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## Identifying the 'aboutness' of highly structured expository documents

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# **Identifying the 'aboutness' of highly structured expository documents**

by

Stuart Hawthorne, BA (Phil.) *Qld*

A Thesis Submitted in Partial Fulfilment of the  
Requirements for the Award of  
Master of Science (Information Science).

In the Faculty of Communications, Health and Science,  
Edith Cowan University.

Date of submission: 9 June 2000

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## ABSTRACT

The increase in commercial documentation over the past 50 years and the permeation of computers into all areas of business has led to a major increase in the individual's reading load. This thesis proposes a method of writing procedural documentation to enable rapid appreciation of the 'aboutness' of such material, thus making the reading task more efficient. The method is derived from a document structure which is used as a basis for the development of rules to construct a hierarchy of in-text headings which encapsulates the 'aboutness' of the text. Reading efficiency is achieved through needing to only interpret the headings to understand what the document is about.

The method was tested by having control and experimental groups complete the same series of questions, answers to which were derived from a set of documents. The set used by participants in the experimental group contained headings structured according to the proposed method; the set used by participants in the control group contained headings which were not structured according to the proposed method. All variables other than headings were negated or neutralised. Answer accuracy and completion times of the groups were compared. On average the experimental group, who used documents containing headings structured according to the proposed method, had 7.5% better accuracy and completed the questions in 13.5% less time overall. These improvements are assumed to be due to the differences in heading effects.





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Finally, I would like to thank Mr Leon Tighe of the Australian Computer Society for those long discussions we had years ago which helped to precipitate and identify the aboutness problem in commercial documents which eventually became the subject of this thesis.

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# CHAPTER 1: INTRODUCTION

## Background

Reading is the means by which the world does a large part of its work. The printed page is a contrivance used ... daily by tens of millions of people. The slightest improvement either in the page or in the method of reading means the rendering of a great service to the human race. (Huey, 1908, p. 421).

Edmund Huey's words, penned in the first decade of the twentieth century, articulate what is almost a self-evident truth—that the ability to read is essential to the business of the world. In the nine decades since Huey, the world's population has increased from 1.75 billion (in 1910) to 6 billion (in 1999), with the current rate of increase being 78 million people per year (United Nations, 1999). The rapid rise in demands on resources by these increasing numbers has led to fundamental changes in the way the business of the world is conducted. These changes have led, in turn, to a large increase in the reading load for individuals in Western countries. In the second half of the twentieth century, the development of electronic computing has kept pace with this expansion of the total corpus of information. Computer use has permeated all areas of society and has enabled highly efficient means of creating, storing and distributing written information to be developed.

The result has been that 'information is abundantly generated and systematically stored but not yet efficiently used' (Brookes, 1981, p.9). There has been an accumulation of 'vast amounts of text material' (Salton, Allan, Buckley & Singhal, 1996, p. 51) and the development of 'increasing problems of both physical and intellectual access to a very fast growing body of (scientific) knowledge' (Ingwersen, 1992a, p. 102). By 1970, Bernier had concluded that 'in practically all fields, researchers are finding it difficult or impossible to keep up' with their reading (cited in Borko & Bernier, 1975, p. 6). The pressure placed on readers

has been widely noted, being variously described as information or message 'pollution' (Capurro, 1990, p. 127), 'the problem of output overload' (Salton, 1986, p. 650), the 'volume of "dross"' (Hutchins, 1978, p. 180), the 'document explosion' (Ingwesen, 1992a, p. 102), 'documentary "inundation"' (Molina, 1994, p. 111), or the 'data glut' (Roszak, 1986, p. 188). Thirty years ago, Black (1967, cited by Guthrie, 1982, p. 187) estimated that the average student was expected to cope with at least 32,000 textbook pages. Others estimated that it would take 27.4 centuries for one person to read just one year's output of the world's biomedical press, if that individual was able to read approximately 70 languages (Borko & Bernier, 1975, p. 6).

Some have observed that with the rapid expansion of science in the twentieth century and the consequent increase in scientific and other literature, there is so much written material available that we run the risk of not being able to find the information we seek, even though it may exist. As early as 1976. Farradane had observed that

... it is generally supposed that when a piece of research is published, in whatever journal, it is assumed to be 'known' by all, whereas it may need research in itself to find it (1976, p. 91).

A similar observation has moved John Seely Brown to compose a contemporary extension to sentiments expressed in T.S. Eliot's poem 'Choruses from "The Rock"':

Where is the wisdom we have lost in the knowledge?  
Where is the knowledge we have lost in the information?  
*Where is the information we have lost in the data?*  
(1985, cited in Barabas, 1990, p. 111)

Many others have identified the consequences of this apparent loss in direction. Wilensky observed three decades ago that 'information ... is now increasingly a source of confusion. In every sphere of modern life, the chronic condition is a

surfeit of information, poorly integrated or lost somewhere in the system' (1968, p. 331). Foskett similarly found that

... there is at this moment considerable danger in the direction that most research in this field [information science] is taking, that is to say, the reduction of information to a commodity and the emphasis on the technology of processing information without regard to its meaning or destination (cited in Shera & Cleveland, 1977, p. 263).

Twenty years later, Capurro observed that, in information-rich societies,

information technologies are able to disseminate an incredible abundance of messages, without making explicit the contexts they arise from, ... the 'blindness' of their own limitations, ... [or] the specific kind of 'partiality' they are supposed to have. Human beings are more and more the 'victims' or 'targets' of a superabundance of messages. (1990, p. 127).

Roszak maintains that the 'superabundance of messages' arises, or at least is maintained, intentionally:

It is a strategy of social control, deliberately and often expertly wielded. It is one of the main ways in which modern governments and interest groups obfuscate issues to their own advantage; they dazzle and distract with more raw data than the citizenry can hope to sort through. ... The computer did not generate this treacherous style of political discourse. ... But to deceive by glutting the public with more expertly engineered information than it can digest is a decidedly new and highly effective twist [on the political approach of the early 19th. century English Benthamites], one to which the computer makes an indispensable contribution. (Roszak, 1986, pp.188, 189, 190).

Compounding these problems of volume is an apparent decline in the ability of even educated users to fully understand complex documents. Pfaffenberger reports on a major study in the United States that found that though 95 percent of adults aged 21 to 25 could read, only a small percentage could understand complex material (1990, pp. 69–70).

## **Need for the study**

The contemporary reading load is not a direct consequence of the rise of computer databases, although it is often perceived as such. Capurro (1990, p. 125) identifies the opening up of written information to the public at large as beginning some 300 years ago and Roszak (in the citation above) alludes to the inundation of the English public with the 'Blue Book' reports in the mid-19th century. A surge in production of scientific and technical material occurred in the

two decades following the end of the Second World War (Ingwesen, 1992a, p. 102), well before the advent of the personal computer. However, computers have accelerated and emphasised these difficulties, which have the potential to impact negatively on business. For example, if it is assumed that just ten percent of the 28 million users of the World Wide Web (International Data Corporation, 1997) spent just one minute perusing a retrieved on-screen document, 26 person-years would be consumed in sixty seconds.

One particular aspect of modern business also has had an impact on the reading load in a more subtle way. The introduction of formal quality systems based on the international ISO9000 quality standard (implemented in Australia under Australian Standard AS9000:1994) led to the adoption of a format for quality procedures and work instructions based on a layout which had previously been used in the production of written standards<sup>1</sup>. This format contained perspective labels like 'Purpose', 'Scope', 'Actions', 'Definitions' and 'Reference Documentation'. This type of label is widely used as a paragraph heading in Australia and overseas (for examples of British practice, see Munro-Faure, Munro-Faure and Bones, 1993, pp. 179–183; and for American practice, Peach, 1995, pp. 225, 239–242; and Stamatis, 1996, pp. 279–288).

Despite being called a 'content marker' by Duchastel (1982, p.182), this type of label is actually content-free and when used as a heading provides no indication of the semantics of its referent text. To ascertain the meaning of the text, it has to be read. In organisations with many procedures, for example, the Queensland Electricity Commission had over 900, the inherent inefficiency of these headings meant a substantial amount of staff reading time was unavoidable. The whole tenor of the ISO9000 standards, of which this is a particular example, is geared exclusively towards the requirements of the author. There is a rigorous emphasis

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<sup>1</sup> Telephone conversations, 29 & 31 March 2000, between the author and Ms Kay Gibbons, Quality Assurance Services, Standards Australia, Sydney.



on gross document structure with an implicit assumption that as long as the appropriate material is contained in the document under the given labels, a reader will eventually find it. That a reader may have to peruse a section, if not the whole document, from start to finish to do this does not appear to be a consideration. From observation, it would seem this approach is common in most commercial writing based on a 'standards' model. The deficiency with this approach is that the context of detailed information is poorly explicated and readers are left to determine this as best they can. Interest in the topic of this thesis arose from the observation that if headings in procedural documents could accurately indicate what the following text was about, and if these headings indicated the context of the information in that text, significant reading time could be saved in the workplace.

With the exception of the legal profession, it is not common to ascribe a cost to the time taken to read documents, yet the time and cost of this can be significant. Nicholas (1996, p.17) identifies five functions for which information obtained from reading may be used: fact-finding, current awareness, research, briefing/background and stimulus. Irrespective of the reason why reading is taking place, it is the process of interpretation that actually takes the time. It is the visible document as a structured graphical object that matters initially as the structure of the text affects the efficiency with which relevance can be determined.

In this study, Huey's challenge is taken up. The goal is to present the contents of the 'page' in a way that enables efficient comprehension of what the contents are 'about'. The study focuses on the length of time taken to read specific commercial documents to determine if they meet the reader's need. This period of time usually falls within the scope of Nicholas' (1996) 'fact-finding' function. Any retrieval system will return a number of documents in response to a query.

Usually, several potentially relevant documents must be scanned before a relevant document is found. The time spent reading irrelevant text is wasted. Strategies that significantly accelerate document scanning while maintaining the effectiveness of that scanning process will be valuable in reducing wasted time.

Abstracts and summaries at the beginning of documents provide some assistance. It is accepted that abstracts and summaries are useful. It has been estimated, for instance, that abstracts can save up to about nine-tenths of the time needed to scan the original document (Borko & Bernier, 1975, p. 6). But even if we accept this claim, there are still overheads associated with the production of abstracts and summaries which lessen their efficiency. The abstracter requires substantial experience in the discipline involved and in the summarising/abstracting process itself. The time taken to read and interpret the original text and to draft and edit the summary can be considerable.

Two further aspects of abstracts and summaries make them unsuitable as a foundation for the structure-based technique being developed in this study. Firstly, abstracts and summaries are still 'texts' in that they consist of continuous prose. The requirement to take in the meaning of the tract as a serial process remains. Some sequential or hierarchical ordering is always required to indicate the context of the various propositions. However, the need to interpret the meaning of later prose in relation to the meaning of earlier prose is time-consuming and abstracts and summaries do not directly address this problem.

Secondly, abstracts and summaries are high-level interpretations of the original text that generalise, even when written by the original author. They are 'second- or third-stage surrogates' (Farradane, 1976, p. 100) for what was originally conceived. They are presented as discrete tracts of text physically removed from the original text. Abstracts and summaries cannot place information in strict

context, nor can they indicate exactly where greater detail can be found. Both indications are required for rapid comprehension and determination of 'aboutness' of the text.

The term 'aboutness' requires explanation. There are two types of aboutness: extensional and intensional. Extensional aboutness is the meaning ascribed to a document by a reader. This may vary from reader to reader. Intensional aboutness is the internal meaning of the text that is consistent, no matter what meaning is ascribed by the reader. Beghtol notes that this perceived separation between intensional and extensional aboutness is at present an unproven distinction (1986, p. 86) and that it

... should not be taken as a rigid one; but it clarifies the point that a document may have only one aboutness but an unlimited number of meanings, differing according to the exact use a particular person may find for the document's aboutness at a certain time. Indeed, the same document can have different meanings for the same reader at different times, but the document, itself unchanging, is assumed to possess a fundamental aboutness. A recognition of the relatively permanent quality of aboutness in documents is one of the assumptions upon which bibliographic classification systems have traditionally been based (1986, p. 85).

MacKay (1969, pp. 74–77) has also reported a similar view. In this study, 'aboutness' means intensional aboutness. When phrases such as 'enabling the reader to determine the aboutness of the text' are used, they mean enabling the reader to determine a personal meaning that ideally matches, or closely approximates, the author's intended meaning.

The object of this study is to exploit the semantic and structural elements of a document in order to make explicit intensional aboutness. Such a structure could facilitate the identification and retrieval of pertinent information from the document. The proposed system is a form of subject or theme retrieval and is in keeping with the purpose of information retrieval systems as defined by Beghtol:

The purpose of retrieval systems is not to answer questions or to satisfy a need for information or to resolve an anomalous state of knowledge. The object of information retrieval systems is 'to help the users do these things'. That is, the purpose of subject retrieval systems is to retrieve documents whose aboutness suggests that a user

may find in them meaning(s) expedient to a certain need of the moment. (1986, p. 85).

This study concentrates on one type of work document, the 'procedure'. The procedure is used for two reasons. Firstly, it is representative of prescriptive expository documents that are widely used in commercial, industrial, academic and defence organisations. Any improvement in the intensional aboutness of such documents should be of benefit. Secondly, the procedure, if correctly written, is a document type that overtly displays all of the propositions that it requires to execute its purpose and there should not be any message other than the message contained in those propositions. This differs from a narrative story which relies on inference or implication to deliver the total message. Procedures are not meant to be interpreted like a story. Such an action could be disastrous. For instance, procedures for handling high voltage electricity systems or the maintenance of pilot ejection seat assemblies must be explicitly stated if accidents are to be avoided.

## **Hypothesis**

The content of a procedural document written according to the proposed heading rules is able to be comprehended more efficiently than the content of the same document when it is not written in accordance with the proposed model.

**Null hypothesis:** The content of a procedural document not written according to the proposed heading rules is able to be comprehended as efficiently as the content of the same document when it is written in accordance with the proposed model.

## **Description of the task**

The principal task of this thesis is to develop and test a conceptual model that enables the systematic identification of intensional aboutness in structured texts and the generation of aboutness indicators. To enable the method to be applied and utilised, a set of prescriptive rules for authors is required.

## **Problems associated with the task**

The principal problem is the interface between intensional and extensional aboutness. Different people may interpret the same document in different ways and a single individual may interpret the same document in different ways at different times. Interpretation is subjective and is characterised by shifting perspectives, contexts, objectives and knowledge bases. It is unlikely that exact correspondence between intensional and extensional aboutness can ever be achieved. An author has control only over intensional aboutness. An approach which seeks to reduce the time taken by a reader to identify intensional aboutness has practical value.

The perspective adopted in this study is similar to that described by Kintsch in his work on depicting text representations. Rather than seeking to negate or avoid the unpredictability of the human condition, he accepted that a high degree of quantitative precision was unobtainable. He envisaged a system that was intentionally imprecise. Kintsch found that

... it is difficult to design a production system powerful enough to yield the right results but flexible enough to work in an environment characterized by almost infinite variability. The approach taken here is to design a much weaker production system that generates a whole set of elements. These rules need to be just powerful enough so that the right element is likely to be among those generated, even though others will also be generated that are irrelevant or outright inappropriate (Kintsch, 1991, p.109).

Kintsch's approach has a parallel in high recall/low precision retrieval systems, where the set of items retrieved contains more items than are required but, at the

same time, there is a high probability that the required item is included in the retrieved set. Kintsch's approach is modified in this study to a more precise 'production system' as it is intended for a specific application. However, it cannot achieve absolute precision either. The system has to contain enough tolerance to accommodate the natural variability of readers.

The aim of the study has been to devise a way to write a document that includes its own 'aboutness summary' that is an integral and recognisable part of the original document. The approach taken is to create a summary that is a hierarchy of the headings that appear in the document. The reader need only read the headings to derive understanding of the 'aboutness' of the text. The headings are related to their referent text and to each other. It should be possible to remove all the body text from the document to leave only the headings and still be able to completely understand what the document is 'about'. The headings constitute a discrete 'text' in their own right. The disadvantages of continuous prose in regard to rapid comprehension do not apply to such a 'text' because the relationship of each term to others and the relative importance of each term is evident from the structure of the heading hierarchy.

Some working constraints have been assumed:

- The prose in which headings are used must look 'normal' (see 'Definitions of Key Terms' below for an explanation of 'text that looks normal').
- The prose in which headings are used, as well as the headings themselves, must be of a form that maintains compatibility with existing document production formats, presentation styles, editorial requirements and referencing conventions.
- The prose in which headings are used must be compatible with existing text storage, handling and processing arrangements.

- The headings must not rely on any external agent to engender their 'aboutness' but must contain or carry this with them in the text.
- Some additional simple rules are required to maintain the aboutness effect of headings to be displayed on a computer screen.

## **Significance of the study**

**Significance for readers:** The method should enable readers of quality procedures and similar highly-structured documents to efficiently ascertain if the document contains or is likely to contain information relevant to their needs. A reduction in the total cumulative human reading time taken to peruse documents is economically advantageous to government, commercial, military, academic and other organisations where it is essential that staff rapidly master formal written instructions.

**Significance for authors:** The method sets out a prescriptive approach for authors of quality procedures and similar work control documents on how to compose headings that accurately summarise the contents. The prescriptive aspect has advantages in producing documents to deadlines.

**Significance for text storage and retrieval systems:** In-text headings developed according to the method provide accurate, ready-made terms for use as key words, key phrases and retrieval coordinate points. The significant expense of indexing and abstracting is substantially reduced, as much of the required intellectual effort has been provided by the author. Using in-text headings for indexing and abstracting minimises misinterpretation. Computer-based text parsers can easily extract headings from the document to produce a machine-derived summary that is complete and accurate.

The result is not dependent on the platform or application used to store, distribute, retrieve or access the text. Documents written according to the method would not require any more preparation than existing documents for incorporation into existing text storage, distribution and retrieval systems.

**Significance for information science:** The method recognises the fundamental importance of the intellectual process to determining relevance. This is in contrast to current, usually computer-based, information retrieval approaches which do not facilitate intellectual consideration of the contents but rather, concentrate on machine analysis of metadata. Contemporary systems have not evolved much from the Shannon & Weaver model (1949), where efficient delivery of the message container is all that counts, not the meaning of the message (see also Brookes, 1975, pp. 44–46 for an analysis of Shannon & Weaver's information theory from the information science viewpoint).

One of the perennial quests for information scientists is for a systematic way of quantifying the aboutness of text. The method developed in this study constitutes a contribution to this particular area of research and, as such, may provide a basis for comment, amendment, critical review and further development.

## **Definitions of key terms in the study**

**ABOUTNESS** is 'intensional' aboutness, the relatively permanent internal meaning of the text according to the author.

**CONSEQUENCES** See **EVENTS AND CONSEQUENCES**

**DETAIL TEXT**, in contrast to 'detailed text', means the physical text which contains meaning at the lowest discursual prominence level of the document, in the same way as 'heading text' means the physical visual text which contains meaning at a



comparatively higher prominence level. The term 'detail' describes the text's position in the discoursal prominence hierarchy whereas the term 'detailed' refers to the level of descriptive or explanatory attention articulated in a particular text passage.

DOCUMENT means a discrete, complete tract of text. 'Document', 'procedure' and 'procedural document' all refer to the same thing.

'EFFICIENTLY'. 'As efficiently', in the null hypothesis statement, means in the same time and with the same accuracy. 'More efficiently', in the hypothesis statement, means in shorter time and with equal or greater accuracy. 'Time', in this context, refers to the time taken to retrieve accurate information from a tract of text.

EVENTS and CONSEQUENCES. The meanings of the terms 'event' and 'consequence' have been expanded to include all conceivable events and consequences, including hypothetical circumstances not yet shown to be possible. A consequence has two forms: as a result of an event, for which the term 'consequence' is retained, or as a 'cause' of a new event. In the information model adopted in this study, a consequence always has these two forms, though at different times.

TAXIS (pronounced TACK-SISS; from the Greek *taxis*, meaning 'arrange'). Taxis of a heading means the heading's denotative and connotative extent, these extents being described by the adjectives 'paratactic' and 'hypotactic'. (A third type, 'hypertaxis', is not utilised directly in this study but is raised in the 'Suggested areas for further research' section at the end of this paper). The effect of the paratactic (denotative) property of a heading is coordination and that of the hypotactic (connotative) property, subordination. In terms of Western reading conventions, hypotaxis operates 'upwards', or to the outside of the document, to secure an effect downwards, while parataxis operates 'downwards', or to the inside of the document, to secure an effect upwards (Figure 1).

