational analysis or training needs analysis, and are usually supported by a body of specialised literature.

General questionnaire-based methods and two specific methods, CODAP and Delphi, are described here. A number of other specific survey techniques are generally recognised and there is a considerable body of knowledge and literature concerned with their development, use and outcomes. Major techniques include the Work Performance Survey System (WPSS) which is described by McCormick (1979) and Gael (1983); Position Analysis Questionnaire (McCormick et al. 1972, Smith & Hakel 1979); the Job Components Inventory (JCI) discussed by Banks et al. (1983); the Occupational Survey Data Analysis System (OSDAS) described in AAITC (1985); and finally Functional Job Analysis (Fine 1973, Weissman 1981).

**General questionnaire-based methods**

In questionnaire-based methods, individuals provide written answers to specific questions contained in the questionnaire. The questionnaire is distributed to each individual personally by the researcher or by post, and the completed questionnaire is collected by the researcher or returned by post. The key feature of these methods is that the questionnaire is designed for self-completion, that is, completion by individual respondents without the presence of the researcher.

For an occupational analysis, workers within the occupation of interest are usually surveyed and the questionnaire may contain three main groups of questions:
questions concerned with the organisation (e.g. numbers of employees in organisation, main activities of organisation, training policies of organisation);

questions concerned with the individual respondent (e.g. age, sex, education and training received, career path, present salary);

questions concerned with the individual respondent's present job (e.g. main job functions, duties and tasks performed, task frequency or relative time spent).

For a training needs analysis, workers within the occupation of interest, or their supervisors, may be surveyed and the questionnaire may contain three groups of questions as follows:

questions concerned with the organisation;

questions concerned with the individual respondent;

questions concerned with the individual (or group) training needs (e.g. present knowledge, skills and attitudes, knowledge skills and attitudes required for the job, perceived gaps in knowledge, skills and attitudes).

Strengths and weaknesses

Questionnaire-based methods have a number of strengths:

information can be collected economically from a large number of people in a relatively short period of time, although sufficient time should be allocated to development of the questionnaire;

well designed questionnaires provide consistent interpretation of questions and easy analysis of the data;

occupational survey questionnaires have the advantage of being capable of producing candid and reliable responses because those surveyed can spend time pondering the questions and because their responses can be anonymous. (Carlisle 1986, p.12)

Questionnaire-based methods suffer from a number of weaknesses:

unless the whole population (i.e. all workers in the occupation of interest) is surveyed, a sample must be taken and it is often difficult to obtain a representative sample;

survey questionnaires, particularly mail surveys, are notorious for low return rates, with figures of 40 or 50 percent return rate considered acceptable (Warwick & Lininger 1975, p.129);
some questions may not be clear to every respondent or interpreted in the same manner;

questions often require expressions of opinion rather than statements of fact, so data based on such questions may require further validation;

some questions may restrict the responses unnecessarily so that problems and solutions may be overlooked.

General principles

A number of important steps should be followed when using survey methods. For example:

care should be taken to define the population accurately;

scientifically-designed methods should be used to obtain a representative sample;

the expected outcomes of the survey should be identified beforehand to provide a basis for design of the questionnaire;

an explicit rationale is required for each item in the questionnaire. This should cover why the question will be asked and how the information will be reported;

the questions should be ordered logically;

leading questions and value-laden wording should be avoided;

the questionnaire should be pre-tested by trialling a draft version of the questionnaire with a small cross-section of the sample;

a covering letter and a pre-paid return envelope should be used for mail surveys;

experienced and trained editors and coders should be used to process completed questionnaires;

principles of statistical inference in reporting results should be used;

tables and diagrams to present numerical data as clearly as possible should be used.

A considerable body of literature on survey techniques has also been produced by the armed services in the U.K., U.S. and Australia - for example the training manuals produced by the Royal Australian Navy (1978).

CODAP method

CODAP stands for Comprehensive Occupational Data Analysis Programs. Although CODAP refers specifically to a suite of 50 computer programs, the term is also used to describe the associated data gathering method. The CODAP method involves:

- constructing an inventory of all the tasks likely to be undertaken in the job(s);
- developing a questionnaire which incorporates the task inventory;
- surveying a sample of the job incumbents;
- analysing the data using the CODAP programs;
- reporting the results.

CODAP studies may vary considerably in size, but compared to other methods, CODAP generally requires a moderate to large amount of time and resources. The most time-consuming stages of a CODAP study include the development of the task inventory and the administration of the survey.

However, CODAP is very useful when a detailed analysis of the work of 50 or more workers is required. A CODAP study will:

- determine existing job groups, each job group consisting of workers having similar job profiles;
- provide a job profile on each job group;
- provide a general profile on each job group using variables such as age, sex, job experience, education and location.

The CODAP method may be used for any occupations which may be broken down into a number of tasks. Thus, it is particularly applicable to manual occupations, but it may also be used for almost any technical, clerical or managerial occupation.
There are two main options available if a CODAP study is to be performed. The first option is to commission a consultant experienced in CODAP studies to undertake the entire study. As there are already a number of experienced CODAP researchers available in Australia, this option is attractive provided an organisation is prepared to commit the necessary funding.

As a second option, the CODAP study may be conducted by an in-house researcher, a feasible alternative if researchers exist with experience in other survey methods of research. Even with this approach, however, it is recommended that an experienced consultant be used for the computer analysis stage of the project.