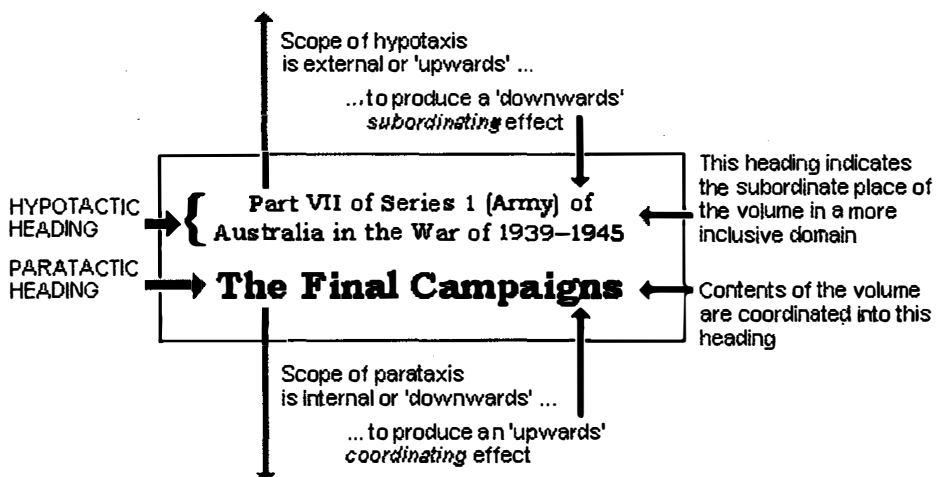


Figure 1 Diagrammatic representation of hypotactic and paratactic scope

TEXT means the physical words, sentences, paragraphs and headings which constitute a document.

TEXT THAT LOOKS NORMAL means text that is structured according to standard typographical and editorial conventions, the application of which conforms, in a publishing context, to 'world's best practice'. In Australia, such conventions are described in the AGPS's *Style manual for authors, editors and printers* (1994), in its quarterly periodical *Styewise* and on the 'AusInfo' Internet site <http://www.ausinfo.gov.au>. For the purposes of this study, the important aspects

of normal text are that a single type style is used throughout a document, that the document contains body text of a certain size and that one or more levels of headings in larger, bolded sizes are employed. In regard to headings in normal text, three assumptions made by readers are recognised:

- That there is a hierarchy of headings and that the larger the physical size of the heading, the more inclusive the referring scope of that heading is.
- That bolding of text is used only for headings—that is, if text is bolded then that text is a heading.
- That headings at a particular level are taken to apply to or include, or have scope or effect over, all of the following text and any headings of lower level, until the next heading of the same level or higher level is encountered.

## **Outline of the study**

The study is in four main parts:

1. **Theoretical foundations and literature review.** Sources which have influenced the direction taken in this study and the framework of the study, are identified.
2. **Development of a suitable document model.** A model is developed that identifies and describes the different levels of text meaning in expository documents.
3. **Development of heading rules based on the document model.** The document model is used as a basis for deriving rules for writing headings at three levels in the text. Additional rules are also developed to maintain the effect of the headings in text displayed on a computer screen.

4. **Testing the aboutness effect of headings.** Procedures containing headings are tested in the workplace to ascertain if they improve comprehension efficiency. An improvement in comprehension efficiency is assumed to be evidence of an improvement in the 'aboutness' effect of headings.

## CHAPTER 2: LITERATURE REVIEW PART 1: THEORETICAL FOUNDATIONS

Marco Polo describes a bridge stone by stone.

'But which is the stone that supports the bridge?' Kublai Khan asks.

'The bridge is not supported by one stone or another,' Marco answers, 'but by the line of the arch that they form.'

Kublai Khan remains silent, reflecting. Then he adds: 'Why do you speak to me of stones? It is only the arch that matters to me.'

Polo answers: 'Without the stones there is no arch.'

(Calvino, 1974, p. 82).

### Historical background

There has been a steady increase in the amount and frequency at which new material has been published over the last 300 years. To promote the processing of this material on an organised basis, the Fédération Internationale de Documentation was formed in France in 1895 and the American Documentation Institute was incorporated in March 1937 (Shera & Cleveland, 1977, pp. 251, 253). During and immediately after the Second World War, Western countries experienced an 'explosion' of scientific and industrial documentation. Evolving work philosophies and new commercial imperatives required more efficient access to this very large store of information. This gave impetus in the post-War decade to the practice of 'documentation', which focused on the retrieval of documents through empirical quantitative methods such as term matching, word frequency counts and pre-determined indexing terms. Fairthorne's (1967) 'morphology of "information flow"' and the two Cranfield projects of Cleverdon (1967), running from the late 1950s to the mid 1960s, are examples of this approach, in which the retriever's or reader's cognitive position was assigned a relatively minor role.

'In the mid-sixties, after years of study and development of indexing and classification systems, the realization dawned that the inquirer's bias or point of view was preventing the attainment of the ideal [information retrieval system]' (Neill, 1992, p.14). By the mid 1970s, the poor efficiency of information retrieval systems (at approximately 50%, according to Farradane, 1976, p. 92) allowed two conclusions to be drawn: firstly, that in order for further improvements to be achieved, human cognitive requirements had to take a more prominent position in the design of systems; and secondly, that in expanding the scope of information retrieval to encompass the reader, a more rigorous theoretical foundation was required. The 'anomalous states of knowledge' or ASK, project of Belkin et al in the late 1970s and early 1980s, in which the reader's position was used as the starting point for a system which employed many of the old quantitative methods, provides an example of how systems were evolving during this transition period (Belkin & Oddy, 1979; Belkin, Oddy & Brooks, 1982a, 1982b; see also Belkin, 1980).

In 1977 (Wagner, 1995, p. 52), the notion of the 'cognitive viewpoint' was introduced to information processing and retrieval. De Mey is often credited with this development though many others were already pointing in this direction. Farradane had noted, as early as the beginning of the previous decade, that 'the ideal index or classification structure will not have the elusive nature of thought in action' (1961, p. 128) and in 1969, Kochen (cited in Shera & Cleveland, 1977, p. 263) suggested that 'epistemo-dynamics' be the basis of information science. In a review of information science as a discipline at the beginning of the 1970s, Harmon (1971, p. 240) predicted closer links between information science and the communication and behavioural sciences. Shortly afterwards, Foskett was arguing that 'more attention must be paid to the question of how people use new information, how they assimilate it into their existing conceptual schemes and

how these schemes may be modified in the light of the new knowledge' (1973, p. 172) and that

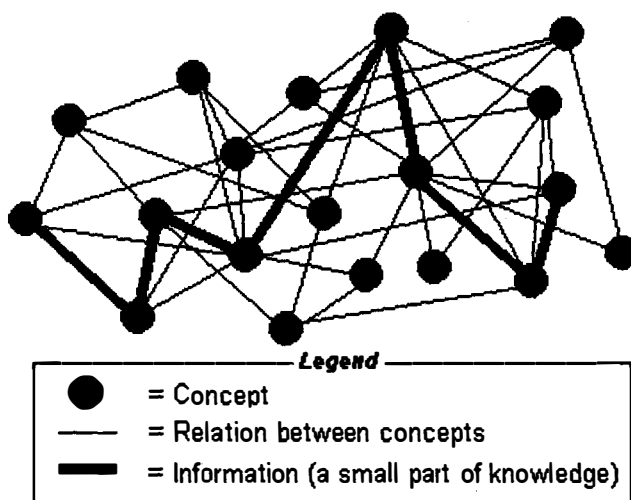
unless what we provide as information has meaning for the recipient, he will regard it as a nuisance, not a blessing; and it acquires meaning from two aspects. One is its relation to the paradigm of which it is a part, that is, its subject connotation. The other is its relation to the user's own context of thought (Foskett, 1973, p. 172).

Belkin (1975) and Brookes (1975) were also advocating a cognitive perspective. Foundation work for the cognitive view was being done as early as 1943 (De Mey, 1982, p. 4) but it was not until the mid-1970s that formal proposals based on this perspective began to be published in the information science literature (Belkin, 1990, p.11).

The essence of the cognitive viewpoint is that 'information processing ... is mediated by a system of categories or concepts which for the information processor constitutes a representation or a model of his world' (De Mey, 1982, p. 4): In short, this means that information is processed in terms of what is already known, a fact that holds true for computerised information processing as well as human processing (Ingwersen, 1992a, p. 122). This provided the wider perspective missing from the 'documentation' approach and, in doing so, signalled the end of that model as the dominant paradigm. Allen's review (1991) illustrates how important cognitive research has since become in contemporary information science, particularly with regard to computerised systems. Ingwersen (1982, 1984, 1992b) has been a prominent proponent of the cognitive view and has developed a 'mediator model' (1992b) for use by information retrieval intermediaries.

Brookes, also adopting the wider cognitive view, was a major influence in articulating a more rigorous theoretical foundation for the now recognised discipline of 'information science'. Brookes found Popper's 'World 3' notion of 'epistemology without a knowing subject (Popper, 1972, pp. 115–119) as a

logical starting point, arguing that knowledge—and therefore, information—could be objective and that it could be stored and manipulated. Under Popper (1972), the human domain consists of three conceptual 'worlds': World 1 is the physical 'world', World 2 is the mental 'world' and World 3 is that occupied by knowledge inherent in artefacts, whether made by humans (for example, a book) or not (for example, a beehive). Brookes' conception differed from the documentationalists' view which generally held that knowledge was subjective or, in Popperian terms, part of World 2. Brookes (initially, 1975, p. 48; and later, 1980, p. 131, with refinements) developed what he called the 'fundamental equation':  $K(S) + \Delta I = K(S + \Delta S)$ . The equation means that a knowledge structure  $K(S)$  is changed to the new structure  $K(S + \Delta S)$  by the addition of information  $\Delta I$ . This was a significant advance on prevailing ideas of what 'information' was. For example, a view published the previous year was that information was a physical surrogate of knowledge (Farradane, 1979, p. 17). Brookes defined knowledge as 'a structure of concepts linked by their relations' and considered information to be 'a (small) part of such a structure' (1980, p. 131). This definition was not too dissimilar to one proposed five years earlier by Belkin (1975, p. 53). Though Brookes did not provide a diagram of his knowledge structure, a depiction of his model may be easily constructed using his definition (Figure 2).



**Figure 2** Diagrammatic representation of knowledge and information  
 (after Brookes, 1980, p. 131)



In a later paper, Brookes emphasised the importance of the contextual relationships between fragments of information and the cognitive structure which encompassed them (1981, p. 9). In Figure 2, this is illustrated by the understanding that the darker 'information' line has meaning only by virtue of the meaning of the surrounding knowledge structure; thus, in order to understand information, one must also have the appropriate context to which to relate it. This view of information and its essential relationship with contextualising knowledge went beyond the relational indexing ideas of Yates-Mercer (1976) and Farradane (1980), which sought to accommodate the myriad connections between concepts by fitting them to a pre-determined indexing matrix (Brookes, 1981, p. 10).

The process-oriented views of Dervine (1983, cited in Neill, 1992, p. 6) provide a contrast to Brookes' objective information approach. While agreeing that information can exist independently of the human mind that created it, that is, objectively in World 3, Dervine's focus is on the subjectivity necessarily employed by human senders and receivers to make sense of a message. Dervine's proposals are interpreted here as being more an apparent contrary approach, rather than an actual contradictory one, to Brooke's, with each emphasising different parts of the same communication continuum. Dervine takes a more applied perspective than Brookes but her argument is ultimately consistent with the wider knowledge/information framework illustrated in Figure 2.

The 1975 version of Brookes' fundamental equation was included in a review of the foundations of information science by Zunde and Gehl (1979). At that time, the equation had the form:  $\Delta I = (S + \Delta S) - (S)$ , 'where (S) is a "knowledge structure" and (S + ΔS) is the modified knowledge structure caused by absorption of the increment of information I' (Brookes, 1975, p. 48). Zunde and Gehl's general conclusion of the material they had reviewed, which included Brookes, was that 'no sufficiently general principles have been discovered' (1979, p. 80).

Ingwesen (1992a, p. 122) interprets this finding as a complete rejection of Brookes' equation. Nevertheless, while there has on occasion been modification made to Brooke's scheme for experimental purposes, for example, Belkin (1975, p. 53) and Ingwesen's 'consolidated information concept' incorporating Belkin's ASK perspective with Brookes' equation (1992a, pp. 121–126; see also 1984, pp.467–471), it is essentially the theoretical knowledge/information model illustrated in Figure 2 which underlies the bulk of work done in information science over the past two decades. This study remains consistent with these approaches and to this end, emphasis is placed on ensuring that both the internal and external context of the information in procedural documents is clearly articulated.

## **Major considerations of the study**

**The cognitive viewpoint and the 'given-new' comprehension process:** It is assumed in this study that the 'cognitive view' is how a reader comprehends a written message. By this is meant that a 'context' or contextualising infrastructure is formed mentally by the reader based on prior knowledge and beliefs to interpret or mediate the message in a text and that this infrastructure is separate from the message itself. An important development of the cognitive view is the 'given-new' comprehension strategy (see for example, Kieras, 1978; Jonassen, 1982a; Charolles & Ehrlich, 1991) which provides a plausible explanation of how a reader formulates a 'contextualising infrastructure'. Uptake of new information occurs by the reader first establishing the 'given'—what he or she already knows and which is believed to be relevant to the topic—then linking any new information in the text, the 'new', to this already understood base. To establish the 'given', a reader first seeks to use information from the text but if this is not available or is deficient, then personal world knowledge is used to formulate, in whole or part, the 'given' foundation (Charolles & Ehrlich, 1991, p. 270). MacKay

calls the mental domain in which a reader formulates the 'given' the 'adaptive-response-space' (1969, pp. 67ff, 77), which highlights the reader's action in 'responding' to the text by 'adapting' information in the text to his or her own understanding.

The 'given' is seen here to be composed of a mix of extra-document 'technical' aspects of the topic under discussion and intra-document pedagogic and presentation aspects. Thorndyke identifies these two dimensions as 'content' and 'structure' respectively (1977, p. 97) and the same terminology is adopted in this study. In brief, under this terminology, 'content' is the meaning of the text and 'structure' is how the text is arranged. A variation in structure can affect how the content is interpreted even though the text itself has not been changed. Thorndyke's distinction is consistent with the "text as diagram" views of Waller (1982, pp. 137ff), the 'text as graphics' idea of Horn (1985, pp. 341–367) and Paivo's (1986) text dual-coding theory. The extent to which topic content is included in a text as 'given' matter is something for the author to determine, based on the topic expertise of the intended audience. Determining what structural elements to include can be approached in a less subjective fashion. Particular aspects of structure are always essential for the author's intended meaning to be recognised; for example, the hierarchical relationships and different levels of importance of particular points that the author has made need to be clearly understood by the reader.

It is proposed that if appropriate structural information can be provided by the author along with the content, the need for the reader to resort to personal world knowledge to construct his or her 'given' position can be minimised. This approach complements the 'buried redundancy' and 'enabling' perspectives discussed later, whereby the intention of the author is to reduce the mental work a reader must perform to understand a tract of text. The advantage of this is that

the author, by providing clear explanation of what his or her position is and by reducing input of the reader's personal world knowledge, can retain a higher degree of control over what the reader's final 'given' position is. As Ramey has put it in her review of computer documentation research, 'without such an explanation, users [readers] can find themselves blocked by their own preconceptions from even realizing that a different interpretation of the facts is possible, let alone required' (Ramey, 1988, p. 147). This is the essential understanding of this study.

**Aboutness:** While no research dealing with the aboutness of procedures could be located, works on various aspects of aboutness have been useful in suggesting directions to be taken. Hutchins (1978) identified the appropriateness of using an 'aboutness' approach for indexing in situations where it was not possible to closely identify the type of reader being served. Hutchins' use of 'theme' as the basis for a means to access 'aboutness' is similarly employed in this study. The difference in emphasis between this study which is concerned principally with thematic structure and other approaches (for example, Meyer, 1975 and Levin, 1978), which concentrate on rhetorical relationships, stems mainly from this source.

Beghtol's (1986, pp. 84–85) clarification of the types of 'aboutness', already mentioned in Chapter 1, has been helpful in confirming exactly what sort of aboutness is to be made clear to the reader. Bruza and Huibers' (1995) idea that aboutness is 'nonmonotonic' with respect to content has been useful in highlighting the need for precision in the prescriptive method developed in this study. 'Nonmonotonic', in regard to aboutness, means that if information is added to or subtracted from a text, the aboutness of the changed text will not be the same as the aboutness of the original text. This would seem to be predicted by Brookes' fundamental equation and can be readily appreciated by visualising

additions or subtractions to the dark 'information' line in Figure 2. The importance of Bruza and Huibers' view is that it triggers a timely reminder that human variability is present in authors as well as readers, which is the same argument put by Dervine (1983, cited in Neill, 1992, p. 6). If the same text was produced by two or more authors, which is possible in theory, it should (after Beghtol, 1986) have the same aboutness. However, the apparent aboutness would differ if these several authors identify different aboutness indicators. Thus, the prescriptive directions developed in this study must be such that two or more authors working independently would identify the same aboutness indicators if they produced the same text. Although this is unlikely to happen in practice, it is nevertheless a useful limiting perspective to adopt in the design of the prescriptive rules.

Kintsch and Van Dijk (1978) have offered an explanation of how a reader mentally condenses a text, using what are called 'macrorules', so as to remember its 'gist'. Le Ny makes an important observation when he notes that such condensations are not so much summaries of the text but summaries of what the text is believed to be about (1991, p. 205). Todd has reached a similar conclusion in his paper on the aboutness of subject headings, finding that

we [as readers or indexers] determine the subject by some nebulous process of reduction, semantic condensation or summarisation. Summarisation is seen as a process of identifying and selecting subjects which are significant indicators of the contents and which together sum up the message ...' (1993, p. 260).

In this study, where efficiency of comprehension is the goal and where it is the intention to influence the reader's 'given' understanding, the approach taken is not to leave the task of 'identifying and selecting' the 'significant indicators of the contents' to the reader. Allen has noted the universally accepted understanding that mental activity is hard work (1991, p. 14). The idea is to exploit this characteristic by making it preferable, that is, mentally easier, for the reader to use material supplied by the author, rather than to resort to personal mental

effort. This saves the reader time as well as leading the reader to the desired 'given' understanding.

**The effect of headings and other cues on the efficiency of comprehension:**

The use of headings to summarise text is not new. There is wide-ranging research on the use of headings to promote efficient comprehension. Some aspects of the method developed here have been examined in a number of studies dealing with narrative discourse though these largely have been concerned with mid- to long-term comprehension. Walker and Meyer's (1980) research into the integration of different types of information in text found that information high in the structure, for example, superordinate headings, is more likely to be integrated than information low in the structure. Thorndyke's (1977) research into readers' comprehension of simple narrative stories showed that structure alone could affect a reader's comprehension by the information it implied. The design of the method developed in this study seeks to have the structure, which is made evident through headings, carry information in its own right, in addition to the information in the text proper.

Schwarz & Flammer have found that 'titles not only serve as text labels or attractors for readers, but are effective facilitators of encoding ... the text' (1981, p.65). In a usability study of technical manuals, Rubens and Rubens reported that test participants found headings and sub-headings to be 'very important' in enabling efficient retrieval from memory (1988, p.231). Kieras' work with narrative stories on 'initial topicalization', an idea which has the same conceptual basis as summarising headings, found a significant improvement in reading times and comprehension (1978,). Schallert (1976) concluded from her work with biasing titles that comprehension could be predictably influenced using titles. Wieringa et al use an example from Anderson (1977) to demonstrate how headings affect comprehension of following text (1993, pp. 107-108).

The research most relevant to this study is that of Kozminsky (1977) who, like Schallert, researched the effect of titles on a reader's comprehension of narrative stories. Kozminsky found that comprehension was promoted by titles that influenced or predisposed the reader's comprehension of the text. He proposed three rules for identifying theme-relevant propositions based on the semantic organisation of propositions (p. 485). These rules were designed to operate on narrative texts and are not useful for expository documents generally and for procedures in particular. This is because they apply to the entire text base, which includes implied propositions and as such cannot attain the degree of tactic closure required for literally true headings. Nevertheless, Kozminsky's research demonstrates the power that titles can and do exert over a reader's perception at the time of reading. It also demonstrates that, given appropriate expression, titles can be used to influence a reader's comprehension in a predictable way. Britton, Glynn, Meyer and Penland (1982), Jonassen (1982b) and Le Ny (1991) have also reported on various aspects of the efficiency of headings to indicate what text is 'about'.

Some problems with headings have been reported. Borko and Bernier, when reporting on titles in scientific literature, found that they are 'too frequently uninformative ... [titles] tend to be very general because of the necessity for brevity; [and] they often suggest possibilities far beyond what the author actually reports' (1975, p. 7). Waller has made a similar observation: 'Uninformative and misleading headings are common, and inconsistent or illogical patterns of headings frequently escape comment' (1982, p. 149). Poor performance is a consequence of the use of poorly-constructed headings.

Very little work has been carried out on what is required to formulate a heading. Waller found that, 'although ubiquitous, headings have never been properly incorporated into the mainstream of grammatical analysis and composition

teaching' (1982, p.149). No work has been reported in the literature on the requirements for the formal development of headings for commercial expository documents. Indeed, no research specifically dealing with the comprehension efficiency of commercial documents could be located. Little has changed since Guthrie (1982, p. 188) reported that the reading activities of adults in the workplace 'have not been heavily researched' and that 'further study of these types of texts and their demands on readers is needed'. In similar vein, Kintsch (1982, p. 93) found that 'almost all of the psychological work has been done on stories' and that 'what is needed ... is an explicit extension of current [narrative] comprehension models to educationally important text types, such as expository prose'.