**Strengths and weaknesses of CODAP**

The main strengths of CODAP methodology are:

- it is a well established and well documented occupational analysis method;
- aspects of CODAP methodology have been refined and validated by many years of research;
- through its cluster analysis program (involving a mathematical grouping of members of the sample on the basis of the task inventory responses) it is capable of systematic classification of job types;
- it is useful for large and diverse populations;
- the computer printout format is designed for occupational analysis reports.

The main weaknesses of CODAP methodology are:

- like other task inventory methods of occupational analysis, CODAP is based on the concept of dividing jobs into tasks, and for some jobs this may be an imperfect representation of the job;
- CODAP studies require a moderate to large amount of time and are moderately to very expensive to conduct, by comparison with other methodologies;
- the CODAP programs require a main frame computer and an expert to run the programs;
- the data is virtually inaccessible to the client;
- lack of future orientation.
Resources

A large number of technical papers on CODAP methodology have been produced, though most have been distributed through the defence services in the United States. A selection of such papers includes Archer (1966), Phalen & Christal (1973), Christal (1973, 1979), Melching & Borcher (1973), Hayton (1986b). General descriptions of CODAP are provided by Goody (1982), Hayton (1986a, 1988), Fugill (undated). Examples of recent studies based on CODAP include Hayton (1984, 1986a, 1987a), National Retail Industry Training Committee (1986), National Printing Industry Training Committee (1986).

Delphi method

The final questionnaire-based technique to be discussed here is Delphi. This technique forms a bridge between survey techniques and group process methods. The Delphi method assumes that society is directed towards goals and that these goals are determined by the actions of various interested groups (Anderson & Jones 1986a). The methodology employed by this technique is based on an examination of future trends, using a series of questionnaires to draw information about the pattern of likely or "desirable" future events from a selected panel of experts. The results of the previous survey are given to the panel for reaction and refinement.

The Delphi method links survey and group process methods because it is conventionally a survey technique, but it may also be run as a conference process. It has 4 phases. In its survey form the process can be accomplished in as little as 45 days (Delbecq et al. 1975). Group size may vary between 10 and 30 but if the responses of sub-groups are to be identified, larger group sizes should be obtained. In the survey of methods of occupational and training needs analysis in Australia (Williams and Hayton 1987), only one Delphi study was conducted in 128 studies surveyed. This study cost $25,000, took six months to complete during which time 250 people were contacted only 50 of whom responded. Only some of the objectives of the study were achieved.

Strengths and weaknesses of Delphi

The main strengths of Delphi are that it is:

- futures orientated, suitable where change is rapid;
- relatively fast, especially in conference format;
- capable of focusing on the main issues.
Its main weaknesses are its:

- low response rate in survey form;
- limited range of responses;
- relatively high cost.

Resources


GROUP PROCESS METHODS

This set of occupational analysis and training needs analysis methods contains some very fruitful techniques for obtaining information. They are all loosely based on the technique of brainstorming and are characterized by two distinct processes:

- idea generation;
- idea evaluation.

Since the dynamics of groups are not always conducive to the free flow of ideas, skilled facilitators are usually required. The facilitator's role is to make it easier for group members to contribute their ideas. For example, this may involve protecting and encouraging shy or reticent members, subtly curbing over-zealous or long-winded members and summarizing diverse opinions.

It takes training and experience for a researcher to develop the interpersonal skills necessary to achieve effective contributions by the entire group. Essential characteristics of an effective facilitator are open-mindedness, tact, understanding of group dynamics, good humour and the ability to synthesize and summarise information.

Strengths and weaknesses

Generally speaking, group methods give detailed qualitative data and can generate creative solutions to problems. However, they can be time-consuming if not well managed and can yield biased outcomes if certain group members are allowed to dominate proceedings.
Brainstorming

This is a technique of small group discussion designed to encourage the generation of an unrestricted flow of ideas. Often certain members of a group lack the confidence to put forward good ideas whereas more confident members are able to impose their point of view irrespective of value. Brainstorming is designed to overcome this problem by removing inhibiting factors and improving interaction and contribution.

Brainstorming is a process which encourages group participation, but it does require a skilled chairperson. The chairperson should be someone skilled in the technique. The issues to be considered are clearly defined by the group and a secretary is appointed. Since brainstorming operates on the principle that quality is a prerequisite of quality ALL ideas generated are recorded.

Criticism or debate on contributions is forbidden and the chairperson/facilitator actually encourages lateral thinking and development of previous ideas. Extreme suggestions are welcomed in an attempt to maximise the number of ideas and adverse judgements are suppressed. At the end of the session the group may choose to evaluate the outcomes by prioritising, combining or editing the contributions.

This technique works most effectively with a group of 5 to 12 people and is ideally suited to consideration of issues like job performance and job design deficiencies, quality control and problem solving.

Although this technique produces inconsistent results, (Shaw 1981) brainstorming usually elicits more ideas than individuals working alone. Successful results, cannot be guaranteed by this method, especially if group members do not have suitable ideas (Applbaum et al. 1979). With knowledgeable and experienced people, however, creative outcomes can be produced within very short periods of time (e.g. 1 hour or less). Furthermore, it is an inexpensive technique when used in-house or where the cost of getting the group together is minimal. The chairperson should be trained or at least have prior experience in brainstorming.

Strengths and weaknesses

The strengths of brainstorming are that it is:

- fast;
- creative;
- inexpensive.

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The weaknesses of brainstorming are that it:

. gives inconsistent results;
. is reliant on group members' knowledge;
. is difficult to control.

Some tips for brainstorming:

. write up the issue or problem being considered;
. work in a circle;
. set a time limit and target: e.g. 30 ideas in 30 minutes;
. swap the role of secretary to maximise contribution;
. suppress killer phrases: e.g. "It won't work", "We've tried that before" or any other hint of criticism;
. praise quantity rather than quality;
. don't settle for just the obvious ideas, seek out the wild ones;
. encourage "piggy-backing": i.e. the improvement, extension and modification of a previous suggestion;
. record every contribution. Failure to do so will imply a criticism and may stifle further ideas from that member;
. when ideas have dried up, move on to evaluation.

Resources

Brainstorming is described in Anderson & Jones (1986a, 1986b), Applbaum et al. (1974), and Shaw (1981).

Nominal group technique

This is a structured form of brainstorming which involves individual silent work prior to group members sharing their ideas. After the group has decided on the topic, the facilitator imposes strict control over verbal interaction while each member writes down ideas.

Discussion is actively curtailed to prevent any prejudgement of an idea or group pressure inhibiting any individual's contribution.
After a short time (say 10-15 minutes), each member then presents one idea in turn (i.e. round robin listing) while the facilitator records all ideas on a flip-chart visible to the whole group. Some general points to be observed during this phase are:

- Ideas are presented in brief words or phrases;
- Ideas are taken one at a time from each member;
- Individual member's ideas are not altered;
- When a member runs out of ideas, they just say "pass". They can re-enter later, if they think of a new idea;
- The facilitator should write quickly;
- Arguments are avoided by allowing no discussion in this phase;
- 'Hitch-hiking' or 'piggy-backing' on ideas should be encouraged;
- No criticism is allowed.

With the agreement of the group the items listed are then merged, simplified or organised as needed. Again, discussion is limited to clarification and the facilitator should ensure that no member is forced to be the sole person responsible for clarifying his/her item.

Next, preliminary voting takes place to establish a priority within the items. If anonymity is an issue this can be done privately on index cards and shuffled.

Discussion on the items takes place for further clarification, support or disagreement from individual members as well as further additions and merging. Ideas developed from other peoples' ideas and generation of new ideas should be actively encouraged. A final vote on the cumulation of ideas is taken. Each member votes individually, ranking items according to their own preference. These votes are then collated to produce a group decision. (Maddock 1987).

The Nominal Group Technique is preferred to simple brainstorming in these situations where members may be inhibited from producing creative solutions by conforming to the group norms or narrow-mindedness.

**Strengths and weaknesses**

The strengths and weaknesses of the Nominal Group Technique are similar to those of brainstorming. The technique sacrifices creativity but there is greater control by the facilitator.
Resources

The method is discussed in Delbecq et al. (1975), Uschak (1983), Anderson Jones (1986a, 1986b) and Maddock (1987).

DACUM method

DACUM is an acronym for Design (or Develop) a Curriculum.

This is another group-centred approach which uses brainstorming to produce a set of behavioural objectives plus a skill inventory for a given occupation or range of jobs. It works best with a group of 8 to 14 participants, producing initial information in one to three days. In Australia, DACUM is mainly used by TAFE to involve industry personnel in curriculum development for vocational training courses.

A DACUM conference usually consists of 5 phases:

1. Introduction and orientation.
2. Clarification of the occupation/jobs to be analysed.
3. Identification of general areas of competence.
4. Identification of tasks within each occupation/job.
5. Analysis of data.

The technique requires a skilled facilitator, a secretary or recorder and a quiet venue, free of interruptions. Participants should be carefully selected on the basis of their occupational knowledge, open-mindedness, industry background and availability for the duration of the process.

DACUM's success relies on the ability of the group members to generate new ideas creatively. All competencies identified are written on index cards by the recorder and placed in sequence on a wall facing the group. During the analysis stage the contributions are given to two or three teaching specialists for comment and an estimate of the instruction time required to cover each subject. The competencies are then regrouped into the order that they would normally be found in a job situation. Finally a draft sequence of topics is developed and submitted to the training provider.

Strengths and weaknesses

The main advantages of DACUM are:

- the speed of initial information gathering;
- that group discussion is more likely to achieve consensus;
that there is more control over input than in a questionnaire approach;

that outcomes are behaviour-orientated rather than information-orientated;

that issues are assessed and analysed at the discretion of the participants, rather than the researcher;

that positive feedback is provided to participants who can see how their input is utilised throughout the process.

**Problems may occur if:**

- the facilitator is not adept in managing group processes or fails to suppress personal biases. (The latter can be prevented by using two facilitators.)

- the participants are not truly representative of industry or lack the ability to articulate their ideas clearly.

The cost of using DACUM will vary according to the scope of the study, the number of participants involved and the time taken for the conference and follow-up analyses.

**Resources**

The method is described by Fryckland (1970), Sinnett (1974), Adams (1975), Jula (1979), Queensland Department of Education (1983), Shears (1985), Anderson & Jones (1986a, 1986b) and Hermann (1987). The TAFE National Centre for Research and Development has also sponsored the production of a video tape with accompanying notes on DACUM. This tape was produced with guidance from the W.A. Department of Education, TAFE Division.

**Force field analysis**

Whenever there is a need for change there will always be arguments for and against. This situation can be tackled by using force field analysis, which analyses the forces working for and against change.

It is unlikely therefore to be used for occupational analysis or training needs analysis but could be used to facilitate implementation of the outcomes of a training needs analysis.