Even in manuals on technical writing and reports of related research, there is limited assistance. The essence of the problem, as Schumacher and Waller found, is that

there exists already a large literature on text-related issues. It is notoriously hard, however, for professional producers of texts ... to access and interpret it. It is scattered among a wide range of disciplines and is not easy to find without the aid of proper research library facilities—and when research material is located successfully it rarely seems applicable to the problem in hand (1985, p. 377).

If the topic of heading construction is raised, it is treated in so trivial a manner as to be useless (see the example cited in Wieringa, Moore & Barnes, 1993, p. 107). A large part of the present study is directed to the development of formal rules to write headings, such rules being intended to produce headings which not only serve their normal navigational function in the surface structure of a document but also accurately and completely identify the aboutness of their referent text.



## **CHAPTER 3: LITERATURE REVIEW PART 2: DEVELOPING THE DOCUMENT MODEL**

The steps taken to develop the proposed method are:

1. **The development of an information model:** An information model appropriate for written procedural documents is derived from Brookes' knowledge/information model.
2. **The development of a document model:** A base document model is derived from the information model. Elements of discoursal and visual prominence are mapped to the base document model to form an extended document model.
3. **The development of prescriptive rules:** Prescriptive rules for authors are derived from the extended document model.

Development of the information and document models is discussed in this chapter. Development of the prescriptive rules is set out in the following chapter.

### **Developing the information model**

Brookes' model, as shown in Figure 2, has been shown to have some limitations when applied directly to documents. These limitations were exemplified by the difficulties experienced by Belkin (with Oddy, 1979; with Oddy & Brooks, 1982a; 1982b) when he sought to use a word or words to represent Brookes-like 'concepts' in text form (Belkin et al, 1982a, p. 68). In the conclusions of their project report, Belkin et al imply that the assumption that concepts could be represented by words was made largely for convenience (1982b, pp. 147, 148–

149) and that 'there are problems in our representations of need and information' (1982b, p. 161). The difficulties of using words to stand for concepts has been pointed out by Kent (1974, p. 304) and Wagner (1995, p. 64) though De Beaugrande suggests there is a case for retaining the practice:

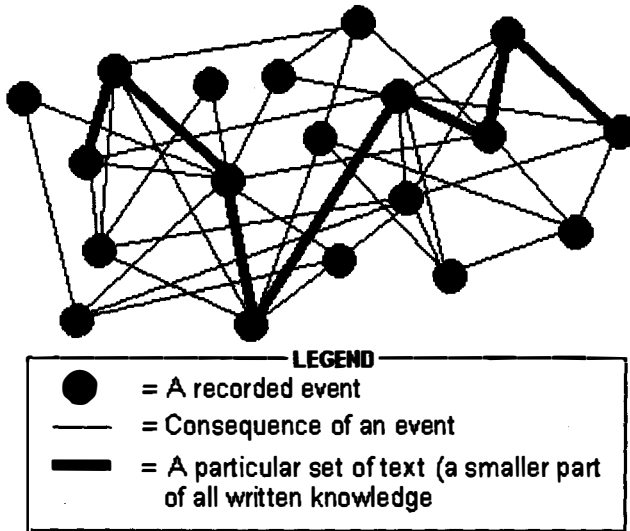
Some researchers would prefer to discard the words [which stand for concepts] altogether in favour of some other designation. But the words are, in some psychologically non-trivial way, the real-time occurrences that activate concepts, and they should not be thrown out—even if we could agree (and so far we can not) on a method for replacing them with 'primitives' or 'semantic features'. (1987, pp.18–19).

The intimation from De Beaugrande is that words are all with which we have to work. Nevertheless, there is an inherent problem in deciding which word or words to use and the person who makes this choice 'is, or must pose as, a judge (for all time to come) of the value of what is presented (Kent, 1974, p.304). Brookes' model is not used in its original form in this study principally because of this concern.

Brookes' model is inappropriate because it is a description that encompasses all forms of knowledge tied up in all types of human and non-human artefacts. To ensure this universal scope, Brookes intentionally used the terms 'concept' and 'relation' with coarse resolution. Brookes himself noted the 'very general way' his 'fundamental equation' stated the relationship between knowledge and information (1980b, p. 131). In this study, only a sub-set of Brookes' all-encompassing universe, the written form of knowledge, is required. This is not to suggest a return to the documentationalists' view of the document; rather, what is needed is another conceptual model that employs a finer granularity of term meaning to more accurately pertain to this lesser domain but which, at the same time, remains consistent with Brookes' universal depiction.

Such a model can be derived from the work of Calvino. An information model based on Calvino's 'multiplicity' ideas (1988; principally the 'Multiplicity' essay pp.

101–124, but also in 'Quickness', p. 48; in 'Exactitude', pp. 68–69; and in 'Visibility', p. 74; see also 1981 for an applied demonstration of multiplicity levels) and which is applicable only to written information, looks at first glance like Brookes', given that each is a network of nodes connected by relationship lines (Figure 3).



*Figure 3* Diagrammatic representation of written knowledge and information  
(after Calvino, 1988)

The main difference between the two models lies in their respective scopes and in the terminology used to describe the elements of the network. Under Calvino, a model of the written knowledge universe consists of 'event' nodes giving rise to 'consequence' lines. Where two or more consequence lines intersect, a new event occurs which in turn gives rise to new consequences. As with Brookes' concepts, there are an infinite number of events in the world and an infinite number of consequences can arise from an event. Events and consequences, as with concepts and relations, exist in an infinite number of dimensions.

Calvino wrote extensively on the multiplicity of semantic connections in a text from within philosophy of literature and though his 'Multiplicity' essay (1988, pp. 101–124) is set out in somewhat abstract terms, he provides prescriptive directions to authors at a level not normally seen in the information science

literature. The model derived from his work however, is consistent with the views of many from within information science who have struggled with the same problems of representing the multiplicity of connections, or 'consequences', in text form. Several of these are reviewed by Vickery (1986) in his survey of knowledge representation. The 'association maps', 'association clusters' and 'problem statement networks' of Belkin, Oddy & Brooks (1982b, pp.149, 150, 156), Vickery's 'semantic nets' (1986, p. 156) and de Beaugrande's 'conceptual dependency networks' (1987, pp. 18, 19, 20) which, as diagrams, mimic the form of the Calvino model, illustrate the complexity of dealing with even a limited text domain. Sparck Jones, in her discussion of text retrieval systems, observes that 'each component of a retrieval system has multiple aspects and relations, implying the existence of connections that are difficult to identify and control ...' (1987, p. 420).

Nelson echoes Calvino's 'multiplicity' (1988) argument when he observes that everything is 'deeply intertwined' and that 'there are no "subjects" at all, there is only all knowledge, since the cross-connections among the myriad topics of the world simply cannot be divided up neatly' (1987, p. 31). Hutchins (1977) and Kintsch (1991) have recognised the practical difficulty of dealing with the multiplicity of connections in knowledge models and have reported on the difficulties of representing the complex knowledge/information network in text form. Compounding this task, Flammer and Luthi have found that 'the mental representation of what is read ... is not isomorphous to the text organization' (1991, p. 57). This means that a reader may re-order the text according to some unpredictable personal perspective, rather than accept the text organisation. This indicates the difficulty of arranging the connections in a text so as to enforce the author's intensional aboutness as the preferred view of the document. But this is no more than that predicted by Calvino:

Someone might object that the more the work tends toward multiplication of possibilities, the further it departs from that unicum which is the *self* of the writer, his inner sincerity and the discovery of his own truth. But I would answer: Who are we, who is each one of us, if not a combinatoria of experiences, information, books we have read, things imagined? Each life is an encyclopedia, a library, an inventory of objects, a series of styles, and everything can be constantly shuffled and reordered in every way conceivable (1988, p. 124).

Calvino's model is intended to include all written forms of knowledge if not all recorded knowledge and the darker track through it represents a particular set of text. This set of text, depending on the scale applied, can be composed of anything from a sentence fragment to all written works in a particular discipline and represents a body of particular information. In regard to this study, the darker track can also represent a procedural document. As with the Brookes model at Figure 2, the meaning of the darker track is established by the meaning of its surrounding context.

## **Developing the base document model**

A document model is required to establish the metrics by which aboutness is to be articulated. However, as Boyce and Kraft (1985, p. 160) have found, there is no general theory of document representation available from within information science. Typically, different models based on linguistic, syntactical or other attributes are developed as dictated by research context. For aboutness, a document model based on thematic meaning of the document's contents expressed in structural terms is required. Calvino's information model (Figure 3) goes part way towards such a representation though it remains a gross knowledge structure dominated by a multiplicity of connections. Further attention is required to reduce the model to a level applicable to the text of a particular document. Van Dijk and Kintsch have noted that 'knowledge must be organised in packets, that it cannot be represented simply as one huge interrelated network of nodes, but [that] there must be subsets of that network that can function as wholes' (1983, p. 47). Where such subsets are generated, there is a need to ensure they remain independently coherent but at the same time it is equally

important to maintain cohesion between subsets so that the whole tract remains coherent. This requires that the same packets underpin each subset but that the cleavage between any two subsets be in terms of whole packets.

In the Calvino model, an 'event' does not qualify as a 'packet' since when an author writes of an event, the author actually writes of certain dynamics of the world which constitute the event and between which cleavage could potentially occur. What is ultimately written about is the 'state' of something in the world. 'State' can be used to define an event, which is the actual or potential change of state of something. In turn, a consequence, or cause, can be defined in terms of an event, being one or more events resulting in, or caused by, a particular state or states. These definitions, which enable the leap to be made from the conceptual to the applied, form the foundation rules (or, after Van Dijk and Kintsch, 1983, the base 'subsets') of the document model (Figure 4).

The form of display used in Figure 4 is an adaptation of the form utilised by Thorndyke in setting out his discourse grammar re-write rules, or 'story grammar', for simple narrative stories (1977, p. 79). In this, Thorndyke seeks to identify the theme-relevant structure, or thematic hierarchy, that underlies a story in isolation from the semantic content of the story. Thorndyke identified a number of researchers who had previously discussed this notion, going back to F. Bartlett in 1932, but noted not one of these investigators had specified the details of this underlying structure (1977, p. 77–78). Flammer & Luthi (1991, p. 48) have since used a 'grammar' approach in their investigations into the mental representation of text. Because it deals with narrative stories, Thorndyke's model is not directly transferable to the present study but his explanation is clear enough to enable his approach to be adapted to show the equivalent thematic structure in procedural documents.

The display in Figure 4 is read, or interpreted, from the bottom upwards. Each element, except the atomic unit of 'state', is constructed from one or more lower elements. Thorndyke's conventions for indicating repeatability and inclusion have been maintained. The element names are actually labels identifying the levels in the thematic hierarchy of a tract of text and after Thorndyke, are referred to as 'rules'. This 'rule' terminology is consistent with McKavanagh's usage (1994, p. 117).

<b>Rules</b>			
<i>Element of thematic hierarchy</i>	<i>Element is manifested by articulation of ...</i>		
Consequence (or cause):	Event* State*		
Event:	Change of state		
State:	[Agent]* [Authority] [Being/existence] [Entity]* [Identification]* [Location]* [Notion/aspection] [Quality]* [Resource]* [Scope/extent] [Time]*		

A term with an asterisk against it means one or more than one of that term. A term enclosed in square brackets is optional (after Thorndyke, 1977).

**Figure 4** Foundation rules for the document model, derived from the Calvino event/consequence model

The entities of state shown in Figure 4 do not constitute an exhaustive or exclusive list but are representative of the sorts of empirical states likely to be discussed in procedural documents. These have been derived in greater part from direct observation of procedures in the workplace and in lesser part from a synthesis of Lindsay and Norman's 'parts of an event' (1977, p. 397) and the semantic categories or 'facets' used in classification of science subjects as listed by Vickery (1986, p. 149). Although all the listed states are shown as optional, at least one state would be required.

The foundation rules in Figure 4 are used to build up six other rules so that a hierarchy of a total of nine rules is constructed. These rules constitute the base document model (Figure 5). In Figure 5, note that rule #3, which is entitled 'Theme', is at the same time one of nine elements in the thematic hierarchy of a document.

Rule #	Rules			
	Element of thematic hierarchy	Element is manifested by articulation of ...		
1	Expository text: (the 'document')	Context + Theme		
2	Context:	Hypotactic (external) reference/ coordinates +State* (in the external world)		
3	Theme:	[Process]* + Goal (internal)		
4	Process:	Episode*		
5	Episode:	Goal (internal) + Event* + Consequence*/Cause*		
6	Goal:	Desired state* (that is, the final consequence or cause)		
7	Consequence (or cause):	Event* State*		
8	Event:	Change of state		
9	State:	[Agent]* [Authority] [Being/existence] [Entity]* [Identification]* [Location]* [Notion/aspection] [Quality]* [Resource]* [Scope/extent] [Time]*		

A term with an asterisk against it means one or more than one of that term. A term enclosed in square brackets is optional.

**Figure 5** *The base document model*

The rules in the document model were derived initially from a synthesis of Thorndyke's (1977, p. 79) rules, the basic story-telling rules of De Beaugrande and Colby (1979), the semantic rules developed after Rumelhart (see Rumelhart, 1975) by Johnson-Laird (1983, p. 363), the facet analysis discussion in Duncan (1989, pp. 158–161), the ways of organising thoughts into sequences, hierarchies



and networks suggested by Kulikauskas and Maskeliunas (1999) and Meyer's idea of 'macropropositions' (1985, p.11ff). In lesser part, the document model also owes recognition to the 'system maps' idea of Bradford (1988, p. 196), Le Ny's (1991) work on semantic representations and text comprehension, Walker & Meyer's (1980) and Meyer & Freedle's (1984) work on discourse organisation, Kintsch & van Dijk (1978) on 'referential coherence' ('a coherent text base is a connected graph', p. 369), comments on 'inferential load' by Charolles and Ehrlich (1991) and Pike's (1967) and McKeown's (1985) views on focus. Campbell's (1995) book on coherence, continuity and cohesion of documents at the design stage has emphasised the importance of closure. Other related research consulted includes that of Schallert (1976), Kieras (1978, 1981), Cirilo & Foss (1980), Grasser, Hoffman and Clark (1980) and Scott (1993).

The problem with the bulk of these sources is that they deal with either, or both, narrative stories and semantic relationships at the sentence level. They cannot be transferred directly to the 'theme-structure' of procedural documents though they have been helpful, by analogy, in establishing the element levels and progression steps of the structure. These original inputs have been substantially modified—indeed, mostly replaced, given the absence of previous research with procedural documents—by the series of hierarchical elements shown which have been derived from first-hand experience of the utilisation of these types of documents in the workplace. Despite the other sources mentioned, Thorndyke remains the dominant influence in this step, since replication of his overall objective of representing the thematic structure of a text in isolation from the meaning of that text was considered essential. The names and essential meanings of some of Thorndyke's terms have been retained in the present structure but others, for example, 'sub-goal' have been dropped.

Though the document model in Figure 5 is set out in the manner of a 'story grammar', its purpose differs from the use to which story grammars are traditionally put. The principal role of the rules in Figure 5 is to aid text generation, not to aid comprehension analysis, even though they may be used by an author in an analytical sense during the iterative process of editing newly-written text. Use of story grammars for text generation is not unknown in the literature. Klein (1973, 1975, cited by Yazdani, 1989, pp. 127–129) has used such an approach in developing programs for computer-generated stories.

It is recognised that the document model in Figure 5 does not cover all types of expository discourse or that it may be ill-fitting in some circumstances, for example, in a report that contained complex conditional recommendations. To some extent, Thomdyke's assumption about his own 'grammar rules for simple stories', that 'the parts are rarely explicitly partitioned and are usually identified inferentially by the reader' (1977, pp. 79–80), applies here. Thorndyke's stories however, were narrative texts and these differ significantly from expository documents. Expository documents are highly structured tracts within which the text is intentionally partitioned. While, in Figure 5, it is not difficult to perceive that the rules at various levels could be represented by particular passages of text, it is not implied that such a one-to-one relationship necessarily exists. Given the evidence from the literature, it is likely that it is not possible to adequately describe all types of expository documents with a single model. Nevertheless, it is contended that the arrangement of elements in Figure 5 fairly models the thematic hierarchy in the type of prescriptive, self-contained expository document examined.

## Mapping 'prominence' to the base document model

If a document has no visual dimensionality, all text elements appear to have an equal importance to the reader. In this regard, Pickering has observed that

if all parts of a discourse are equally prominent, total unintelligibility results. The result is like being presented with a piece of black paper and being told, 'This is a picture of black camels crossing black sands at midnight' (attributed to Longacre, cited by Pickering, 1980, p. 40).

A number of researchers have looked at this aspect of texts, specifically that some parts of a text are more important than others to the central focus or theme. There is an expectation on the part of the reader that within a tract of text, there will be a 'pedagogic emphasis on the main idea' (Pace, 1982, p.17) and that different levels of emphasis should be used to construct a hierarchy to signal or to point to this main idea (Meyer, 1985, 1987). The existence and content of these levels need to be made prominent so that they stand out from the rest of the text and in turn cause the main idea or ideas to stand out. Traditionally, it is in-text headings that are used to indicate or demonstrate 'prominence' and in keeping with the goal of producing normal text, such headings are retained for this purpose in this study. This is in contrast to what could be called 'chunk labels', as employed in Horn's (1985) Information Mapping® Writing Service standards, which are heading-like terms that are displayed outside of the body text in a separate column.

The discourse analysis framework of Pickering (1980) in particular, and of Longacre (1983) and Salkie (1995), along with MacLachlan & Reid's (1994) 'frames', have been helpful in clarifying the notion of prominence in a way that can be used to formulate heading rules. 'Prominence' has both qualitative and quantitative aspects, being, respectively, 'discoursal prominence' and 'visual prominence'. Discoursal prominence may be understood in terms of the three values ascribed to it by Pickering: theme, focus and emphasis (1980, pp. 40–41). The scope of 'theme' is defined as encompassing 'a whole discourse or a stretch

of text that is directed towards a single objective' (Pickering, 1980, p. 42) and this scope can be seen to describe the scope of rules 1, 2 and 3 in Figure 5. Similarly, the extent of 'focus' as defined by Pickering and the extent of rules 4 and 5 are in accordance. Pickering's idea of focus is that

the domain of focus will normally be the paragraph or a section. It differs from theme in that it only attaches to a particular participant, event, or place, etc., or perhaps to a whole clause or sentence, whereas thematic material will be deployed throughout the paragraph or section. I see focus as cooperating with or contributing to theme, but believe it is both valid and useful to distinguish between them (1980, p. 49).

In the same way, 'emphasis' can be mapped to rules 6, 7 and 8 in Figure 5, though a slight departure from Pickering's description is required. His view is that emphasis is used 'to refer to any localised highlighting' and that it '... will usually attach to a single word or phrase, by which I mean that will be the extent of its domain' (Pickering, 1980, p. 51). Pickering's idea that emphatic and thematic prominence may occur simultaneously in the same clause is located too low in the structural hierarchy for best effect in structured expository documents. Instead of emphasis operating at the word or phrase level, it is desirable to have it operating on the paragraph. But to have this, his definition of focus needs amendment, since text at the paragraph level is already covered there. Pickering allows focus to operate on a 'section', typically consisting of more than a paragraph, and this is taken as being the operating extent of focus rather than a single paragraph. An extended document model, which maps Pickering's three discursal prominence levels to the rules of the model, is illustrated in Figure 6. In Figure 6, Pickering's 'single word or phrase' survives as 'detail' and is not considered to be part of the higher discursal prominence hierarchy but rather, to be part of the background against which prominence is brought out.

Rule #	Rules		Prominence	
	Element of thematic hierarchy	Element is manifested by articulation of ...	Discoursal	
1	Expository text: (the 'document')	Context + Theme	Theme	
2	Context:	Hypotactic (external) reference/ coordinates +State* (in the external world)		
3	Theme:	[Process]* + Goal (internal)		
4	Process:	Episode*	Focus	
5	Episode:	Goal (internal) + Event* + Consequence*/Cause*		
6	Goal:	Desired state* (that is, the final consequence or cause)	Emphasis	
7	Consequence (or cause):	Event* State*		
8	Event:	Change of state		
9	State:	[Agent]* [Authority] [Being/existence] [Entity]* [Identification]* [Location]* [Notion/aspection] [Quality]* [Resource]* [Scope/extent] [Time]*	Detail	

A term with an asterisk against it means one or more than one of that term. A term enclosed in square brackets is optional.

**Figure 6** The base document model with Pickering's (1980) discoursal prominence values mapped to the rules

As noted, prominence also has a quantitative, visual aspect to it. In regard to the use of headings in a document, visual prominence is manifested as headings of different sizes, typestyles, font weights or positioning. The principal role of visual prominence is to indicate discoursal prominence at different levels; that is, simply, visually-noticeable headings mean importance, more visually-noticeable headings mean more importance (Brockmann, 1990, p. 217ff; Waller, 1982, pp. 137ff; Horn, 1985, pp. 341–367). Because there are three discoursal prominence levels, an equal number of visual prominence, or heading, levels are indicated. However, the need for three and only three levels of heading is indicated anyway, on the basis of graphical considerations and how these interact with a reader's

cognitive abilities and short term memory demands. The three levels of heading used in this study are termed 'main', 'side' and 'paragraph' headings.

Because the visual differences between heading levels is one of size and relative position, their specification has had to be quantified for implementation in this study. However, it is not intended that the approach adopted here be a specific recommendation of the thesis. Other approaches, necessitated by particular publication standards, house styles or other editorial consideration and which achieve the same ends would be acceptable. What are called 'main', 'side' and 'paragraph' headings in this study may well be identified differently in other implementations. The particular heading parameters used in the research documents are specified in Chapter 5. It is sufficient at this stage to indicate the three heading levels as visual objects without detailed specification (Figure 7).

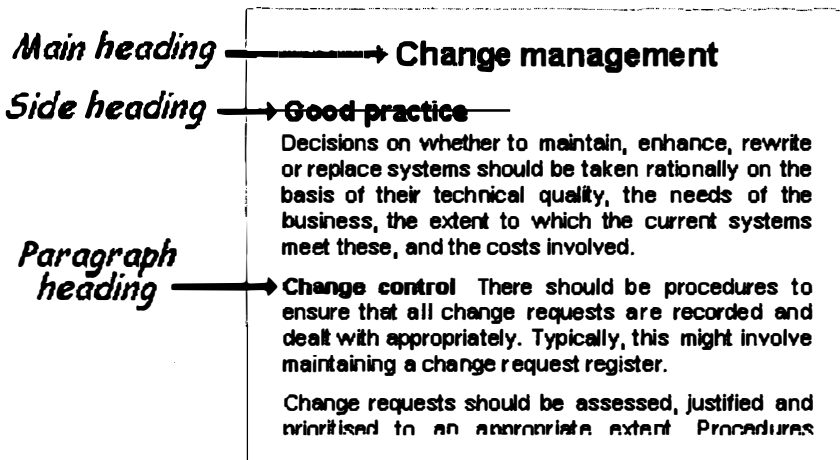


Figure 7 Examples of main, side and paragraph headings

The location and purpose of a main heading at the beginning of a document appears to be widely accepted and understood, at least in Western countries. As envisaged here, main headings must always be of a particular construction. This construction is dealt with in detail later. For the moment, discussion will focus on the other two heading types, side and paragraph. Only two levels of heading are used in the text to enable a minimal hierarchical structure to be implemented.

This reduces the risk of introducing visual 'noise' to its lowest possible level.

An important consequence of this is that the reader does not have to remember the particular hierarchical relationship of one heading style to another since it is visually evident through the property of 'affordance' (Gibson, 1977; Microsoft, 1997). Affordance is the indication of the potential of a visual object by one or more characteristics of the appearance of that visual object. For example, the 'buttons' on windows-based computer screens are not actually buttons but their appearance and their apparent depression, often accompanied by a simulated 'click' sound when selected with the mouse pointer, gives important feedback and confirmation to a user. Such objects 'afford' the sense of use of physical buttons. Similarly, the levels of headings in their respective consistent sizes and consistent relative positions provides constant confirmatory feedback to the reader—the size and position of a particular heading 'affords' or enables the sense of the prominence level at which that heading operates. Affordance becomes especially significant when documents are displayed using small viewing 'windows' which can fragment the text tract. This occurs when procedures are issued in physically-small pocket-books or on computer screens.

From the cognitive viewpoint too, it would seem having only two levels in the text is well accommodated within Miller's 'chunks of information' limit (Miller, 1956, cited by Felker, Redish & Peterson, 1985, p. 50), The 'chunks of information' proposition is that a reader cannot retain in short-term memory more than  $7 \pm 2$  'chunks' of information at any one time. Information exceeding this limit is either not remembered in the short term or additional mental activity must be invoked to commit the information to long-term memory. In similar vein, Brusaw, Alred and Oliu (cited in Wieringa et al, 1993, p. 110) report that 'in extremely technical material, as many as five levels [of headings] may be appropriate, but as a general rule it is rarely necessary (and usually confusing) to use more than three'.

Brockmann (1990, p. 210) notes that the United States Army advises its handbook writers not to use paragraph numbering beyond two levels. A two-level heading scheme accords with Wright's findings on what makes a text readily 'usable'. She found that, among other requirements, the information contained in the text had to be 'easy to find' for a text to be usable by a reader and that this required 'consistency, signposting and arrangement' (Wright, 1988, p. 636). All these properties are exhibited strongly by the two-level scheme. A two-level scheme is also consistent with Verplank's (1988) visual design concerns. Verplank has noted the problems faced by document designers are the same as those faced by artists and designers in all fields and that

[a] *consistent graphic vocabulary* is a familiar stylistic goal of visual designers and product designers; it is also a central human factors concern in communications and usability. Similarly, *visual order and user focus* are familiar compositional problems in design for communications of all sorts (1988, pp. 366-367, original emphasis).

Using just two levels of heading in the text is also advantageous for the author since a two-level structure is comparatively easy to apply as part of the writing task. This minimises the risk of introducing structure-based features requiring interpretation into the reading task. Examples where the author has used too many heading levels in order to make complex subject matter appear simpler show the dangers of departing from a simple presentation. Often, this makes the text more difficult to comprehend. Brockmann (1990, p. 210) gives an example of an almost incomprehensible paragraph heading from an Australian Department of Defence manual that uses seven levels. Wieringa et al (1993) have noted that 'the problem is that readers cannot keep track of a detailed hierarchy of headings, so the headings wind up conveying some global, complex scheme that is evident only to the writer'. Rubens and Rubens (1988, p. 231) similarly caution against overburdening the reader's capacity to understand an over-complex prominence system.



The recommended two levels of heading in the text proper, plus the main heading level, are consistent with approaches taken by contemporary natural language interpreters, as described by McKeown (1985, pp.56-81). The role of 'global focus' is satisfied by the main heading. Similarly, the requirements of 'immediate focus' are covered by side and paragraph headings. The 'current focus' is represented by the paragraph heading of the paragraph currently being read plus the paratactic effect of the relevant side heading. The 'potential focus list' is represented by the combination of all other side and paragraph headings, while the 'focus stack' is represented by a list of those paragraph headings plus relevant side headings of those paragraphs already read. This compatibility is important in keeping within the working limitation that the method developed in this study should not adversely impact existing arrangements or processes that deal with text.

In Figure 8, the levels of visual prominence, as represented by the three heading levels, have been assigned to the three discursual prominence levels. The visual equivalent of discursual 'detail' comprises the body text, dot points, tables and so on that contain the bulk of the document's detailed informative content. Again, these are not considered to be formally part of the visual prominence hierarchy—indeed, it is by comparison with this larger and visually-uniform level of background that visual prominence and in turn discursual prominence is achieved.

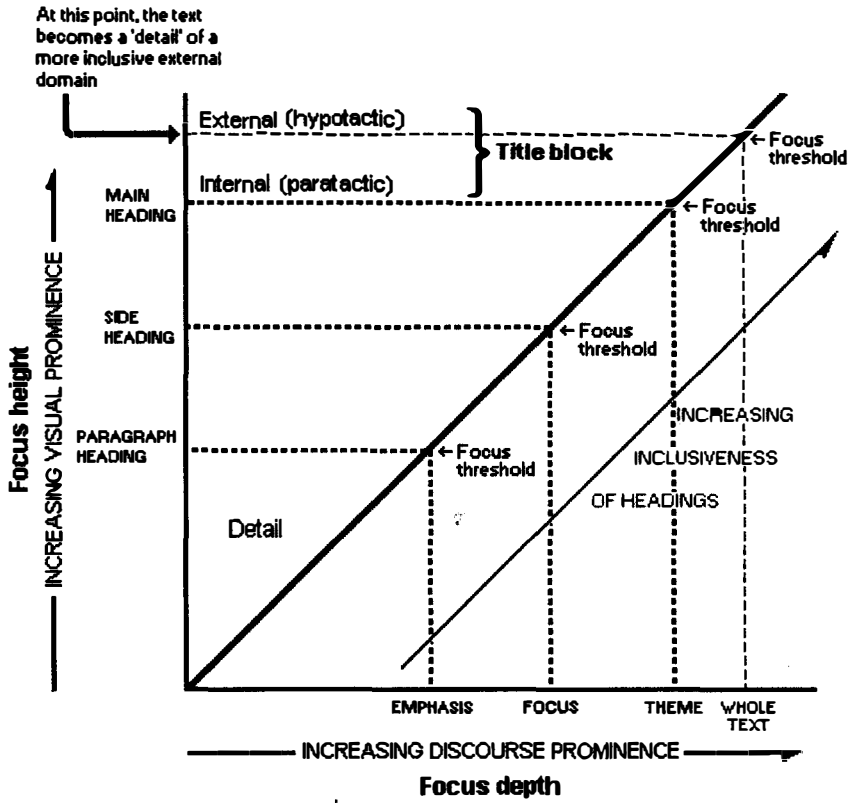
Figure 8 shows the complete extended document model.

Rule #	Rules		Prominence	
	Element of thematic hierarchy	Element is manifested by articulation of ...	Discoursal	Visual
1	Expository text: (the 'document')	Context + Theme	Theme	Main heading
2	Context:	Hypotactic (external) reference/ coordinates +State* (in the external world)		
3	Theme:	[Process]* + Goal (internal)		
4	Process:	Episode*	Focus	Side heading
5	Episode:	Goal (internal) + Event* + Consequence*/Cause*		
6	Goal:	Desired state* (that is, the final consequence or cause)		
7	Consequence (or cause):	Event* State*	Emphasis	Paragraph heading
8	Event:	Change of state		
9	State:	[Agent]* [Authority] [Being/existence] [Entity]* [Identification]* [Location]* [Notion/aspection] [Quality]* [Resource]* [Scope/extent] [Time]*	Detail	Body text, dot points, tables and so on.

A term with an asterisk against it means one or more than one of that term. A term enclosed in square brackets is optional.

**Figure 8** The extended document model, showing elements of discourse and visual prominence mapped to the rules

Development of the document model so far has concentrated on the author's 'bottom-up' viewpoint. As a check on how a document constructed according to the rules of the document model would present to a reader, the arrangement of prominence levels can be re-stated to depict the reader's 'top-down' perspective (Figure 9) (after Pike, 1967, pp. 109, 110). Different heading levels clearly indicate where focus 'thresholds' (Pike 1967, p. 111–112) exist. This saves the reader time in having to determine these.



**Figure 9** A reader's 'top-down' view of a document written according to the document model (after Pike, 1967, pp. 109–112)

## CHAPTER 4: DEVELOPING HEADING RULES BASED ON THE DOCUMENT MODEL

### Requirements for heading rules

In this study, the intention is to diminish the need to read the detailed text referred to by a heading since longer reading times accrue when microstructures of text have to be analysed by the reader (Graesser, Hoffman & Clark, 1980). What is intended is that, at least initially, the headings are read instead of the text, though the inclusion of headings actually provides more text, in total, to read. Even though the message imparted by the headings may be, strictly speaking, redundant and potentially time-wasting, they play an important role in lessening initial reading time. Bennett and Landauer (1981) have described how this works:

The value of a message ... appears to reside not in its information, ... nor in its obvious redundancy, ... but in what could be called its buried redundancy—parts predictable only with difficulty, things the receiver could in principal have figured out without being told, but only with a considerable cost in money, time or computation. In other words, the value of a message is the amount of ... work plausibly done by its originator, which its receiver is saved from having to repeat (cited in Pagels, 1988, p. 66).

This 'buried redundancy' is similar to the visually-oriented 'enabling' effect identified by Horton in his formulation of GRAPHIC = MESSAGE + ENABLERS + NOISE). Horton describes 'enablers' as being

essential to speedy, reliable delivery of the message. Enablers help the user interpret the message. ... imagine what would happen if they were omitted. If you leave out enablers, users can still get the same message, but it will take them longer and they will make more mistakes (Horton, 1994, p. 30).

The idea of 'buried redundancy' and 'enablers' is an underlying tenet of the whole approach taken in this study. The object is to shift as many of the tasks that a reader would need to carry out to understand what the document is about, from the reader to the author. To this end, attention is given to the reader's need to recognise contextual relationships as a prelude to deriving meaning from the text.

If these can be made explicit and reliable the reader's commitment to the task can be reduced.

A fundamental characteristic of a heading is that it must be literally true. Headings consist of terms that refer to some text. In keeping with Frege's 'function/object' ontology, the terms of the heading express the 'sense' of the text and designate its 'reference' (Frege, 1892, p. 123). The 'sense' is the 'thought' or 'objective content which is capable of being the common property of several thinkers' (Frege, 1892, p. 124). In other words, the ordinary meaning of the heading usually stands for the intensional aboutness of the referent text. The 'reference' of the text is its binary truth value, namely TRUE or FALSE (Frege, 1892, p. 125). A heading in a document has a dynamic attribute, even though the physical text which comprises the heading does not change after it has been created. A heading continuously discharges the function of mapping its referent text to a truth value and this truth value is, or should be, always TRUE. That a heading invokes this mapping process has been demonstrated by Schallert (1976) and Kozminsky (1977). Both researchers, reasoning backwards from the reader's expectation that a heading will be true, and thus knowing *a priori* the truth value to which a reader would map the heading, used different ('biased') headings to effect different understandings of a text. Assumption of this mapping process also underlies the example given by Wieringa et al. (1993, pp. 107–108).

An author's use of a heading is a valid exploitation of the reader's expectations but this must be exercised with responsibility. Unless there is an intention to mislead, it is to abuse the reader's reliance on the author to include headings which are not literally true. This point has a parallel in the rules of conversational implicature discussed by Richards and Schmidt (1983, p. 119–124). Though their interest is with spoken language, their observations made in the light of Grice's 'maxims of cooperative behaviour', (Grice, 1975, cited at 1993, p. 120), are

relevant here. In regard to the maxim of quality, they observe that 'we normally act on the assumption that our [conversational] partner is not being untruthful or is not deliberately trying to deceive us. If not, it would be extremely difficult to maintain conversation with our partners' (1983, p. 121). In regard to the maxim of quantity, they note that in conversation, there is 'the assumption that if a speaker has access to [relevant] information required by the hearer, he or she is expected to communicate that information to the hearer' (pp. 120–121) and that 'we normally give sufficient, but not more information than is required (p. 121). They posit 'that conversation is more than a series of exchanges; it consists of exchanges which are initiated and interpreted according to intuitively understood and socially acquired rules and norms of conversational cooperation ...' (p. 122). These observations of conversation, which are consistent with the wider topic of 'cooperation' (see, for example, Rapoport & Chammah, 1965), are equally applicable to procedures. However, the communication norms implicit in the use of procedures require a more rigorous level of necessity and sufficiency. This is because of the higher degree of criticality normally present in procedures and because a reader cannot ask for clarification from the author, as a listener can of a speaker. The text, unlike conversational speech, is uttered only once and has to be correct the first time. The point is that if authors, like speakers, transgress the implicit norms of the communication medium either by accident or design, the receivers of their message will be misled. Once readers realise they have been misled, their confidence in the text to meet their expectations will diminish. It is crucial that such a situation not occur with procedural documents.

For a heading to be true, two requirements need to be satisfied. Firstly, the meaning of the terms of the heading must be semantically correct; for example, a heading of the form 'How to calculate insect density' should not be used to refer to a tract of text discussing, say, engine maintenance. Secondly, a heading must be as inclusive or exclusive as the text to which it refers, otherwise the function of

mapping the referent text to an ostensible TRUE truth value will be misleading, or at least confusing. A common example of uncertain truth value occurs with the use of a heading which has, or may be construed as having, universal scope to refer to particular cases, as in the use of the heading 'Methods of testing ...' to refer to a tract of text discussing only a few methods of testing but omitting others. Such a heading is either not literally true, or has the potential to mislead. In this example, following Grice's 'maxim of quantity' (1975, cited in Richards & Schmidt, 1983, p. 120), if only six methods of testing were discussed, the heading 'Six methods of testing ...' would more accurately reflect the exclusiveness of the referent text and would more closely approach the ideal of literal truth.

Two further aspects bear upon compilation of literally true headings. The first is the 'certainty of belief', as discussed by Popper and Waller and the second is the notion of taxis. In regard to certainty of belief, Popper's thesis (1972, pp. 78ff) provides a useful foundation for deriving a more general idea of the notion of 'certainty', as it applies particularly to the reader but also the author. Popper notes that 'the "certainty" of belief is not so much a matter of its intensity, but of the *situation* of our expectation of its possible consequences. Everything depends on the importance attached to the truth or falsity of the belief' (1972, p. 78). This observation of Popper, though made in a different context, has general relevance to one of the central tasks of the study, that of purposely engendering a sense of reader confidence in the 'situation' of the text in the headings to provide a reliable guide to the content and meaning of the detailed text. If a reader can perceive that headings mean no more and no less than what they say, then that reader's expectation of the consequences of headings in the document will be satisfied.

Waller too, has raised the issue of a reader's belief in the text to provide desired information. Waller's idea is that typography can be used as macro-punctuation

at the document level. He notes that macro-punctuation is an interpolation which may be 'helpful in describing areas of doubt in terms of compatible areas of certainty' (Waller, 1982, p 152). This means that a reader may view a particular tract of text on first sight as an area of doubt. If a heading is added to the tract, its presence initially contributes to a reduction of the original doubt, but only until the heading is interpreted. If such a heading is found to be genuinely useful by the reader, a further reduction or even complete negation of the original doubt may occur. The reader will be 'certain' in his or her belief that the headings will not mislead and the confidence which follows from this belief enhances the continued use of headings as a guide to the meaning of the whole document.

An issue closely related to a reader's confidence in the text is that of the reader's initial expectations of the document. In her discussion of a planning process for online systems, Bradford lists 11 expectations that readers have of technical books (1988, p. 185). Among other things, readers expect a tract of text to have a specific layout, surface structure and heading hierarchy. 'Difficulties arise when these expectations are violated' (Hartley, 1981, p. 23). However, if these expectations are satisfied, rapid comprehension is possible and 'comprehension becomes only a matter of "filling in the slots"' (Kieras, 1978, p 14). The problem for the author is in trying to identify 'expectations' in a standard way from user to user. Usability definitions, which seek to describe a text in terms of what a reader believes makes the text usable, are too vague to be used for this purpose (Booth, 1989, p.128). The best approach would seem to be to produce text that has a stereotypical layout, since readers' expectations of these are less diverse. An example of a 'stereotypical layout' is a newspaper article. For the type of documents examined in this study, stereotypical layout is obtained through the use of 'normal' text presentation and, for many corporate documents, this could be enhanced by use of a standardised house format. Kieras (1978) has noted that one of the difficulties with expository documents is that their content is often



not stereotypical and textual surface structure has to be relied upon to specify how text is to be integrated. In such cases, where the reader is initially unaware of how the document content is presented, the 'normal' textual surface structure acts as a substitute for prior knowledge of the presentation stereotype.

The second aspect which bears upon the compilation of headings is taxis. In developing literally true headings, taxis, particularly parataxis, is the prime consideration. The reason for this is bound up with another desirable characteristic of headings in prescriptive expository tracts and this is that they be 'thematic', rather than 'perspective', headings. To achieve closure, a heading must ideally be both paratactically and thematically accurate. The use of thematic headings has been found to have significant time-saving consequences at all heading levels (Schwarz & Flammer, 1981, p. 65). A thematic heading is one that is derived from the words, phrases and direct meaning of the set of propositions to which that the heading refers, while a perspective heading is one that refers to a set of propositions but which is derived from interpretation of those propositions. In other words, a thematic heading is 'of' the set of propositions while a perspective heading is 'about' them.

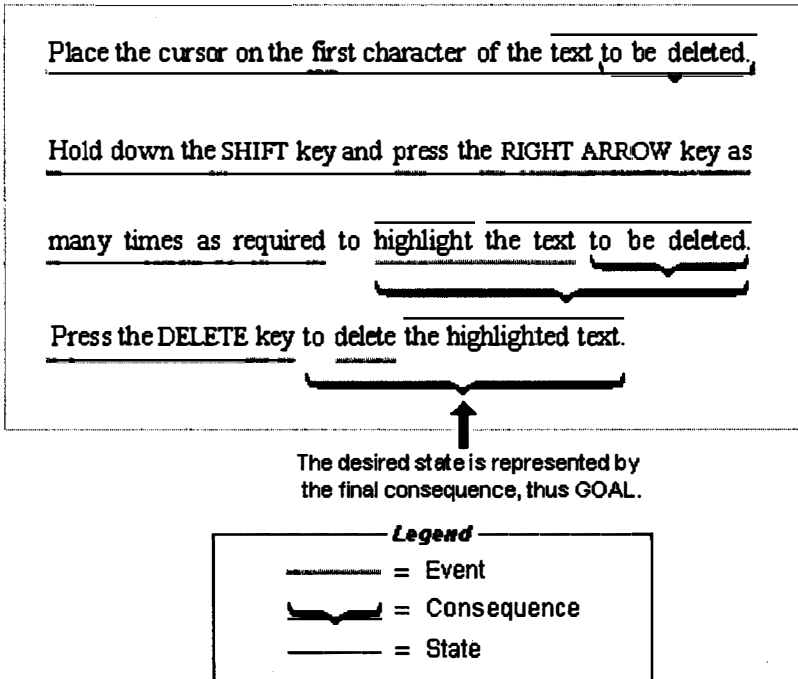
A useful perception employed by Van der Weide, Huibers and van Bommel (1998) to obtain presentation and reading efficiencies in displaying long lists of document titles returned from a computer search may be noted here. This is that each heading must be 'sufficiently surprising'. For procedural documents, this means that a heading must be textually unique and have a denotative scope not provided or overlapped by another heading. Assuming information is not repeated in the body text, headings that are literally true and have thematic and tactic closure will satisfy this requirement both inside and outside the document. The absence of this 'surprising' quality is why content headers like 'Actions', 'Introduction' and 'General', which may appear in every procedure in a series of

procedures, make such inefficient headings for both the reader and retrieval systems.