Force field analysis helps to reduce the forces against change and increase the forces for change. Therefore force field analysis may improve the chances of bringing about the desired change. The activity can be undertaken individually, in pairs or in groups. (NPITC 1984).
The steps for conducting a force field analysis in a small group setting are:

1. List on a large piece of paper both the beneficial and constraining forces. It is often helpful to consider the traditional "5 ms", or resources of management: i.e. manpower, machinery, methods, materials and money. You may wish to add a 6th "m" representing minutes, which would reflect your recognition that time is also an important resource. (Other groups, such as quality circles, typically exclude "money" since it is not a direct factor in determining causes of defects in a product or the malfunctioning of a system or procedure).

2. Rank the forces according to the importance of the effect on the present situation. Some groups do this graphically; others use a scale of 0-10.

3. Rate the forces according to how easily they can be increased or decreased. Consideration should be given to enhancing the beneficial forces or alternatively, to removing or diminishing the importance of the constraining forces. A combination of the two may even be feasible.

4. Then take the forces which are easiest to change, and with the greatest likelihood of success, and develop goals and plans to undertake this change. This will involve deciding what needs to be done, who needs to do it, when it needs to be done and what resources are required.

5. Then tackle the more difficult forces, using the same approach as used in the previous step. (Maddock 1987).

Strengths and weaknesses

The strengths of the technique are that it is simple, quick and inexpensive. However its weaknesses are that it tends to ignore interaction between forces. In addition, individuals and small groups inexperienced with the technique may overlook crucial forces. Furthermore difficulty is often encountered gauging the relative importance of various forces.

Resources

The process is described in Eiben (1976), Sanders (1977), Utt (1977), Brandt (1982) and the Curriculum Branch, Education Department of Victoria (1985).
Search conference

Search conferences represent another form of structured brainstorming. As the name implies, a conference or group of people searches for information or solutions. It is a technique which emphasises and anticipates future trends and is useful for assessing the current situation, proceeding from there to predict future needs and trends.

The search conference works well with groups of 15 to 30 members who possess knowledge and experience in the field under discussion. A trained facilitator is needed to control the process in which members interact in small groups of 5 to 10 before reporting back to plenary sessions of the conference. The process usually takes from 1/2 to 2 days depending on the number and complexity of the issues involved.

Typically a search conference commences with a statement of both the organisation's main objectives (e.g. to have well trained workers) and the conference's specific objectives (e.g. to determine their training needs). Each group's findings are recorded and reported back to the conference where the issues are synthesised and perhaps referred back to the groups for further clarification. When the conference has agreed on the organisation's future needs, strategies are then developed for meeting those needs. Finally an attempt is made to predict the outcomes and impact of those strategies.

Guidelines for conducting search conferences are similar to those for brainstorming. The search conference has been used extensively for deducing labour force requirements from corporate objectives (Emery 1976). Like other group processes this method cannot be relied upon to produce totally accurate or unanimous forecasts. The quality of the information generated can be directly related to the calibre of the participants, especially the facilitator. However, when all participants are in this one location it is relatively inexpensive in terms of time and cost.
As we saw in the previous section, there is a wide range of techniques available for conducting a training needs analysis. Clearly there is no one best method" which covers all situations. Thus the problem becomes one of choosing the most appropriate for each situation.

A number of factors will help to determine which method (or methods) is chosen. Each factor can be posed as a question which may be considered before choosing how the study will be undertaken. Before moving to the specific questions associated with the factors, it may be useful to address two over-riding questions.

1. What is the problem to be addressed?
2. What are the objectives of the study?

The answers to the above two questions should provide guidelines for answering the following specific questions:

3. How specific will the study be?
4. What will the scope of the study be?
5. What depth of information is needed?
6. How large is the group that has to be surveyed?
7. How rapidly is the area under study changing?
8. How much time is available to do the study?
9. How much money is available to undertake the study?
10. What special requirements, if any, does the study have?

It will be necessary to consider the importance of each of these questions. Some will be more important in particular circumstances; others will have little relevance or significance. Thus there will be a need to apply a "weight" or importance rating to each of the questions.

FACTORS TO CONSIDER

A description of what is implied by each of the questions above follows:
How specific will the study be?

Some studies may be concerned with the training needs within only part of an organisation, others with the training needs of an entire industry. Thus some studies may be highly specific while others are more general. Some may deal with the very specific needs of a particular firm, e.g. training needs for flight attendants on a new aircraft. Alternatively, others may be large in scale because they are trying to address the needs of a whole industry - or even training needs across industries, e.g. training needs for computerization in banking and finance.

What will the scope of the study be?

Not only do studies vary in terms of their specificity, they may vary in scope as well. While some may be concerned purely with local needs and hence confined to a single organisation, (or part of an organisation) others may be regional, state-wide or national.

What depth of information is required?

Some techniques are suitable for gathering information in depth to help define a training need or describe an occupation or job. Other methods of gathering occupational data are more general.

In-depth information involves assessing the detail of what a job or occupation entails and how it is done. In this way, training needs can be specified. Other techniques are more superficial in that they may help to establish what sorts of duties or tasks the worker performs, but do not really get at the underlying "essence" of what a person performing that job does - in other words how the duties and tasks interact, and the ways in which the knowledge, the skills and the attitudes people bring to the job combine to ensure its adequate performance.

How large is the group that has to be surveyed?

The group size (that is, population size) bears some relation to the scope and depth of the study. The size of the industry, sector of industry, occupational group or organisation under study will help to determine the types of survey method used. Studies with a broad scope will generally require a larger group to be sampled. For such groups (say, an industry or a sector of industry), surveys or other quantitative methods are usually employed. If in-depth information is required, observation, interview and group process methods may be necessary. If a large population is involved but a group process is required, repeated group sessions could be planned.
How rapidly is the area under study changing?