Rules for compiling headings that satisfy all of the above requirements are now developed. These rules are developed in 'reverse'—first, rules for paragraph headings, then for side headings and then for main headings. The reason for this is to ensure that significant meaning identified in the lower level headings is drawn 'upwards' to be represented in the main heading so that the main heading truly represents the contents of the whole document.

## **Developing a paragraph heading**

The scope of a paragraph heading encompasses rules 6, 7 and 8. A paragraph heading is derived from the uppermost rule (rule 6) in this set in two steps. Because rule 6 defines a goal as a desired state, the first step is to locate in the paragraph the text that indicates that the desired state has been achieved. This is always the final consequence. This may not be the last consequence mentioned in the paragraph since collateral information is often placed last in the expository sequence. 'Collateral information' refers to exceptions to the rule, special cases, unusual circumstances and the like. The purpose of this step is ensure that the heading to be developed points to this consequence so that paratactic closure of the heading is obtained. Sample text illustrating the first step in developing a paragraph heading is shown in Figure 10. In Figure 10, the parsing of the passage into events, consequences and states has been rather overstated to illustrate the process. In many cases, the final consequence will be readily evident from simple visual inspection. Nevertheless, this step should be executed with care since it is upon the paragraph headings that the efficiency of the other heading levels ultimately depend.



**Figure 10** The first step in developing a paragraph heading: identifying the final consequence

The second step is to manipulate the words that indicate the final consequence into an acceptable heading. This is done in terms of the components of rule 6, using a method based on that developed by Schwarz & Flammer (1981). This is set out in Figure 11.

<i>Goal</i>	<i>Paragraph heading</i>
Desired state (FORMULA)	(Final consequence or cause)
Desired state (TEXT)	to delete the <del>highlighted</del> text.

**Figure 11** The second step in developing a paragraph heading: The words of the final consequence are manipulated to construct an acceptable paragraph heading

In Figure 11, in this case, the term 'highlighted' has been removed because it is not part of the desired state, the deletion of text is. As in this example, some license or specific knowledge of the external world may be needed to manipulate the actual words. With highly technical text, an author, or editor, may need to

seek assistance from experts to separate and to sequence the terms that identify a consequence from the terms that describe attributes of that consequence. The words 'to delete the text' (in Figure 11), are put into a form appropriate for the document style, becoming, say, 'Deleting text' or, because the paragraph covered a number of sequential steps, 'How to delete text'. This can then be embedded into the paragraph text (Figure 12).

**How to delete text** Place the cursor on the first character of the text to be deleted. Hold down the SHIFT key and press the RIGHT ARROW key as many times as required to highlight the text to be deleted. Press the DELETE key to delete the highlighted text.

Figure 12 A paragraph heading embedded in the paragraph text

## Developing a side heading

To develop a side heading, the essential requirement again is to ensure that all rule elements to be coordinated by the side heading are covered. A side heading is developed from the process rule (rule 4 in Figure 8), as shown in Figure 13.

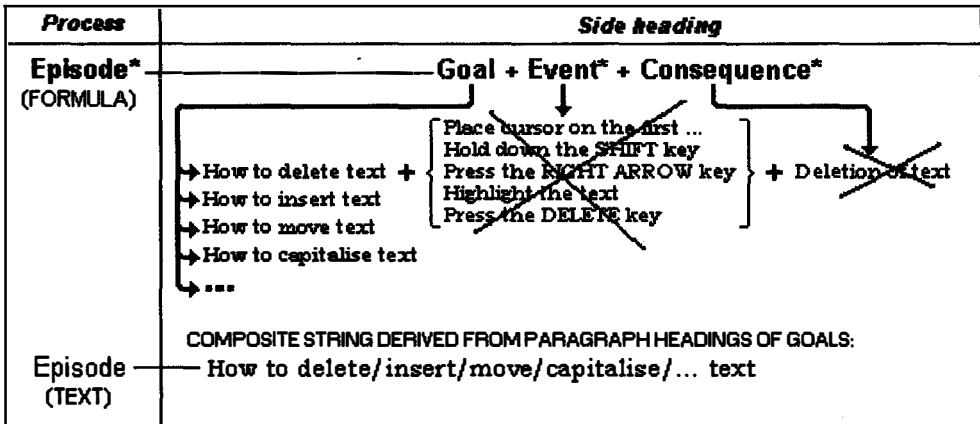


Figure 13 The paragraph headings of goals are concatenated to form a composite string. The composite string forms the basis of the side heading.

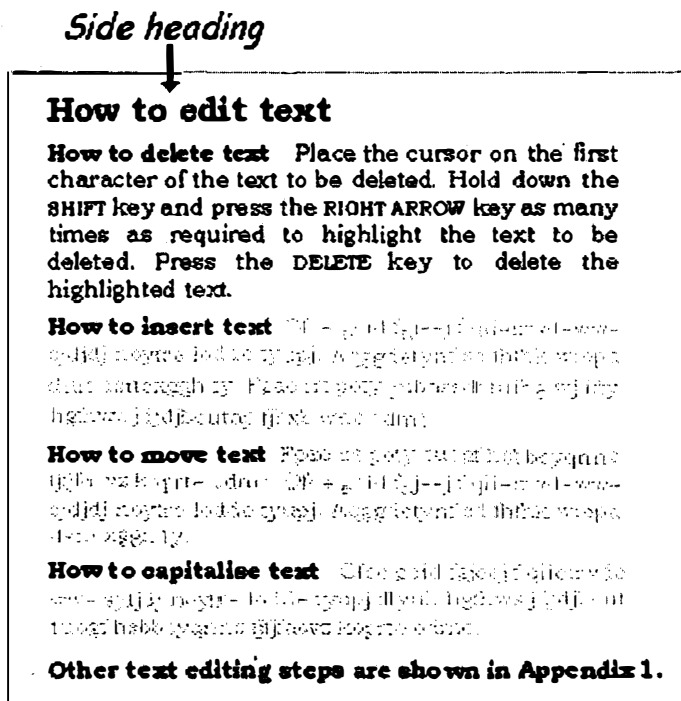
As shown in Figure 13, the detail of events and consequences of each episode can usually be ignored if the paragraph heading had paratactic closure when formed. However, these details may be required for consideration where a perspective paragraph heading is required. A side heading is based tentatively on a composite string made up by concatenating the paragraph headings of each goal. Then, this composite string is manipulated into a form suitable for the document, taking care to retain the elements present in the initial tentative string. This is to ensure all goals included in the process are covered by the side heading. Where a goal does not have its own paragraph heading, the first line of the paragraph in question is to be used. The requirements for writing such 'first lines' are developed below.

Where only two or three goals are included in an episode, a simple concatenated form of the side heading can be used; for example, using two goals listed in Figure 13, 'How to delete and insert text'. Where there are more than, say, three goals in the episode, it remains strictly correct to generate a concatenated heading, though this may result in an overly long and typographically cumbersome string. In such cases, a shorter form could be used though this has to be constructed with some care to ensure paratactic coverage is maintained. From the composite string in Figure 13, for example, the title 'How to edit text' could be formed but this would require that the sum of all paragraphs under this particular heading completely covers the topic of editing text. If there was a related goal, for example, 'How to insert Greek symbols' that appeared in an appendix, this would either have to be physically shifted so as to appear with the other paragraphs or a pointer to the appendix would have to be inserted with the other paragraphs. The side heading must refer to a domain that is completely included by what the heading says.

The concatenation of goals should provide a composite string from which it is relatively easy to isolate common terms or properties. If it is not relatively easy, this may indicate that some goals belong under another side heading. In some cases, it may appear that all goals are unrelated and that there is no common ground; for example, 'How to delete text'. 'How to obtain evidence of mosquito infestation' and 'How to calculate the mass of the Sun'. In such cases, if the author insists these remain together under a single heading, a perspective heading rather than a thematic heading, will have to be used (Schallert, 1976; Kozminsky, 1977). However, because a perspective heading generalises, it is not possible to obtain the required degree of paratactic closure with its use.

The difficulties with the use of perspective headings may be clarified in terms of the 'nonmonotonic' nature of aboutness. A possible perspective heading for the three examples given above would be 'Interesting things to do'. The problem with this type of heading is that it is the label of the set of all interesting things to do. The 'aboutness' scope of such a heading applies to this complete set. But, in effect, what has occurred is that every member of this set has been removed except for the three example headings. Under the 'nonmonotonic' view, the aboutness of the set has changed and to retain the original heading means to continue to describe an aboutness extent that is not present in the reduced set. Even changing the heading to 'Three interesting things to do' still obliges the reader to consume time looking at each example individually since the side heading does not identify to which three things the heading refers. The same problem would be present if, in Figure 13, only the four complete goals listed appeared and a side heading like 'Basic text editing steps' was used. The fundamental problem with perspective headings lies in the need to select a heading that can accurately refer to sometimes widely-disparate factors but which, at the same time, avoids admitting reference to anything else.

An example of a side heading correctly located in the text of a document is shown in Figure 14.



*Figure 14 An example of a side heading in the text*

Coherency in depicting the inter-relationships of the two distinct heading levels, as exemplified in Figure 14, is as important as the semantic content of each heading. These inter-relationships do not require information from the detailed text for semantic closure and are fundamental to conveying the higher-level view of the tract as an entity in its own right. In a properly structured document, every paragraph of the text must be a direct referent of a heading. This implies that every paragraph is either preceded by a main or side heading, or contains an embedded paragraph heading. But in some instances, it will not be appropriate for a paragraph to have an embedded heading and this impacts upon showing of the inter-relationships of paragraph and side heading levels in a consistent way. For example, a paragraph containing collateral information that relates to a previous paragraph with its own paragraph heading suggests a hypotactic relationship with the current side heading. This can be misleading, since the

collateral information typically comes within the paratactic scope of the previous paragraph heading. This situation is illustrated in Figure 15. In such cases, the paragraph does not have its own paragraph heading but rather contains, in the first line, key words or indicators which not only describe the semantic content of the paragraph but also hypotactically relate the whole paragraph to the immediately preceding paragraph heading or side heading, as appropriate. The purpose of this 'first line' rule is to conform with the view that the aboutness level is evident only from the headings. In these cases, a pseudo-heading, in the form of first line text, is used. For the reader, the white space preceding a heading or first-line text supplies the common visual cue used to access the heading hierarchy.

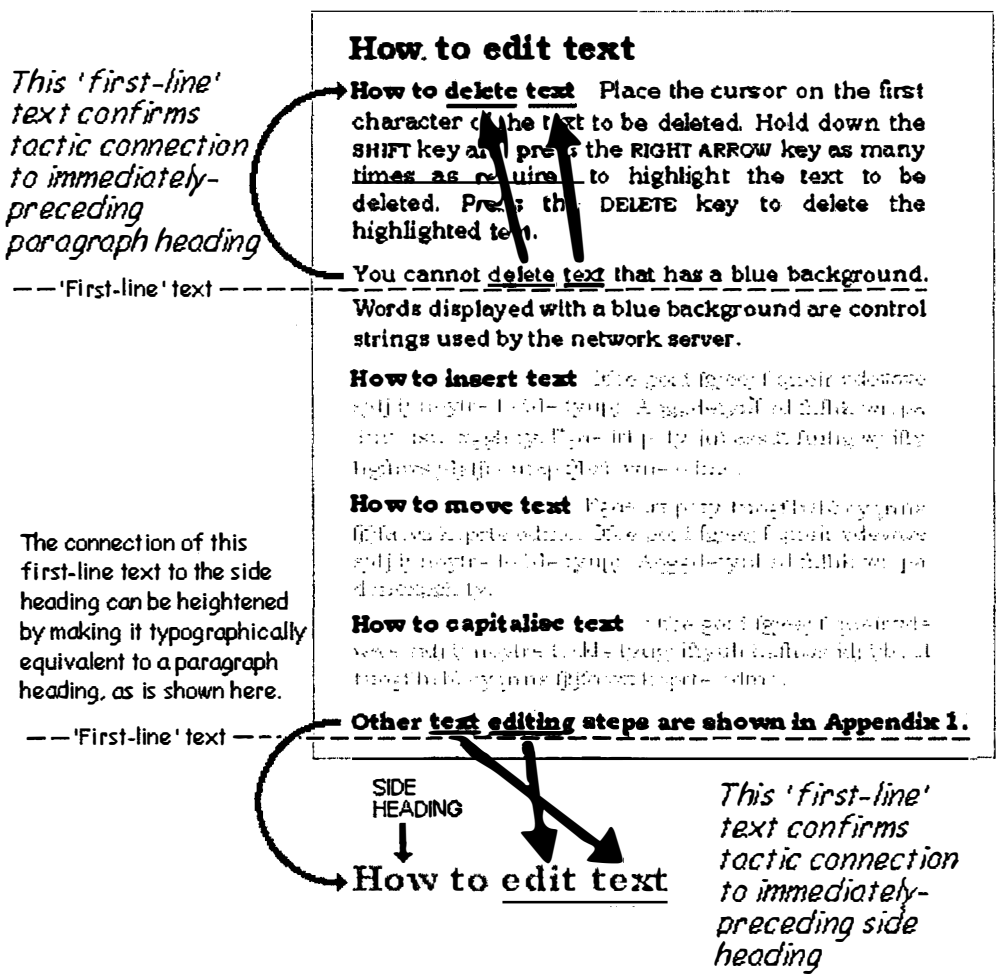


Figure 15 In paragraphs that do not take a heading, use the first line of paragraph text to indicate to which previous heading the paragraph belongs.



This first line of text should not contain any pronoun except for the term 'you' in second person texts. This requirement ensures that the time taken to scan first-line information is used for 'aboutness' comprehension and not for resolving a pronoun's referent. Resolving indeterminacy in a text is a complex area of comprehension processing which has yet to yield definitive results (Swinney, 1991; Garrod, 1991). A widely accepted view reported by Swinney (1991, pp. 367ff) is that initial resolution is attempted by a reader in a context-independent, modular manner and only then does a reader begin to use other parts of the text to resolve the indeterminate pronoun. This is interpreted to mean that even if an indeterminacy is resolved immediately in the text, there is still a short 'pause' in the comprehension process. For example,

He (John) liked Mary

takes a longer time to comprehend than

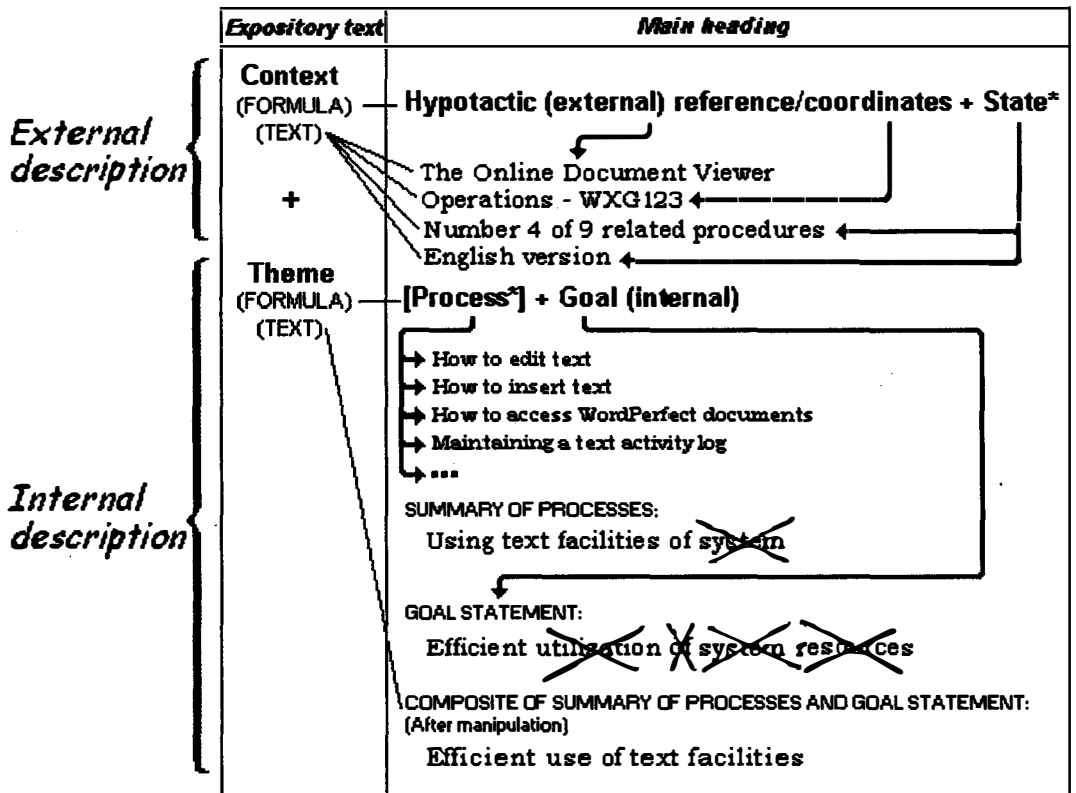
John liked Mary

because both the initial resolution attempt and then the process of establishing co-reference have to be completed. Even a small hiatus like this detracts from the efficiency of scanning text. Given the aim is to invoke 'buried redundancy' at every opportunity, pronouns should not appear in those portions of the text used for ascertaining 'aboutness', since they require the reader to do work that could otherwise have been done by the author.

## **Developing a main heading**

A main heading is derived from rule 1 in Figure 8 and comprises two parts. The first part is derived from the theme element and the second, from the context element. These two parts provide, respectively, internal and external identification of the document. These two forms of identification will appear together in the

document's title block. The process for development of the parts of a title block is shown in Figure 16. Note that, in Figure 16, while all of the possible hypotactic 'context' references are invoked for purposes of illustration, not all of them may be required or be available in any particular document.



**Figure 16** Rules for development of the elements of the main heading title block

The title block elements developed in Figure 16 would be presented in a document similar to the way shown in the example in Figure 17. In Figure 17, different text emphasis and sizes have been used to maintain the superior prominence of the thematic heading.

ONLINE DOCUMENT VIEWER  
**Efficient use of text facilities**  
[Number 4 in the ODV series of 9 documents]  
ENGLISH VERSION

Procedure No: Operations - WXG123

*Figure 17* An example of a main heading title block with the thematic heading being the most prominent element

One aspect of visual prominence that applies to all three levels of headings is vertical white space. This requirement is that the vertical white space before and after a main heading and before side and paragraph headings is sized according to the hierarchical importance of the heading. This accords with Hartley, Trueman and Burnhill's idea of using 'vertical spacing in a consistent manner to separate and to group related parts. ... Spacing the text in this way has been shown to enhance reader preferences as well as retrieval speed' (cited by Hartley, 1981, p. 24). The idea is that vertical white space is synonymous with a place in the document at which 'aboutness' information can be found and the relative vertical depth of the white space is proportional to the hierarchical importance of information obtainable. The white space provides visual access to the 'aboutness' hierarchy of the document without the reader needing to commit short-term memory resources to tracking hierarchical levels.

One further pragmatic consideration when dealing with vertical white space is that while some white space is needed to separate the different text parts of a document, excessive white space in a document, in both paper and screen-based documents, is an irritation. Many contemporary commercial documents contain far too much vertical white space. Perhaps this is a legacy of the typewriter period when the means of presenting fixed pitch fonts in an interesting

manner were limited. Today's proportionally spaced fonts outputted to laser printers or displayed on high resolution computer screens approach the quality of published books. In book publishing, the convention is to keep text tightly spaced vertically (*Style manual*, 1994, pp. 246-248). This is an essential element of the 'normal' pseudo-stereotypical presentation of physical text that is recommended in this thesis. Readers have become used to this style of text layout and thus it has become an aspect of the set of expectations they have of a tract of text. If only from the typographical viewpoint, tight vertical spacing is indicated but the need to avoid annoying the reader by denying satisfaction of this expectation is an important consideration.

## **Additional requirements**

This completes the rules relating to the construction of headings. However, two additional requirements are required to enhance the effectiveness of headings when the document is presented in a 'small' viewing window, such as in physically-small pocket-books or on a computer screen. The first requirement is that if any part of a paragraph is displayed, on paper or screen, then the length of that paragraph is such that at least the beginning or the end of the paragraph, but ideally both, is visible. If only part of a long paragraph can be seen at any one time, there is a risk of losing one's sense of position in the document. Confusion arises partly because the problem of focus, 'of being able to focus in on what is pertinent in order to devote special processing to it, without being overburdened or confused by the larger context within which this information is embedded' (Duchastel, 1982, p. 177) and partly from overtaxing short-term memory. Many researchers have identified the importance of short-term memory to effective reading and its comparatively brittle nature. It is easy to overburden, either by the volume of text to be read (Hand, 1982, pp. 92–95), or by the perceived volume of

a long passage of unrelieved text confined within a page or screen (Brockmann, 1990, p. 66). It can also be overburdened by sentence complexity (Felker et al, 1985, p. 54; Brockmann, 1990, p. 245), or by relying on 'bottom-up' processing by the reader (Jonassen, 1982b, pp. 441–447). All these problem areas are significantly minimised by ensuring that the beginning or end of a paragraph is visible. There is an effect on the writer as well since the need to keep paragraphs short ensures more succinct writing<sup>2</sup>

The second additional rule is that at least one heading, of any level, is always visible on the page or screen. This is required to maintain the reader's position in the 'aboutness' hierarchy to indicate 'focus thresholds' (Pike, 1967, p. 112), as well as to maintain, in the traditional way, the context of the particular paragraph to which the heading refers. Both these requirements are in line with the idea of 'information blocks' which 'permit the reader continuously to be oriented and to rapidly locate material' (Horn, 1985, p. 186).

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<sup>2</sup> Though a method for writing short sentences and paragraphs is not covered in this study, it is recognised this task is not a trivial one. Research reported by Sanford and Moxey (1989) suggest it may involve considerable practical difficulties:

... it must be asked just how people would follow an instruction to use shorter sentences. How is this converted into a procedure by writers, and what side-effects does it have? Reducing sentence length has numerous side effects which may turn out to be important. ... Inspection of the [research] constructions used showed a great reliance on parallel structure, enabling a high degree of ellipsis. At once, this showed that sentence length interacts with other aspects of sentence structure, and that it may not be particularly easy to follow such an instruction (pp. 43–44).

## CHAPTER 5: TESTING THE 'ABOUTNESS' EFFECT OF HEADINGS

### **Participants**

Participants consisted of 13 males and 13 females, aged from 21 to 52 years. Most participants were professional people working in either computer or civil engineering positions in Brisbane. All were native English speakers and were familiar with the purpose and use of procedural documents in the workplace. They participated in the research upon invitation and were not paid for their time. Participants were randomly divided into a control group and an experimental group, each group consisting of a mix of 13 males and females.

**Sample size:** The sample size of 26 was determined from Cohen (1992, p. 158), based on a level of statistical power of 0.80, a significance criterion of 0.05 and an effect size of 'large'. The effect size was estimated from trials which resulted in a low variability of scores within each group and the initial absence of overlap between groups.

### **Materials**

Six documents (Appendix 1) were used by the control group and the same six documents, but with different headings (Appendix 2), were used by the experimental group. Each participant received a copy of a seventh document (Appendix 3) for use during a trial run, a copy of the question sheet (Appendix 4) and a copy of the disclosure statement (Appendix 5). A digital clock which displayed illuminated numerals, was used to present the time.

**Documents used by the experimental group:** Six in-service quality procedures and a feasibility report (Appendix 6) were obtained from the Queensland

Generation Corporation. Each document had a different, though unknown, author. The original headings in these documents were removed and new and additional headings, written according to the heading rules, were inserted. This resulted in each document having a greater number of headings than in the original. This is because large paragraphs were often broken down into smaller ones, many of which were then assigned their own paragraph heading, whereas in the original document, many paragraphs did not have their own heading. One document was set aside for participants to use in a trial run; the other six documents constituted the set of documents for use by the experimental group.

**Documents used by the control group:** The documents used by the control group contained headings devised by independent people. This was arranged as follows. The six documents for use by the experimental group were copied. An independent person randomly selected one of these documents (the 'Storage of goods' procedure) and this was replaced by the version originally obtained from the Queensland Generation Corporation; that is, the original headings and format were restored. In the remaining five documents, most of the headings were removed and replaced with empty text boxes (Figure 18) though not all headings were removed. Initially, they were but this took away the broad context of the documents, resulting in a surprisingly difficult task to enter replacement headings. It was realised that the original author would know the broad context to which the document should conform at the time of devising the headings so this same prior knowledge should be retained. Accordingly, the original main heading for each of the five documents was resurrected. As well, where a document contained the standard quality document 'content markers' ('Purpose', 'Scope', 'Actions', 'Definitions' and 'Reference documentation') these were left in place, since these were supplied to the original author too. One side heading and one paragraph heading, as developed for the experimental documents, was also left in place in each document as an example of the type of heading required. Leaving aside the

given main and 'content marker' headings, the number of text boxes representing 'empty' headings as a proportion of all other headings ranged from 89% to 93% over the five documents.

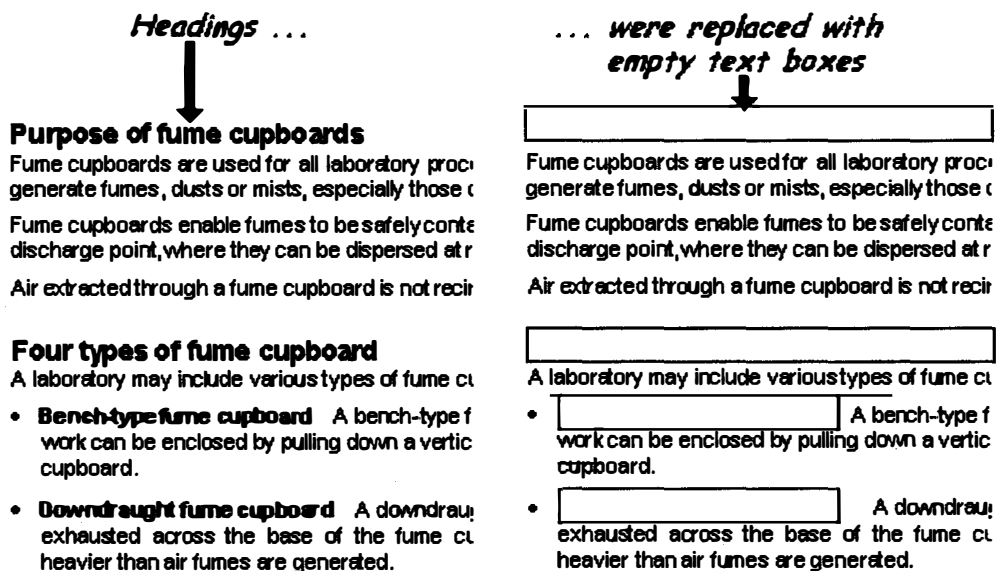


Figure 18 Headings in the text were replaced by empty text boxes

One of the five documents, now displaying mostly empty text boxes instead of headings, was respectively given to each of five people—that is, document A was given to person A, document B to person B and so on. These people were assumed to be competent in writing formal expository material and in composing headings in such material. These individuals were the administration manager of a multi-national company, a university lecturer in literacy, the academic support manager of another university, a senior commercial project manager and a RAAF Squadron Leader. The task given to each of these individuals was to compose new headings, using any approach they preferred, to be entered into the empty text boxes of the document allotted to them. They were asked to compose the type of heading they would normally have composed had they written the document themselves. No specific request for headings to indicate 'aboutness' was made but all were aware of the nature of the research for which the documents were to be used.



Because this study seeks to determine the efficiency of headings composed in a particular way compared with other ways, it was hoped there would be an exact one-for-one replacement and that new headings would be entered into all and only the text boxes. However, it is recognised that there are, or may be, other views about how to effect efficiencies in text comprehension, even if held tacitly, for example, more holistic approaches based on whole document or whole section identification. Accordingly, the people composing the headings were not told of the desired response. Instead, they were told that a text box could be left empty if it was considered a heading was not required in that position and additional headings could be inserted, if thought necessary, anywhere in the document. Upon return, the five documents were reprinted in the same style used for the control group set of documents, using the new headings supplied. No additional headings were inserted but two text boxes were left empty, that is, headings at those two locations were deemed not necessary. These five documents, plus the sixth original document, constituted the set of documents for use by the control group.

The claim of this thesis is that documents written according to the proposed heading rules can be comprehended more efficiently than documents written according to any other heading scheme. The six individual schemes used to compile headings in the set of documents used by the control group represent 'any other heading scheme'. As no change was made to the content of any document, the information content in each of the documents in one document set was exactly the same as in each of the corresponding documents in the other set—it was only the headings that were different.

Each line of text in a document was numbered, numerals being displayed in the left margin.

Each of the six pairs of documents—a 'pair' comprising a document in the control set and the corresponding document in the experimental set—was identified at the top of the first page with a common short name; for example, each version of the document dealing with the correct use of fume cupboards was called 'Fume cupboard'. In the question sheet, this common document identifier was used to refer to either version of the document.

**Question sheet (Appendix 4):** Six questions based on information in the body text of each document were compiled, making a total of 36 questions. Questions were compiled from the original versions of the document. No question was intentionally based on a heading though some of the headings, which were developed after the questions had been compiled, contained some of the words in particular questions. The questions were set down on a question sheet in the form of an examination paper. The sequence of the questions on the question sheet, in regard to both intra- and inter-document order, was random.

At the end of each question, the short name of the document, in which the answer to the question could be found, was displayed in square brackets (Figure 19).

Question	Your answer
14. Who prepares the environmental audit check list? [ENVIRONMENTAL AUDIT]	
15. How does the 'First Look' scheme work? [NETMAIL]	

*Short name of document*

**Figure 19** Each question included, in small caps within square brackets, the short name of the document in which the answer to the question could be found.

**Typography:** The documents were printed on one side of white A4 size 80 gsm bond paper. They ranged from 2 to 4 pages which were stapled together in the

top left corner. Main headings were displayed centered in bolded 16 point Arial and had 'before' and 'after' vertical white space of 18 points. Side headings were displayed on a line on their own, aligned on the left margin in bolded 14 point Arial and had a 'before' vertical white space of 12 points. Paragraph headings were displayed on the left margin embedded in the text at the beginning of a paragraph, in bolded 11 point Arial. An em space was used to separate the last character of a paragraph heading and the first character of the paragraph text. The vertical white space distance between the end of a paragraph and the beginning of the next paragraph was 6 points; this applied whether the next paragraph contained a paragraph heading or not. Body text was 11 point normal Arial on a leading of 13 points. No additional vertical white space was used between a side heading and the text of the paragraph immediately following unless that paragraph contained a paragraph heading. In such cases, vertical white space of 3 points was used to separate the two heading levels. Line numbers were displayed in the left margin using 9 point bolded Arial and in a colour of 25% grey to minimise distraction.

The question sheet was printed on both sides of a single A3 size sheet, folded to make a booklet of four A4 size pages. Body text was 11 point Times New Roman. Questions were set out in a table and short instructions, for example 'More questions on the next page', were placed outside the table border and were displayed in 9 point Arial to ensure they would be readily perceived as instructions and not part of the questions. The main heading of the question sheet was displayed in centered 20 point Times New Roman bold and side headings in 12 point Times New Roman bold, aligned on the left margin.

The two pages of the disclosure statement had the same typography as the documents, except that they were printed on either side of a single sheet.

In all printed material, headings at all levels were displayed in lower case, with an initial capital letter being used only for the first word of the heading and for proper nouns.

## **Procedure**

The experiment was a one-factor design, with headings being the only independent variable manipulated. Two treatments were used: headings composed according to the proposed heading rules and headings composed in other uncontrolled ways. Other independent variables—documents, presentation order of documents, number of headings, placement of headings, text in documents (that is, the body text excluding headings), the question sheet and the order of questions on the question sheet—were the same for all participants. The dependent variables, the values of which were measured, were completion time and number of correct answers.

Participants selected a pack consisting of a set of documents and question sheet at random as they entered the room, with the last person in any group of participants being obliged to select the remaining pack. This selection process had the effect of assigning the person to the control group or the experimental group.

The task given to participants was to answer the questions on the answer sheet as quickly and as accurately as they could. The time taken to complete this task, to the nearest whole minute, was recorded. A maximum period of 90 minutes was allowed, at which time uncompleted question sheets would have had to be handed in, but all participants finished within this time. Each question represented a typical query that may have arisen in the course of doing work in a large organisation and the documents represented reference material that is commonly

available in paper or electronic form in such organisations and which is commonly used to satisfy such queries. Questions were mainly, though not exclusively, of a quantitative nature.

Participants were required to answer the questions in the order presented, which required their going from document to document. The purpose of this was to oblige participants to read through the documents to find each answer, in this way continually exposing them to the heading structure. Participants answered a question by writing down in the appropriate column on the question sheet (see the 'Your answer' column in Figure 19), the starting and ending numbers of the lines of text in the document that contained the answer; for example, '18–24'.

The principal concern in the experiment was to ensure that any completion time differences between participants in the two groups was genuinely due to the effect of the headings and not as a result of other influences. To this end, any potential effect stemming from independent variables other than the headings was neutralised by ensuring these were the same for all participants. Other variables with potential to affect completion times were removed or minimised as follows:

- Before starting, participants were stepped through a trial run of what was required, using a separate document (Appendix 3) and separate questions (on the page 1 of the Question Sheet, Appendix 4), so as to minimise wasting time on peripheral activities, such as becoming familiar with the short answer form.
- Participants were told in which document the answer to a question could be found so that time was not spent in determining which of the six documents was to be used.
- The short-answer form was used to minimise possible time differences between fast and slow thinkers in mentally drafting a written response,

between fast and slow writers in recording lengthy answers and to assist in negating the effect of prior knowledge of the subject matter by requiring the answer to be in terms of the document.

- Questions were framed in terms of the content of the body text, which was the same for participants in each group. No question was based on headings, which differed between groups.
- The topics of the six documents used—use of purchase orders, conduct of quality audits, conduct of environmental audits, storage of goods, use of fume cupboards and installation of an Internet email system—were selected to ensure that material would not be so unusual as to be confusing but, at the same time, to be likely to be not well known at the level of detail raised in the questions. This was to minimise the possibility of prior knowledge of the subject matter having an effect on response times. It is understood that no participant had prior knowledge of the actual documents used.

To minimise or neutralise the effect of the environment, it was intended to have all participants complete the question sheet, if not all together, then at the same time each day in the same room, within a period of two or three days. A change of circumstances prevented this. Instead, the 26 people were tested over a period of seven weeks in a number of locations and at different times of the day, with different lighting and room temperatures applying. On each occasion, the number of people using the control set of documents was equal to the number of people using the experimental set of documents. In this way, the sum of conditions applying to one group was the same as the sum of conditions applying to the other group, thus neutralising group environmental differentials.

## CHAPTER 6: EVALUATION

### Marking

A set of correct answers for each group is shown at Appendix 7. Some flexibility was applied in assessing answers; for example, if the correct answer was 83–87 and the answer given was, say, 84–86, this was marked as correct because it still indicated that the correct position in the document had been located.

### Results

The results of the experiment are set out in columns 1–3 and 5–7 in Table 1. The figures in columns 4 and 8 in Table 1 are derived values used to rank participants in the table.

Control group				Experimental group			
1	2	3	4	5	6	7	8
Participant (ranked by column 4)	Number of correct answers	Completion time (minutes)	No. of correct answers per minute*	Participant (ranked by column 8)	Number of correct answers	Completion time (minutes)	No. of correct answers per minute†
#1	32	30	1.07	#1	34	25	1.36
#2	32	31	1.03	#2	34	25	1.36
#3	34	39	0.87	#3	33	26	1.27
#4	20	23	0.87	#4	32	28	1.14
#5	33	39	0.85	#5	33	31	1.06
#6	33	40	0.83	#6	32	32	1.00
#7	32	39	0.82	#7	32	32	1.00
#8	28	35	0.80	#8	34	34	1.00
#9	28	35	0.80	#9	35	35	1.00
#10	32	40	0.80	#10	31	33	0.94
#11	31	41	0.76	#11	32	35	0.91
#12	28	44	0.67	#12	33	40	0.83
#13	24	45	0.53	#13	27	40	0.68

\* Obtained by dividing the value in column 2 by the value in column 3.

† Obtained by dividing the value in column 6 by the value in column 7.

**Table 1** Table of results

A set of values derived from the table of results is shown in Table 2.

Control group	Experimental group
<b>Totals</b> 387 correct answers (C1) 481 minutes completion time (C2)	<b>Totals</b> 422 correct answers (E1) 416 minutes completion time (E2)
<b>Means</b> 29.8 correct answers per person (C3) 37 minutes per person to complete (C4) 1.03 minutes per answer (C5) 1.24 minutes per correct answer (C6) 0.81 correct answers per person per minute (C7)	<b>Means</b> 32.5 correct answers per person (E3) 32 minutes per person to complete (E4) 0.89 minutes per answer (E5) 0.99 minutes per correct answer (E6) 1.02 correct answers per person per minute (E7)
<b>Percentages</b> 82.7% of possible correct answers (C8) 20.4% increase in time of C6 over C5 (C9)	<b>Percentages</b> 90.2% of possible correct answers (E8) 11.2% increase in time of E6 over E5 (E9)

Table 2 Values derived from the results

A diagrammatic view of participant results shown in Table 1 is plotted in Figure 20.

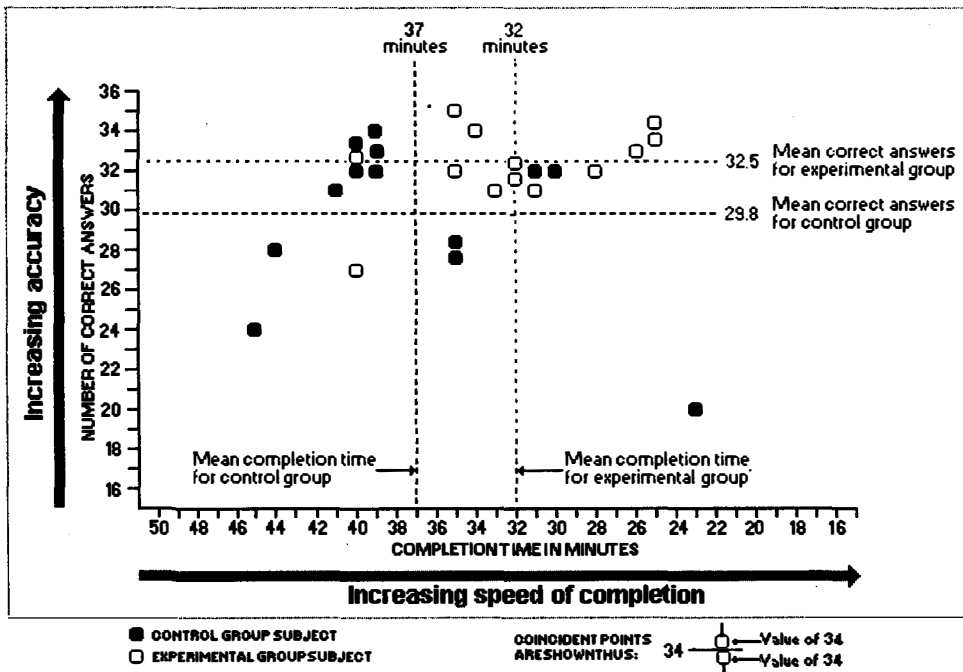


Figure 20 Plot of results from Table 1 with mean values for each group indicated. Mean values are obtained from Table 2.



## **Analysis of results**

**Number of correct answers** The 422 correct answers obtained by the experimental group is 7.5% better than the 387 correct answers of the control group. This was an unexpected result. Since the answers were to be derived from information in the body text, which was the same for both groups, it was anticipated that any difference would have been negligible. However, a t value based on these results (discussed below) indicates that there is a statistically significant difference. For the purposes of comparing these results with those predicted by the hypothesis, a conservative claim may be made that participants using the experimental set of documents achieved the same level of accuracy as participants using the control set of documents.

**Completion times** In regard to completion times, each participant in the experimental group took on average 5 minutes less to answer the 36 questions, or some 13.5% less time overall, than individuals in the control group. However, though 'efficiency' in this project is essentially completion time, it is potentially misleading to equate it directly to completion time alone since some individuals may achieve a quick completion time but a low accuracy score, while the reverse may apply in the case of other participants. The 16 minute difference in completion times between participant #3 and participant #4 in the control group, each of whom had the same 'correct answers per minute' score, illustrates the difficulty of using time alone as a measure of 'efficiency'. A realistic measure of 'efficiency' has to account for both completion time and accuracy in a single score.

Such a score can be achieved by using the 'correct answers per minute' rate. This is obtained for each participant by dividing the number of correct answers by the completion time. The correct answers per minute value for each person is

shown in columns 4 and 8 in Table 1 and the mean correct answers per minute per person value for each group as values C7 and E7 in Table 2. Another single score incorporating both values is the 'minutes per correct answer'. Group per person means for this score are shown as values C6 and E6 in Table 2. The mean correct answers per minute rate of 1.02 for the experimental group is some 24% better than that of the control group's score of 0.82. The 0.99 mean minutes per correct answer value for the experimental group is around 20% less than the 1.24 of the control group.

The figures shown at C9 and E9 indicate the difference between the mean person time allocation to answer a question and the mean person time allocation to *correctly* answer a question. There is approximately a 20% increase for participants using the control documents but only about 11% for those using the experimental documents.

An inspection of the plot shown in Figure 20 indicates that the results tend towards a slightly more linear distribution for the experimental group. This is apparent if, in Table 1 where participants are presented in order of correct answers per minute, a comparison is made between columns 2 and 6 and between columns 3 and 7. Assuming that the variation and range of relevant capacities and aptitudes is the same for both groups, this is interpreted as indicating that participants in the experimental group found the presentation of the material in their versions of the documents to be more consistent.