A rapidly changing area, in which technology and other factors are dynamic or unpredictable, may demand different analysis techniques from one where the occupation or training need is relatively stable. Some techniques are designed to find out 'what is' rather than what 'will be'. If change is likely, but has not yet taken place, 'what is' techniques will not reveal these changes. Thus the analysis will date quickly if change comes rapidly. Stable situations suggest processes such as surveys, observation or DACUM. Where change is more rapid, techniques such as Delphi, Nominal Group Technique and Search Conferences are valuable ways of exploring future trends. Interviews may be useful in either stable or changing circumstances.

How much time is available to undertake the study?

The time available is an important consideration when deciding upon techniques to be adopted. The shorter the time, the more the study will have to concentrate on limiting the group size. The scope of the study is necessarily limited when time is short, so the researcher should focus on the important issues only. Shorter timelines suggest group process methods and limited consultation and involvement. Longer timelines suggest more extensive consultation and sampling, and a broader scope. Surveys generally take longer than group process methods.

How sensitive are the findings of the study likely to be?

Some analyses have a number of potentially sensitive issues associated with them. For example, if the outcomes of the analysis affects an industrial award or involves job redesign, it could lead to some form of dispute. In general, interview or group process methods are better techniques to use if sensitivity is likely to be an issue. This is because problem areas can either be contained within the interview or talked through during group discussions. A mixture of techniques can be used to deal with sensitive issues.

It is a good idea to allow extra time to complete studies involving sensitive issues. Often the process of gaining consensus and acceptance of the outcomes will take many months.

How much money is available to undertake the study?

The cost of analyses varies a great deal. The cost depends not only on the size of the study, the depth and the time available, but also on the costs not actually accounted for. As an example, some costs are never formally incurred because they are hidden or, although incurred, are met from other sources. For example, computer time and the salaries and expenses of those attending a DACUM meeting are often not charged.
However the golden rule is to limit the scope and depth of the study if limited money is available. Do not try to do too much if your resources are few.

**Some other important questions to ask when choosing your method**

There are a number of other questions to consider when choosing a technique. These include:

- **Is the necessary expertise available?** - that is, are there people available who are familiar with the chosen technique and how to use it?

- **Is the analysis method acceptable to those involved in the study?** - an important issue is whether those who commission the analysis as well as those who participate in it or use its findings have confidence in the methods used. In short, does the analysis method chosen have credibility with the people who will have to act on the findings? Does it have credibility with those affected by the information gathered or the outcomes? Invariably some methods have higher credibility with certain groups than others.

- **What information is already available?** - careful research may reveal that a considerable amount of work has already been done in analysing an occupation or defining the training need. This information should be compiled and examined in order to establish the amount and type of information already available and to determine what further information may be needed to fill any gaps. For example, a recent occupational analysis may provide the duties and tasks involved in a job. However information may not be available on how these duties and tasks are related, and what knowledge, skills and attitudes are required. It may not be clear how the job is actually done in the workplace.

**A METHOD SELECTION MATRIX**

Using these questions as a basis, a matrix has been prepared to assist in choosing the methods which will best suit particular requirements. This matrix is presented in Figure 4. Each of the methods has been rated in the matrix so that these requirements can be easily matched with the characteristics of each methodology.

To illustrate the use of the method selection matrix, a simple example of a quality problem in a small metal manufacturing firm is given below:
EXAMPLE: A QUALITY PROBLEM IN A SMALL METAL MANUFACTURING FIRM

A small metal manufacturing firm wishes to investigate quickly an intermittent quality problem with one of its machining centres. Only four workers operate the centre over two shifts and the firm is prepared to spend up to $5,000 on the study.

The results of using the method selection matrix are shown in Figure 5. CODAP is immediately ruled out (study time frame unsuitable) and General Survey Questionnaire rates poorly. On the other hand, Interview and Nominal Group Technique appear to be the most suitable. Having narrowed down the options, a final choice could be made on the basis of comparative benefits such as exact time or cost.
**FIGURE 4: METHOD SELECTION MATRIX**

<table>
<thead>
<tr>
<th>FACTOR VALUE</th>
<th>YOUR REQUIREMENTS</th>
<th>TECHNIQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>General Survey questionnaire</td>
</tr>
<tr>
<td>part of organisation</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>whole organisation</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>sector of industry</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>industry wide</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>across industries</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>local</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>regional</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>state/territory wide</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>national</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>in depth</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>superficial</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>small (less than 100)</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>medium (100-1000)</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>large (1000+)</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>slow</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>medium</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>fast</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>short (&lt;4 months)</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>medium (4-9 months)</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>long (9+ months)</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>low</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>medium</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>high</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>low (&lt;$2000)</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>moderate ($2000-$5000)</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>high ($5000-$20000)</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>very high ($20000+)</td>
<td></td>
<td>o</td>
</tr>
</tbody>
</table>

**SPECIAL FEATURES**

List your special requirements:

The special features of each technique are given in Chapter 8 of the manual

**TOTAL MATCHING**

<table>
<thead>
<tr>
<th>MATCH?</th>
</tr>
</thead>
</table>

**Note:**
- o = highly suitable
- o = suitable
- x = unsuitable
FIGURE 5: SELECTION MATRIX FOR EXAMPLE: A QUALITY PROBLEM IN A SMALL METAL MANUFACTURING FIRM

<table>
<thead>
<tr>
<th>TECHNIQUE</th>
<th>General Survey questionnaire</th>
<th>CODAP</th>
<th>Delphi</th>
<th>Interview</th>
<th>Nominal group</th>
<th>DACUM</th>
<th>Force field analysis</th>
<th>Search conference</th>
<th>Task analysis</th>
<th>Critical incident technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATCH?</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Note: • = highly suitable  0 = suitable  3 = unsuitable

List your special requirements:

The special features of each technique are given in Chapter 8 of the manual.
You will have noticed that throughout this monograph we have used the expressions knowledge, skills and attitudes rather than the more scientific expressions cognitive, psycho-motor and affective. For the purposes of this document we have regarded the two sets of terms as synonymous.

In Figure 6 we have expanded the contents of Figure 2 in a step-by-step manner. We strongly recommend a step-by-step approach to both the planning and conducting of occupational and training needs analyses. In this way problems can be overcome as they arise, in reasonably sized manageable blocks rather than a large collection of unrelated problems. A description of each step follows:

**OCCUPATIONAL ANALYSIS**

If an accurate occupation or job description is not available, then an occupational or job analysis is required. Occupational analysis procedures were outlined in Section 4. If a job description exists but you are not sure of its adequacy the components of Figure 3 provide a check-list. If clarification of Figure 3 is required refer to the text in Section 4.

**PERFORMANCE STANDARDS.**

Progressing through Figure 6, the next recommended action is to establish performance standards for the job. These are concerned with the purpose of the job; why it exists at all. What are the outcomes expected from the person or persons in that particular job or occupation.

Performance standards for a batch production occupation will include quantity produced in a given time, together with basic quality limits. Non-specific expressions like "within agreed quality limits" are often used and appropriate at this stage. Defined or agreed quality limits may vary with similar organisations. Quality, quantity and time will be the parameters for batch operations.

In process operator jobs, quantity is usually dependent on line speed. This may be one of the performance standards. Others may include such things as, maintaining temperature between certain limits, controlling thickness of spread or viscosity. There are many other possible factors all of which depend on the particular operation. The parameters chosen will require that the operators maintain the factor within certain limits which will have a reading on a dial, gauge or chart. Again at occupational level "within agreed limits" will often be a non-specific standard.
FIGURE 6: FLOW CHART OF TRAINING NEEDS ANALYSIS (Adapted from Figure Three in 'Analysing Training Needs' by the Australian Institute of Training and Development, 1987)

- Is an accurate occupation or job description available?
  - No: Do occupational analysis or job analysis
  - Yes: Set job performance standards

- Have the job performance standards been decided?
  - No: Analyse the knowledge, skills and attitudes required for each task and write personnel specification
  - Yes: Set task performance standards

- Has the expertise required to get the work done been defined?
  - No: Analyse the knowledge, skills and attitudes required for each task and write personnel specification
  - Yes: Set task performance standards

- Is the job currently being done?
  - No: Recruit
  - Yes: Identify actual deficiencies

- Can the standards be met?
  - No: Should the standards be: re-assessed, revised, re-arranged, modified?
    - Yes: Determine required alterations and effects
    - No: No problem

- Determine appropriate training and non-training responses
- Where are the job design
  - Identify actual deficiencies
  - Determine required alterations and effects

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For service jobs, time and quantity variables will usually be present as well as accuracy. Other less tangible factors such as customer satisfaction will also be relevant. Again at this stage, for an occupation, non-specific statements will probably be acceptable because of the variation in standards from one organisation to another.

In all cases the information gathered during the job or occupational analysis will form the basis of the specification.

ANALYSING KNOWLEDGE, SKILLS AND ATTITUDES REQUIRED

Next comes the section *Analyse knowledge, skills and attitudes required for each task and write personal specification.* This is what we have defined as a training needs analysis.

For a batch operation, this will require information on what needs to be achieved - the outputs of the job - and some information on the use of certain tools and equipment. Attitude may be important. If the batch operation involves team work, a collaborative attitude may be essential. If, however an individual has the sole responsibility for an entire job or process, then determination, persistence and pleasure in personal achievement may be of a greater importance than a collaborative attitude.

Process workers need considerable knowledge of the processes they are controlling. They will need knowledge and skill in interpreting the various instruments which provide them with information. Skill in making careful adjustments will probably be critical to the process. Usually a relatively calm attitude is essential. A panicky process operator or one who expects to see instantaneous results from his/her actions can be disastrous. Operators in service industries require knowledge about their jobs. Skill levels will vary. Some require high levels of skill, others don't. Attitudes are crucial in all service operations.

How is information on the required level of accuracy and precision, and about the particular needs going to be collected? This of course is the central thrust of this monograph. The matrix in Figure 4 will be an invaluable help here. You will have noticed that the back cover of this monograph folds out to give the matrix. This has been done to make it easy for you to copy the matrix for regular use.

**Example: Training needs analysis for a batch operation**

As an example let us take a batch operation based at one location for which in-depth information is needed on an occupation with 70 people involved. Although the pace of change is only moderate it is important to resolve the situation quickly. Both management and unions are keen to see the analysis done. A budget of $3000 has been allocated.
Referring to the method selection matrix of Figure 4, our study requirements were:

- part of organisation specificity;
- local scope;
- in-depth information;
- small population size;
- medium pace of change;
- short study time-frame;
- low sensitivity;
- moderate cost.

Scores for the various techniques based on the information gathered were:

- General Survey Questionnaire (Score 9);
- CODAP (Score 7);
- Delphi (Score 11);
- Interview (Score 14);
- Nominal Group (Score 16);
- DACUM (Score 14);
- Field Force Analysis (Score 14);
- Search Conference (Score 14);
- Task Analysis (Score 12);
- Critical Incident (Score 12).