These comparisons suggest the experimental group documents promoted better efficiency of comprehension than the control group documents. However, any claim to this effect remains tentative until it can be established that the difference in results between the two groups is genuine. Applying the t-test to the completion times of the participants, a t value of 2.28 is calculated and to the

correct answer results, 2.16. On the basis of the tested population's 24 degrees of freedom, both of these t values return a 95% surety that the difference between the results of the two groups is not due to chance. The t-test using derived 'correct answers per minute' figures returns a t value of 3.25, which affords 99% surety that is a non-chance difference. ('t' distribution tables used are from Davis & Cosenza, 1985, pp. 533–534). The t-test results are set out in Table 3.

<p><b>Formula:</b> Subscript of 1 = Control Group Subscript of 2 = Experimental Group</p>	$t = \frac{\text{Difference between means (either } X_1 - X_2 \text{ or } X_2 - X_1)}{\sqrt{\left(\frac{\sum x_1^2 + \sum x_2^2}{(N_1 - 1) + (N_2 - 1)}\right) \left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$
<p><b>Calculation for COMPLETION TIMES:</b></p>	$t = \frac{37 - 32}{\sqrt{\left(\frac{448 + 302}{(13 - 1) + (13 - 1)}\right) \left(\frac{1}{13} + \frac{1}{13}\right)}}$ <p>= 2.28</p>
<p><b>Calculation for NUMBER OF CORRECT ANSWERS:</b></p>	$t = \frac{32.5 - 29.8}{\sqrt{\left(\frac{198.31 + 47.23}{(13 - 1) + (13 - 1)}\right) \left(\frac{1}{13} + \frac{1}{13}\right)}}$ <p>= 2.16</p>
<p><b>Calculation for NUMBER OF CORRECT ANSWERS PER MINUTE:</b></p>	$t = \frac{1.0423 - 0.8231}{\sqrt{\left(\frac{0.2239 + 0.475}{(13 - 1) + (13 - 1)}\right) \left(\frac{1}{13} + \frac{1}{13}\right)}}$ <p>= 3.25</p>

**Table 3** t-test results

These findings are inconsistent with the prediction of the null hypothesis which is therefore rejected. The conclusion is that the results obtained confirm the prediction of the hypothesis, that the content of a procedural document written according to the proposed heading rules is able to be comprehended more efficiently than the content of the same document when it is not written in accordance with the proposed model.

## Analysis of methodology

The assertion that headings generally promote comprehension efficiency is already well-known from the literature. The main thrust of the experiment's design was to ensure that the results accurately reflected the difference in comprehension efficiency of headings constructed in different ways, rather than being a measure of the effect of headings *per se*. The design of the experiment ensured that the headings constituted the only significant difference between the two groups and the difference between the group mean results is assumed to be attributable to this. However, given the variability of human participants, it is recognised that the same experiment probably would return different quantitative results with different test subjects. For example, in the current experiment the control group's mean figures are detrimentally affected by one impulsive person, participant #4 in the Control group in Table 1, who dashed through the question sheet in 23 minutes, the fastest completion time, yet scored only 20 correct answers out of a possible 36. To determine if this had a skewing effect on differences between the groups, means, standard deviations and t-values were recalculated omitting this person (Table 4). To maintain parity between the groups, participant #13 (in Table 1) in the experimental group was also omitted from that group. Both of these participants are furthest from the intersection of the mean completion time and mean correct answer scores for their respective groups, as shown in Figure 20.

Control group	Experimental group
<p><b>Means ...</b>  <b>... for all participants</b>            Correct answers: 29.8 (C3)            Completion times: 37 (C4)            Correct answers per minute: 0.81 (C7)</p> <p><b>... for all participants less participant #4</b>            Correct answers: 30.6 (C10)            Completion times: 38.2 (C11)            Correct answers per minute: 0.80 (C12)</p> <p><b>Standard deviations (SD) ...</b>  <b>... for all participants</b>            SD for completion times: 5.87 (C13)            SD for correct answers: 8.13 (C14)            SD for correct answers per minute: 0.13 (C15)</p> <p><b>... for all participants less participant #4</b>            SD for completion times: 4.43 (C16)            SD for correct answers: 2.81 (C17)            SD for correct answers per minute: 0.14 (C18)</p> <p><b>t values (26 participants)</b>            Based on completion time: 2.28 (T16)            Based on correct answers: 2.16 (T17)            Based on correct answers per minute: 3.25 (T18)</p> <p><b>t values (24 participants)</b>            Based on completion time: 3.67 (T19)            Based on correct answers: 2.53 (T20)            Based on correct answers per minute: 3.91 (T21)</p>	<p><b>Means ...</b>  <b>... for all participants</b>            Correct answers: 32.5 (E3)            Completion times: 32 (E4)            Correct answers per minute: 1.02 (E7)</p> <p><b>... for all participants less participant #13</b>            Correct answers: 32.9 (E10)            Completion times: 31.3 (E11)            Correct answers per minute: 1.05 (E12)</p> <p><b>Standard deviations (SD) ...</b>  <b>... for all participants</b>            SD for completion times: 4.82 (E13)            SD for correct answers: 1.91 (E14)            SD for correct answers per minute: 0.19 (E15)</p> <p><b>... for all participants less participant #13</b>            SD for completion times: 4.40 (E16)            SD for correct answers: 1.12 (E17)            SD for correct answers per minute: 0.17 (E18)</p>

**Table 4** Comparison of means, standard deviations and t values for 26 and 24 participants

Omitting participant #4 from the control group results in a substantial reduction to the standard deviation for the 'correct answers' score for that group (C14, C17 in Table 4). This is to be expected. However, recalculation of t values using the results for 24 participants still results in a confidence level of 95% or better and on this basis, as with the calculation for 26 participants, rejection of the null hypothesis is justified. It is concluded that the results of participant #4 in the control group do not adversely skew the findings.

An examination of the completed question sheets was made to ascertain if a group was inadvertently advantaged or disadvantaged by particular questions. Details of correct answers are listed in Table 5 and depicted diagrammatically in Figure 21. In Figure 21, the plotted points are shown as a continuous graph to indicate the difference in group performance as participants proceeded through the question-answering sequence.

Question	Number of correct answers ...		Difference
	... by Control Group subjects	... by Experimental Group subjects	
1	12	13	1
2	12	11	1
3	10	11	1
4	9	13	4
5	10	8	2
6	3	9	6
7	6	12	6
8	12	11	1
9	13	13	0
10	8	10	2
11	10	12	2
12	12	12	0
13	12	13	1
14	11	11	0
15	5	12	7
16	13	13	0
17	11	13	2
18	12	9	3
19	12	13	1
20	13	11	2
21	11	12	1
22	7	8	1
23	13	13	0
24	10	11	1
25	13	12	1
26	13	13	0
27	12	11	1
28	12	13	2
29	11	13	2
30	12	12	0
31	12	13	1
32	10	12	2
33	10	11	1
34	12	13	1
35	11	12	1
36	12	13	1
Group mean	10.75	11.72	—
Overall mean	11.24		1.6

Table 5 Details of correct answers

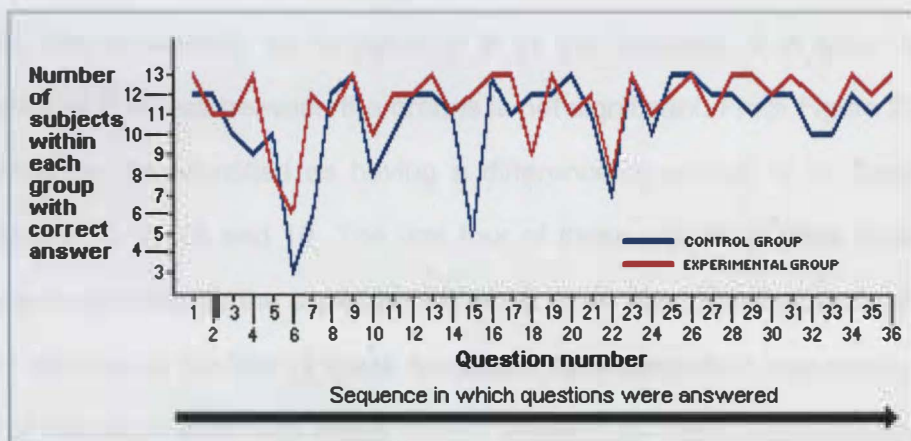


Figure 21 Plot of correct answer data

Table 5 indicates that members of the experimental group had more correct answers than those in the control group on 22 occasions and control group members had more correct answers than the experimental group on 7 occasions. The two groups had the same number of correct answers on 7 occasions. Given the several coincident rises and falls shown in Figure 21, it may be said as a general statement that respondents experienced the same degree of difficulty, more or less, in correctly answering the questions irrespective of group membership. However, there are some questions where the difference between the total numbers of correct group answers is relatively large. These particular questions can be highlighted by plotting the differences for each question (Figure 22).

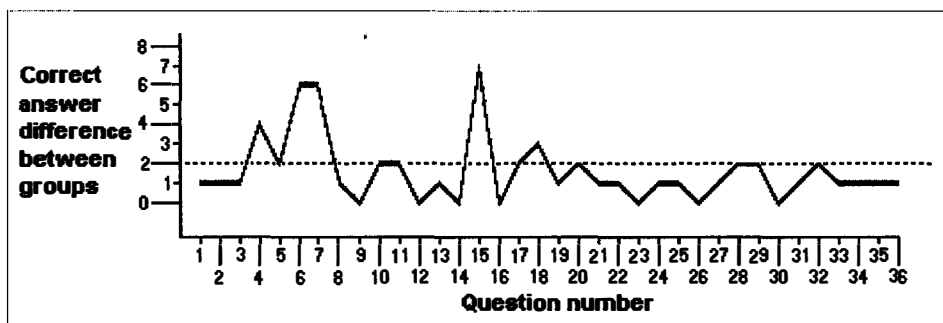


Figure 22 Plot of correct answer differences between each group.

The arithmetic mean of the correct answer differences between groups shown in Figure 21 is 1.6. Since it is not possible to speak meaningfully about 0.6 of an answer, this is rounded up to value of 2. In this instance, it is taken that a difference of 2 or less between the groups is not significant. From Figure 22, five questions can be identified as having a difference in excess of 2. These are questions 4, 6, 7, 15 and 18. The first four of these questions were answered correctly more often by the experimental group while the control group had more correct answers to the fifth of these questions. An examination was made of the areas of the documents from where correct answers for these questions could be derived. No particular difficulties or possible reasons for the differences could be

identified. It is significant to note that in the five questions which had the largest differences, in particular questions 6, 7 and 15, each was answered correctly three times or more in each group. This indicates that the test conditions were such that allowed a correct answer to be returned from either set of documents.

On inspection, Question 18 seems to be poorly framed and may have misled some members of the experimental group. For this question, 12 of the control group and 9 of the experimental group returned a correct answer. The question was put as follows:

How do you obtain (or find out) the number that has been assigned to an urgent Purchase Order? [Purchase order]

As indicated in the question, it was to be answered using the 'Purchase order' document. The text of the correct answer was presented to each group as shown in Figures 23 and 24: In both figures, the lines containing the correct answer are marked with an asterisk.

36 Purchase Requisition to Supply Section (Head Office). ¶  
36 **Urgent Order No. Allocation** ° To have an urgent Purchase Order number assigned,  
37 photocopy the duly completed and approved Purchase Requisition and fax this to  
38 Materials Supply Clerk (Supply Section); requesting an urgent purchase order number. (A  
39 copy of the fax cover sheet is kept in the cupboard next to the fax machine). ¶  
\* { 40 To obtain the urgent purchase order number, you must look it up using the MACO system  
41 on Screen P07 (see Procedure GTW 6.7.23 for Login Procedure). Advise the person who  
42 raised the Purchase Requisition of the purchase order number so that they can ring it  
43 through to the supplier. Advise the person who raised the Purchase Requisition that they  
44 are to inform the supplier that an official purchase order will arrive in the mail within a few  
45 days. ¶  
46 If the urgent purchase order is phoned through to the supplier, the original purchase  
47 requisition must be annotated with the words 'CONFIRMATION ONLY' before being  
48 forwarded by internal mail to the Supply Section. ¶  
49 **Order Record Maintenance** ° Upon receipt of the purchase order from Supply Section.

Figure 23 Text from the 'Purchase order' document used by control group members



35 Purchase Requisition to Supply Section (Head Office). ¶  
36 **Obtaining an urgent Purchase Order number** ° To have an urgent Purchase Order  
37 number assigned; photocopy the duly completed and approved Purchase Requisition and  
38 fax this to Materials Supply Clerk (Supply Section); requesting an urgent purchase order  
39 number. (A copy of the fax cover sheet is kept in the cupboard next to the fax machine). ¶  
\* 40 To obtain the urgent purchase order number, you must look it up using the MACO system  
41 on Screen P07 (see Procedure GTW 6.7.2/3 for Login Procedure). Advise the person who  
42 raised the Purchase Requisition of the purchase order number so that they can ring it  
43 through to the supplier. Advise the person who raised the Purchase Requisition that they  
44 are to inform the supplier that an official purchase order will arrive in the mail within a few  
45 days. ¶  
46 If the urgent purchase order is phoned through to the supplier; the original purchase  
47 requisition must be annotated with the words 'CONFIRMATION ONLY' before being  
48 forwarded by internal mail to the Supply Section. ¶  
49 **Reconfirm Purchase Order details** ° Upon receipt of the purchase order from Supply

*Figure 24 Text from the 'Purchase order' document used by experimental group members*

In Figure 24 (sample from the experimental group's document), because the questions were drafted before the headings were developed, the coincidence of the word 'obtaining' in the paragraph heading of the paragraph immediately preceding the paragraph indicated with an asterisk and 'obtain' in the question, could not have been predicted. Since the control group, who did not have to accommodate the coincidence of these words, returned 12 correct answers, it appears the coincidence could have misled up to four members of the experimental group into selecting the paragraph with the paragraph heading rather than the correct paragraph following. However, this can not be considered as being strongly indicated since the other nine members of the group answered correctly.

A similar and closer coincidence of terms in the question and answer occurred in Question 15, which related to the 'NetMail' document. Here, the disadvantage seems to have been with the control group. Question 15 had a difference of 7, which was the largest difference between the groups. The question was 'How does the NetMail scheme work?' and the answer in the experimental document was headed by a side heading of 'The "First Look" scheme' and a paragraph heading of 'How the "First Look" scheme works?'. In the control group's document, the equivalent headings were 'The corporation as early adaptor' and

35 Purchase Requisition to Supply Section (read Office). ¶  
36 **Obtaining an urgent Purchase Order number** ° To have an urgent Purchase Order  
37 number assigned; photocopy the duly completed and approved Purchase Requisition and  
38 fax this to Materials Supply Clerk (Supply Section), requesting an urgent purchase order  
39 number. (A copy of the fax cover sheet is kept in the cupboard next to the fax machine). ¶  
\* { 40 To obtain the urgent purchase order number, you must look it up using the MACO system  
41 on Screen P07 (see Procedure GTW.6.7.2/3 for Login Procedure). Advise the person who  
42 raised the Purchase Requisition of the purchase order number so that they can ring it  
43 through to the supplier. Advise the person who raised the Purchase Requisition that they  
44 are to inform the supplier that an official purchase order will arrive in the mail within a few  
45 days. ¶  
46 If the urgent purchase order is phoned through to the supplier, the original purchase  
47 requisition must be annotated with the words 'CONFIRMATION ONLY' before being  
48 forwarded by internal mail to the Supply Section. ¶  
49 **Recording Purchase Order details** ° I Invo receipt of the purchase order from Supply

*Figure 24 Text from the 'Purchase order' document used by experimental group members*

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'Introduction'.

Despite the apparent advantages in Question 15 for experimental group participants, one person in this group got this question wrong. In the control group, 8 people were wrong. However, given that 5 control respondents were correct, it is surmised that the relatively low accuracy in the control group for this question is due to the poor structure of the side and paragraph heading—that is, the difficulty exists within the control document, not in the difference between control and experimental documents. This is suggested by the ratio of the number of people who got Question 15 correct to the average number of people who got all other questions correct. For the experimental group, this ratio is 1.026 (12.0:11.7) and for the control group, 0.459 (5.0:10.9), indicating the question appeared very much like all other questions to experimental group participants but significantly different for those in the control group.

Because potential question/answer term coincidences were just as likely to impact on one side or the other, it is not considered that this, where it has occurred, has affected the results to a significant extent. The close similarity of Question 15 with the answer text in the experimental document suggests that not only is it desirable to formulate the questions before the headings so as to avoid possible direct influence of the latter over the former, but that each of these steps should be done by a different person to avoid subconscious influences. Additionally, a case may be made for checking the questions against the headings after both have been developed and making adjustments if required to rectify any coincidences that have inadvertently occurred. Neither of the latter arrangements was invoked in the present study. But even though artificial manipulation of the documents or the questions may be justifiable, at least tentatively, at the experimental level, documents implementing the proposed method must eventually operate in the real world. There does not seem to be any

## 'Introduction'.

Despite the apparent advantages in Question 15 for experimental group participants, one person in this group got this question wrong. In the control group, 8 people were wrong. However, given that 5 control respondents were correct, it is surmised that the relatively low accuracy in the control group for this question is due to the poor structure of the side and paragraph heading—that is, the difficulty exists within the control document, not in the difference between control and experimental documents. This is suggested by the ratio of the number of people who got Question 15 correct to the average number of people who got all other questions correct. For the experimental group, this ratio is 1.026 (12.0:11.7) and for the control group, 0.459 (5.0:10.9), indicating the question appeared very much like all other questions to experimental group participants but significantly different for those in the control group.

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practical way to control a person's formulation of their 'question' in the workplace or to amend the headings in documents in very large document stores so as not to coincide with these 'questions'. From the experimental point of view, it may have been desirable for the questions and headings to be composed by different people so as to more accurately replicate what occurs in practice. But even this would not guarantee that term question/answer coincidences would not occur. Given this, the experiment in this project is considered to have implemented a fairly true representation of what would occur in the workplace.

Ultimately, it is difficult to be sure why the relatively large differences between the groups for this and the other four 'high difference' questions has occurred. It is assumed the differences are attributable in part to human variability and in part to the effect of headings, where applicable. Leaving aside the difference in heading content, the conclusion is that the form of the questions and the source documents in total did not unfairly advantage or disadvantage participants in either group.

The inclusion of the NetMail document, which was a report rather than a procedure, was made to test whether the proposed method can be used for documents other than procedures. If Question 15 is omitted, the ratio of the average number of people who got all other NetMail questions correct to the average number of people who got all other questions correct is 1.008 (11:8:11.7) for the experimental group and 0.927 (10.2:11.0) for the control group. The ratio over both groups is 0.969. This is interpreted to mean that there is not much difference between reports and procedures when it comes to interpreting their content. Assuming other types of documents have a similar format and implement the same intention in regard to restricting interpretation, the conclusion is that the proposed method can be used for documents other than procedures.

The principal omission from the experiment was that the effect of main headings was not directly included in the test. While the experimental documents contained main headings, participants were directed to individual documents by use of a 'short name' and there was no need for participants to rely on the actual main heading to identify a document. As noted earlier, the original main headings were used for the main headings of the control documents either because one document was used in its original form or because in the other five, they were resurrected to provide context for insertion of 'any other' headings. There is minimal difference between the original main headings and those used in the experimental group documents. But it was felt anyway that the small size of the document collection enabled uncontrollable factors to be introduced. Because there were only six documents, factors other than the content of the main headings could have been brought into play by some participants but not others to avoid depending on document titles; for example, short term memory of document contents could have been invoked or arrangement of the documents in a particular sequence on the desk in front of the participant could have been used. It is felt that a reliable test of the effect of main headings would involve a much larger collection of documents, say 100 or more, which would preclude use of these assisting devices and oblige participants to evaluate the semantic content of the main headings each time a new document was scanned. The approach taken was to confine the experiment to intra-document heading effects—that is, use of side and paragraph headings only. It was considered this would still enable the predicted heading effects to be adequately tested but would at the same time remove the potentially distorting effect of additional time accrued in uncontrolled ways.

## Suggested areas for future research

**Extension to hypertactic levels:** Efficiencies could be obtained by extending the proposed method to the hypotactic levels which sit 'above' the immediate hypotaxis of individual documents. Many contemporary computer applications which utilise linked lists to provide access to online databases already have the programmatic arrangements to enable this to be done. Typically, such applications display hierarchical 'headings' but authors of such lists lack a consistent structural approach to accurately determine the contents. Extension of the proposed method would provide this approach. A typical application of this nature, Queensland Rail's Information Retriever, is illustrated in Figure 25.