On the basis of these results the researcher/trainer, decided to use Nominal Group Technique to develop and rank the key factors, and follow up with structured interviews with managers, supervisors and a random sample of operators.

The following results were obtained from the Nominal Group Process:

- A total of 35 possible knowledge components was identified, but the voting showed only 8 receiving support;
- With relation to skills, 27 possible were identified but 6 dominated the voting;
- With relation to attitudes, 32 possible factors were proposed but again 6 dominated the voting.

These 20 factors were incorporated into an interview questionnaire. Interviewees were asked to express the importance of each factor on a 0-10 scale. No limits were imposed, so that if they wished, respondents could score all factors 10 or all factors 0. None did.
The data were analysed by calculating the average rating for each factor. From this it was found that 5 knowledge factors were important, 2 of which were unique to the organisation.

Of the 6 skill factors, only 4 were unique to the organisation. However, it was recognised that the other 2 should form part of the job selection criteria.

Three attitudes were found to be important, all of which needed reinforcement during the training period.

In defining the personnel specification, the researcher proposed that 2 of the 3 non-unique knowledge components, the 2 non-unique skills and all 3 attitude factors should be included in the job selection criteria. The remaining 3 knowledge, 4 skill and 3 attitude factors were defined as the training needs which required a training response.

Example: Study of an occupation in an entire industry

Another example of using the matrix would be a national Industry Training Committee (ITC) wishing to identify training needs for an occupation. The occupation covers at least 200 jobs in a stable industry. A grant of $50,000 had been obtained to conduct a study over a period of a year in an area where sensitivity was low. Because of the nature of the different organisations involved, the information would be indicative rather than in depth.

Use of the method selection matrix of Figure 4 showed that General Survey Questionnaire (score 16), CODAP (score 16) or Delphi (score 15) could be appropriate. The ITC would then have several options which would include:

- undertaking a General Survey via questionnaire themselves
- engaging a survey organisation
- engaging a CODAP specialist
- using Delphi themselves
- getting another organisation to use Delphi
- seeking more general advice e.g. from TAFE National Centre for Research and Development.

In undertaking a General Survey Questionnaire there are many traps. For this reason experienced or professional surveyors regularly pre-test their questionnaire, refine it, do a pilot run, and refine again before issuing the final questionnaire. The methods of analysis of data should be considered early so that the questionnaire design allows valid data analysis. The data analysis should focus on the research issues only; it is wasteful to analyse everything.
The *Method Selection Matrix* is a valuable guide. It is also a new technique developed by the TAFE National Centre during the research into training needs analysis techniques.

**Outcomes**

The outcomes of this analysis will be a statement of the knowledge, skills and attitudes required to do the job, together with recognition of those factors which are unique to the organisation. In addition, a personnel specification, in the form of job selection criteria will be produced.

We also recommend that at this stage, and at various stages throughout the process, regular cross checks be made by observing the job actually being done. This regular check of theory by practical observation improves the quality of the total analysis.

**TASK PERFORMANCE STANDARDS**

From here we then set performance standards for the individual tasks. These will be components of the overall job performance standards, probably specified in greater detail. At this stage we have reached tasks in a particular organisation. Precise quantity outputs must be established. Quality standards for batch operations, parameter limits in process operations, customer satisfaction, error levels and other relevant factors for service operations will all need to be defined precisely.

**SUBSEQUENT STEPS**

We then pose the question "Is the job currently being done". If it is not being done at all, then individuals can be recruited using the personnel specification developed earlier. If the job is being done, then there are two possibilities; it is either being done satisfactorily and therefore no problem exists or the performance standards are not being met. If performance standards are not being met, we then need to review the standards and ask whether they should be changed in some way. If the answer to this question is yes, then it is necessary to revert back to either job or task performance standards and pick up the sequence again.

Even if this is necessary if should be a fairly speedy process the second time through.

It it is concluded that the performance standards are both realistic and necessary, we then need to examine where the deficiencies arise. Is it with the individuals or is it with the job design? If the problem is job design, then the required alterations and their subsequent effects need to be determined.
If the problem lies with the individuals, we then need to identify the actual deficiencies and be quite objective in deciding whether training will rectify the problem. In situations where new skills have to be acquired - for example, with new machinery or job redesign, then the task remains to determine the necessary training. It is then necessary to devise a training program which will fill the gap between existing knowledge, skills and attitudes and those required for the new situation.

Similarly with the new information at hand, selection and training of recruits can be done on the basis of real knowledge and understanding of the job.

WHO SHOULD DO THE ANALYSES?

This is a difficult question in many cases and clearly depends on a variety of factors. We do not intend to attempt a definitive answer but only to point out some of the parameters which will affect the decision.

In answering the "who" question, clearly competence or willingness (and time) to acquire competence will be a critical factor. Similarly, the nature of your job will help determine whether you should undertake it yourself or get someone else to conduct the actual study.

For example TDEs will already have considerable specialised knowledge of their own industry. They can give good advice to companies within their industry and may be willing to undertake a study for an organisation or group of organisations. However, any study which aims to cover the whole industry will almost certainly require the assistance of consultants.

Trainers in the private sector are often acutely aware of the constraints of time and money, which often forces them to attempt the study themselves. If trainers have the time and competencies there are many advantages in conducting the study themselves. They are:

- they retain control
- they save considerable time by not having to brief consultants
- they can use their own knowledge regularly
- they know the 'political' pitfalls
- it can be quicker overall
- it is perceived as costing less.

There are also some possible disadvantages. They are:

- their other work may be neglected
- they may be considered to be biased
their expertise may not be readily accepted. (The expert is the guy from the next town)

they may get too close to the problem.

If consultants are to be used, this monograph should help in planning the study and also in the selection and control of the consultant. Knowing the techniques to be used in the study will limit the number of consultants with proven competence and who, therefore, should be considered. For example, an amiable well meaning consultant who had never done or been trained in a CODAP analysis would be a disaster if a CODAP study were to be undertaken.

We hope that understanding and using the methodologies outlined in this monograph will help trainers and training providers in the important task of analysing training needs.
As stated in the Introduction this monograph has been intended as a practical working tool for curriculum developers, training designers and trainers. It was not designed to be a learned treatise on the subject. However, at the risk of appearing pedantic we have found it necessary to be more precise than is usual in discussion of training needs analysis.

In Figure 1 we showed how macro industry analyses which are important for national planning purposes lead to the labour market analyses. These analyses focus on implications for labour supply and demand with consequent impacts on government policies. The next stage is occupational analyses which act as the major link between the macro analyses and the micro, single organisation analyses. In their wider form they cover national occupations with many thousands of members. At the lower end of the occupational analysis spectrum we often use the term job analysis which we see as a sub-set of occupational analysis.

The objective of the occupational or job analysis for our purpose here is to establish those factors which constitute an accurate description of the occupation or job. The major difference between these occupation and job descriptions is the precision of the performance standards. At occupational level these will be indicative only; whereas for the individual firm or organisation they should be defined accurately.

The existence of an occupation or job description makes it possible to conduct a training needs analysis.

We believe that this sequence is logical and consistent. We found it necessary to provide definitions of occupational analysis and training needs analysis to ensure consistency in application. The definitions we have used bear repeating.

They are:

**OCCUPATIONAL ANALYSIS IS THE IDENTIFICATION OF THE CURRENT AND LIKELY FUTURE JOBS WITHIN AN OCCUPATION AND THE DUTIES AND TASKS WHICH COMprise EACH JOB, TOGETHER WITH OTHER RELEVANT JOB INFORMATION.**

We see this as the starting point for training needs analysis, which we have defined as follows:

**TRAINING NEEDS ANALYSIS IS THE DETERMINATION OF THE DIFFERENCES BETWEEN THE ACTUAL CONDITION (WHAT IS) AND THE DESIRED CONDITION (WHAT SHOULD BE) IN HUMAN PERFORMANCES WITHIN AN ORGANISATION OR GROUP OF ORGANISATIONS IN TERMS OF HUMAN KNOWLEDGE, SKILLS AND ATTITUDES.**
Figure 2 provides a flow chart which covers the scope of this publication. In the flow chart, and at various other times we have stressed the importance of non-training responses. As trainers we are sometimes tempted to assume that we can solve all problems with appropriate training. Such factors as job redesign or tighter raw material specification are sometimes more realistic solutions. These are the situations shown at the bottom of Figure 2 where no deficiencies between required and actual knowledge, skills and attitudes exist but nevertheless performance problems are in evidence.

In Section 5 we dealt with the various techniques of occupational analysis and training needs analysis. Some techniques are primarily occupational analysis techniques whereas others are primarily training needs analysis techniques. Some of the techniques discussed are applicable to both but it is important in research design to have a very clear idea of the information you wish to collect.

The different techniques have been grouped under five headings:

- Organisational knowledge and records;
- Observation methods;
- Interview methods;
- Questionnaire-based methods;
- Group process methods.

Whilst direct observation is a viable method in its own right we have also recommended that, when other methods are used, it is useful to cross check by observation thus maintaining contact with the reality of the job.

Most studies will use more than one method, particularly when an occupational analysis is being conducted as well as a training needs analysis. The various methods have been described in reasonable detail and a guide to further information has been provided.

The different methods and the appropriate occasion for using them have been listed in the Method Selection Matrix of Figure 4. Whilst this is daunting at first sight it is relatively easy to use. The various factors provide a useful check-list of the information needed before an analysis is attempted. We need to answer the following questions:

- How specific will the study be?
- What will the scope of the study be?
- What depth of information is needed?
- How large is the group that has to be surveyed?
How rapidly is the area under study changing?

How much time is available to do the study?

How much money is available to undertake the study?

What special requirements, if any, does the study have?

Figure 4 gives guidance on the likely subdivision of the factors under factor value and each of the techniques is rated for each factor value on a 0, 1 or 2 scale.

We have provided worked examples, showing how the matrix might be used. We believe that trainers will find this matrix to be an invaluable tool.

In Section 7 we have gone through the stages of the process in detail as outlined in Figure 6. We have shown how the matrix can be used and the value of the analysis in establishing job selection criteria which form a major component of the personnel specification.

We hope the tools we have provided will help our readers in the important task of analysing and defining training needs.


FIGURE 4: METHOD SELECTION MATRIX

<table>
<thead>
<tr>
<th>FACTOR VALUE</th>
<th>YOUR REQUIREMENTS</th>
<th>GENERAL SURVEY QUESTIONNAIRE</th>
<th>CODAP</th>
<th>DELPHI</th>
<th>INTERVIEW</th>
<th>NOMINAL GROUP</th>
<th>DACUM</th>
<th>FORCE FIELD ANALYSIS</th>
<th>SEARCH CONFERENCE</th>
<th>TASK ANALYSIS</th>
<th>CRITICAL INCIDENT TECHNIQUE</th>
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List your special requirements:

The special features of each technique are given in Chapter 8 of the manual.

TOTAL MATCHING

Note: ** = highly suitable  * = suitable  x = unsuitable