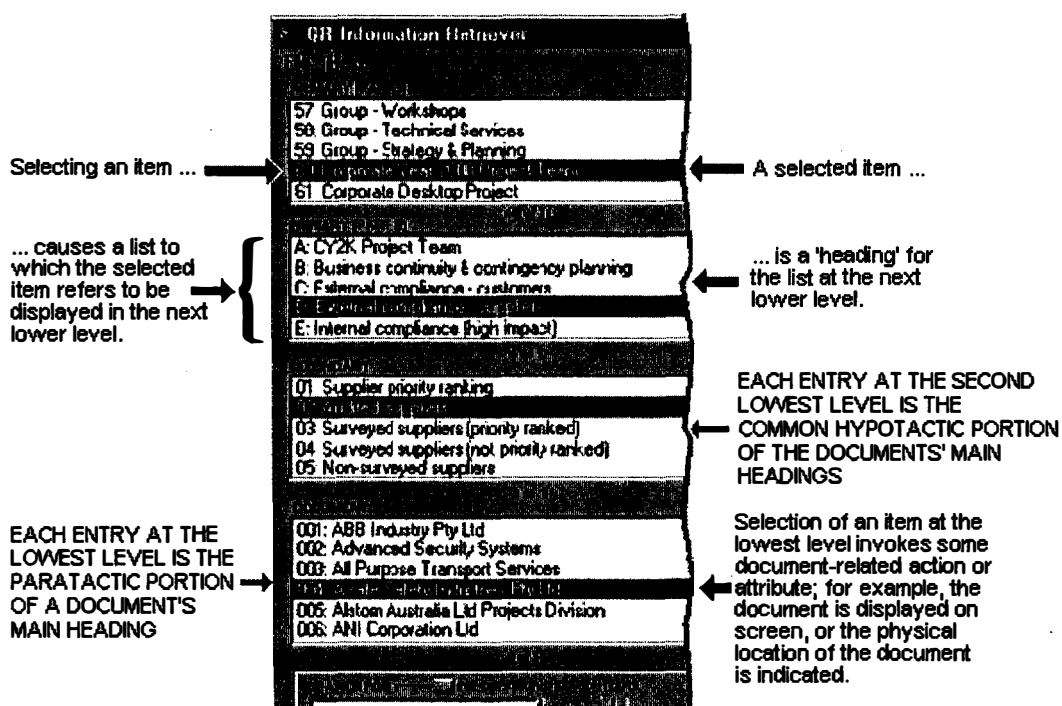


Figure 25 User interface screen of a typical 'linked list' application

In such applications, the entries in the 'detailed' level list (shown as the 'Document' window in Figure 25) would comprise the respective paratactic portions of the main headings of the documents. An entry in the lowest 'heading' level (shown as the 'Secondary' window in Figure 23) would be the hypotactic element that is common to the main headings of these documents. Additional

work would be necessary to build on the extended document model (as shown in Figure 8) to encompass this document hierarchy to form a 'documentation grammar'. Formalising the documentation hierarchy in this way, particularly if the hypotactic links are extended back to appropriate elements of the organisation's operational lifecycle, would provide a rigorous foundation for the organisation's information architecture and classification systems.

**Validating existing structured documents:** It may prove fruitful to investigate the use of the proposed method in areas where there is a requirement to minimise or confine qualitative interpretations such as in medical documentation or written military orders. Material produced in such areas is already highly refined and structured and often utilises special vocabularies. The proposed method, particularly in its emphasis on literally true headings, may provide a useful alternative method for establishing meaningful headings that are not likely to be misinterpreted.

**Identifying 'aboutness' of photographs:** Knowledge of the proposed method may be useful, in a methodological sense, in developing an approach to identify the aboutness of photographs. This is a notoriously difficult task but it has a number of basic similarities with written material in regard to intensional understanding and extensional interpretation. Typically, extensional approaches are employed—see for example, the 'action', 'facial expression' and 'concepts and feelings' indexing terms of Steemson (1997) and the proposal of O'Connor (1996) that the aboutness of a photograph is the sum of what various viewers think it is about. The problem with these types of approaches is that they seek to induce a universal description from one or more particular cases, a step which cannot be justified. This has a parallel in the indexing approaches of the documentationalists (see Belkin, 1980). The evidence from philosophical enquiry, where this difficulty is studied as the 'is/ought' gap or the 'fact/value' problem



(see, for example, Hare, 1963, 'Description and evaluation') is that this approach is fundamentally flawed. Given this, it is proposed that a photograph could be described in terms of what it records, not by an interpretation of what it records; that is, such descriptions must be 'of' the photograph, not 'about' it.

The methodology used in the current project may help practitioners working with photographs to narrow and focus their scope of inquiry. This could work in the following way. A distinction equivalent to that between expository and narrative texts needs to be made for photographs. Then, within the set of 'expository' photographs, further analysis is required to identify a type of photograph in which interpretation has to be narrowly confined; for example, photographs in a medical text book. A visually-oriented model equivalent to Calvino's 'event-consequence' perspective for written material (Figure 3) needs to be found to enable Brookes' theoretical concepts (Figure 2) to be utilised in the applied state. This would then be used to develop a representation of the 'thematic' hierarchy of a photograph independent of content meaning. Once this is done, the next step is to identify levels of meaning and to extract the essential theme-based aboutness at those levels.

## APPENDIX 1: DOCUMENTS USED BY THE CONTROL GROUP

This Appendix contains the following six procedures:

- Requirements for designing and using fume cupboards
- Processing a purchase requisition and obtaining a purchase order
- Handling, storing, packaging, preserving and delivering of goods
- Conducting internal quality audits
- Recommendation for corporation to participate in the 'First Look' scheme for MS-NetMail
- Conducting environmental audits.

The pagination of some of these procedures has been affected by their insertion into the thesis document. The margin measure for some paragraphs has been adjusted to maintain the same line numbers that were used in the experimental documents. Some procedures which contained a footer are included without that footer because they conflict with the footer of the thesis document. For the same reason, page numbers of the procedures are not included. However, the content upon which questions were based remains unchanged. The form of the footers that have been removed is shown in Figure 26.

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RESPONSIBLE OFFICER: R. HARTIGAN

APPROVED BY: .....NAME: R. McGUIGAN DESIGNATION: MANAGER PRODUCTION

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**Figure 26** *Example of document footers removed from the procedures displayed in the Appendices*

[ FUME CUPBOARD ]

LABORATORY HEALTH AND SAFETY PROCEDURE  
CORPCO-LABHAS-5250

June 1995

## Fume cupboards

### Contents

- Purpose of fume cupboards
- Types
- Locations
- Air extraction
- Containing fumes
- Discharging fumes
- Technical requirements
- Fire protection
- Lighting
- Label
- Use
- Inspection
- References.

### Purpose of fume cupboards

Fume cupboards are used for all laboratory procedures which have the potential to generate fumes, dusts or mists, especially those of a hazardous nature.

Fume cupboards enable fumes to be safely contained, then conveyed to an outside discharge point, where they can be dispersed at reduced concentrations.

Air extracted through a fume cupboard is not recirculated to other rooms.

### Types

A laboratory may include various types of fume cupboards such as:

- **Bench-type** A bench-type fume cupboard is constructed so that work can be enclosed by pulling down a vertically-sliding sash on the front of the cupboard.
- **Downdraught type** A downdraught fume cupboard allows air to be exhausted across the base of the fume cupboard, during processes where heavier than air fumes are generated.
- **Recirculating type** A recirculating fume cupboard is not recommended for unrestricted use.
- A recirculating fume cupboard is to be used with AS 2243.9- 1991.
- **By-pass type** A by-pass fume cupboard allows variable portion of the room air to flow into the working chamber, to prevent excessively high face velocities at low sash openings.

### Locations

Fume cupboards are to be located away from doorways, so that in the event of fire or explosion the exits do not become obstructed.

Positioning of other fume cupboards, traffic flow in the laboratory, and air extraction systems are to be considered in the design process. Obstacles such as walls,

43 benches and the access for maintenance also need to be considered, and are  
44 referred to more comprehensively in Section 5900 of these procedures.

45 Ideally, positioning of fume cupboards should be considered at the laboratory  
46 design stage.

## 47 **Air extraction**

48 **Extraction velocity** Fume cupboards must have a minimum face velocity of 0.5  
49 metre per second, with a reserve capability of at least 20% designed into the  
50 extraction system to cover loss of performance in service. This face velocity must be  
51 as uniform as possible across the sash opening.

52 Face velocities in excess of 1.0 m/s through a fully opened sash can lead to local  
53 turbulence in front of the operator, resulting in exposure to fumes and contaminants.

54 **Problems** When the operation of fume cupboards causes a significant change  
55 in the rate of air extraction from the room, fan-assisted make-up air may be  
56 required to restore airflow balance. A make-up distribution system must not  
57 disturb the fume cupboard airflow pattern or reduce its operational containment  
58 level.

## 59 **Containing fumes**

60 **Maximum containment** To achieve maximum containment of fumes, fume  
61 cupboards are to be as free from turbulence as possible.

62 **Turbulence** Partially closing the sash, reducing room turbulence and not storing  
63 large items in the fume cupboard reduces formation of eddies within the unit and  
64 reduces the risk of the operator being exposed to fumes.

65 If large pieces of equipment are to be used in the fume cupboard, place these on  
66 a platform that has a 2 - 5 centimeter clearance from the bench and which is  
67 located towards the back surface to achieve more efficient airflow and  
68 containment.

## 69 **Discharging fumes**

70 **Minimum discharge** The fume discharge should be at a minimum velocity of 10  
71 metres per second to minimise downwash on the leeward side of the stack in  
72 accordance with AS 2243.8 - 1992.

73 **Point of discharge** The point of discharge should be above the dynamic wake  
74 of the building and vertically upward (at least 3 metres), located as remote from  
75 air intakes as possible in accordance with AS 1668.2 - 1991.

## 76 **Technical requirements**

77 **Materials** All materials used in the construction of fume cupboards are resistant to  
78 any substances to be used in them, easy to clean and have a smooth, non-porous  
79 finish.

80 **Services** Services within a fume cupboard such as gas, electricity and water  
81 should be positioned to minimise the risk of fire or explosion. Services such as gas  
82 and water should be located inside the fume cupboard, preferably with the controls  
83 located externally and colour coded in accordance with AS 1345 - 1982.

84 **Electrical connections** As fume cupboards are classified as hazardous areas  
85 (according to AS 2430), electrical outlets are not located within the fume cupboard  
86 as they create an ignition source, are susceptible to corrosion from fumes and  
87 prevent safe manual wash down of the fume cupboard interior.

## 88 **Fire protection**

89 If a fixed fire protection system is installed in a building, it should be extended to  
90 the fume cupboard in accordance with AS 2243.8 - 1992.

## 91 **Lighting**

92 **Minimum** Lighting levels within the fume cupboard must give a minimum of  
93 400 lux illumination to the work area.

94 **Sources** Light sources must be designed so as not to be an ignition hazard or  
95 be able to be corroded by fumes.

## 96 **Label**

97 A permanent label must be affixed to each fume cupboard in a prominent  
98 position. The label must state:

- 99 • Identification number of the fume cupboard
- 100 • Model number of fume cupboard and name of manufacturer
- 101 • List of air-cleaning devices associated with the fume cupboard (for example,  
102 scrubbers).

## 103 **Use**

### 104 **Before use of the fume cupboard**

- 105 • Ensure the fume cupboard is clean and free from contamination
- 106 • Ensure the fume cupboard is working correctly using an airflow indicator. It is not  
107 enough to know that the fan is switched on.
- 108 • Ensure there is enough space in the fume cupboard for the proposed process to  
109 be carried out.
- 110 • Ensure that all equipment that is required fit into the fume cupboard at the same  
111 time does so. If practicable, place all equipment to be used inside fume cupboard  
112 before starting to verify this requirement.
- 113 • Ensure equipment is positioned towards the centre and back of the cupboard to  
114 reduce disturbance to the airflow at the working aperture?

### 115 **During use of the fume cupboard**

- 116 • Sash positions
- 117 • FULLY OPEN when setting up apparatus process or reagents
- 118 • PARTIALLY OPEN when handling hazardous substances inside the fume  
119 cupboard
- 120 • CLOSED or AS LOW AS POSSIBLE when the process is in operation.
- 121

- 121 • Use the minimum quantity of hazardous substances necessary for a particular  
122 process.
- 123 • Where practicable, use reaction rates which minimise hazards such as the  
124 production of excessive fumes or heat.
- 125 • When decanting hazardous substances from bulk stocks, use a decanting bench  
126 fitted with a local exhaust.

#### 127 **After use of the fume cupboard**

- 128 • Dispose of any hazardous waste in accordance with legislative requirements.
- 129 • Clean and decontaminate the fume cupboard.
- 130 • Lower the sash enough to minimise the effect of outside disturbances, while  
131 allowing a satisfactory air flow.

### 132 **Inspection**

133 **Power sources** During inspection or maintenance on a fume cupboard, the fume  
134 cupboard is to be isolated from the power source to prevent it being operated.

135 **Tags** During inspection or maintenance on a fume cupboard, the fume cupboard  
136 is to be tagged 'SYSTEM UNDER MAINTENANCE - DO NOT USE', and any  
137 chemicals in the fume cupboard are to be removed.

138 **Air cleaning** Air cleaning devices in fume cupboards are to be inspected and  
139 maintained in accordance with maintenance manuals on a weekly basis. Trapped  
140 contaminants are to be disposed of in accordance with legislative requirements.

141 **Maintenance operations** Half-yearly and annual testing and maintenance  
142 operations are to be conducted in accordance with AS 2243.8 - 1992. Where fume  
143 cupboards are used continuously, more frequent maintenance may be necessary.

144 **Maintenance details** Details of all testing and maintenance operations  
145 undertaken are to be recorded.

### 146 **References**

- 147 AS 1345- 1982 CCH Laboratory Safety Manual 1992.
- 148 AS 1668.2 - 1991 Identification of the contents of piping, conduits and ducts.
- 149 AS 2243.8 - 1992 Mechanical ventilation for acceptable indoor-air quality.
- 150 AS 2243.9 - 1991 Safety in laboratories - Fume cupboards.
- 151

[ PURCHASE ORDER ]

GTW 6.7.2/5

# Processing purchase requisition and obtaining an order

## Contents

1. Purpose
2. Scope
3. Definition
4. References
5. Method
6. Attachments.

### 1. Purpose

To maintain a standard approach for processing a purchase requisition and obtaining a purchase order.

### 2. Scope

Operation of a system for processing a purchase requisition and obtaining a purchase order for Strathville Site.

### 3. Definition

Not applicable.

### 4. References

- GTW 6.7.2 Application of the Procurement Manual: Strathville.
- GTW 6.7.2/3 Receipt of Purchase Requisition/Order Goods for Payment Via MACO.
- GTW 6.6.1/4 Receiving Purchase Order Deliveries.

### 5. Method

**Authority levels** Purchase Requisitions are approved by an officer with the appropriate financial delegation, as set out in the following table:

<i>Amount</i>	<i>Approving officer</i>
\$3,000	Senior Process Investigation Engineer/Principal Metallurgist
\$5,000	Strathville Site Superintendent
\$10,000	Chief Scientist/Chief Process and Combustion Engineer
\$80,000	Manager Technology

**Data Requirements** Enter the following details in chronological order into the 'Strathville Purchases Requisition Records' book:

- Purchase Requisition Number
- Supply Company
- Price
- Raised By
- Date.

**Direction of Purchase Requisition** To obtain a Purchase Order, forward the approved Purchase Requisition to Supply Section (Head Office).

**Urgent Order No. Allocation** To have an urgent Purchase Order number assigned, photocopy the duly completed and approved Purchase Requisition and fax this to Materials Supply Clerk (Supply Section), requesting an urgent purchase order number. (A copy of the fax cover sheet is kept in the cupboard next to the fax machine).

To obtain the urgent purchase order number, you must look it up using the MACO system on Screen P07 (see Procedure GTW 6.7.2/3 for Login Procedure). Advise the person who raised the Purchase Requisition of the purchase order number so that they can ring it through to the supplier. Advise the person who raised the Purchase Requisition that they are to inform the supplier that an official purchase order will arrive in the mail within a few days.

If the urgent purchase order is phoned through to the supplier, the original purchase requisition must be annotated with the words 'CONFIRMATION ONLY' before being forwarded by internal mail to the Supply Section.

**Order Record Maintenance** Upon receipt of the purchase order from Supply Section (Head Office), enter the purchase order number into the 'Strathville Purchase Requisition Records' book, beside the correct PR details.

As well, enter the following details from the purchase order into the 'Strathville Purchases by Section' book (left hand side of page):

- Order Number
- Number of different items
- Progressive number of items for the current month
- Total amount of order
- Progressive amount of orders for the current month.

**P.O. Distribution (Yellow)** The yellow copy (order advice copy 2) is endorsed with the purchase order number and forwarded to the person who raised the Purchase Requisition.

**Filing. Incomplete P.O.s** The pink (receipt advice copy 3) and white (assets control copy 4 and originator's copy 5) should be stapled to the purchase order and filed as follows:

- Purchase Orders for goods which will be received are stored in a tray marked 'incomplete orders', located in the stores receiving area.
- Purchase Orders for services are stored in a lever arch file marked 'incomplete orders', located on the shelf above the Material Supply Officer's desk.
- Purchase Orders for contracts (for example, lawn mowing - where 1 order covers approximately a year's work), are stored in the top tray on the left hand side of the Material Supply Officer's desk.

**Filing. Completed P.O.s** When all the goods/services have been supplied and the invoices have been receipted for payment, the completed purchase order shall be filed alphabetically in the lever arch files, located in the bookshelf adjacent to the Material Supply Officer's desk.



See also related procedures:

- For receipt of goods, see Procedure GTW 6.6.1/4.
- For receipt of invoice/s, see Procedure GTW 6.7.2/3.

## **6. Attachments**

Not applicable.

[ STORAGE OF GOODS ]



1 CORPORATE PROCEDURE FOR  
2 **Handling, storage, packaging, preservation**  
3 **and delivery**

4 PROCEDURE: CORP - MATL - 402

5 **Contents**

- 6 1. Purpose  
7 2. Scope  
8 3. Actions  
9 3.1 General  
10 3.2 Handling  
11 3.3 Storage  
12 3.3.1 General  
13 3.3.2 Entering storage  
14 3.3.3 Items in storage  
15 3.4 Packaging  
16 3.5 Preservation  
17 3.6 Delivery  
18 3.7 Records  
19 4. Definitions  
20 5. Reference Documentation.

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22 **1. Purpose**

23 To establish and document guidelines to manage and control the safe handling,  
24 storage, packaging, preservation and delivery of all goods processed by the stores  
25 facilities of CORPCO.

26 **2. Scope**

27 This procedure applies to the handling, storing, packaging, preserving and delivering of  
28 goods from the point of receipt through to and including the issue to the end user within  
29 the stores facilities of CORPCO.

30 **3. Actions**

31 **3.1 General**

32 Records shall be maintained of goods held within Department Stores that require  
33 special treatment, e.g. hazardous goods. Details shall include:

- 34 • handling and storage requirements

- storage location
- person(s) responsible for the handling and storage of the goods.

Personnel involved with the handling and storage of goods shall be advised of any special requirements Material Safety Data Sheets for those goods that require special treatment shall be made available.

Reference should also be made to the corporate procedure 'Dispatch for transport of dangerous goods'.

## 3.2 Handling

All personnel handling goods shall be responsible for ensuring that goods are handled in a manner that will:

- prevent damage and deterioration
- not compromise the safety of the handler.

Any equipment used to handle goods e.g. cranes, forklifts, lifting equipment shall be maintained and licensed in accordance with the manufacturer's recommendations, specific Corporate/Departmental Procedures and any Statutory Authority requirements. Only personnel licensed in accordance with the appropriate Statutory Authority's requirements shall operate specialised handling equipment. The details of the operator's licence shall be maintained in the Department's Training Records. Safe Working Practices and safety equipment shall be utilised as required when handling goods.

Should a supplier recommend the method in which goods are to be handled, then those recommendations shall be employed unless Department procedures pertinent to local site conditions determine otherwise. The advice contained in relevant Material Safety Data Sheets (MSDSs) shall be followed.

## 3.3 Storage

### 3.3.1 General

All specialised storage containers e.g. bulk storage containers, require current certification to be issued by the appropriate Authority. Goods are not to be stored in containers for which certification has expired.

All hazardous and dangerous goods are to be stored in clearly designated, marked and controlled areas in accordance with appropriate statutory requirements and departmental procedures. Flammable and combustible liquids shall be stored in properly maintained areas that will control any accidental leakage or escape of the liquids. Compressed gas cylinders shall be stored and handled in accordance with manufacturers' instructions. Incompatible liquids and gases shall not be stored together.

All goods shall be stored in designated areas that will ensure they are kept free from damage, deterioration or loss. The condition of stock shall be assessed at regular intervals, as determined by Department Procedures, to ensure any deterioration of items (including their preservation treatment) or the expiry of the storage life date is detected.

### 3.3.2 Entering storage

Goods shall only be accepted for formal storage after passing a Receiving Inspection, refer to CORP-MATL-401 (Receiving Inspection and Testing of Goods). After being cleared for use, the goods shall be subjected to receipt processing in accordance with the Department Procedures and the requirements of the corporate Inventory Management System. Where required, goods shall be suitably marked and/or labelled prior to being placed into storage.

### 3.3.3 Items in storage

Stock items shall be issued in accordance with departmental procedures and the requirements of the Corporate Inventory Management System. Goods are issued on a rotational basis to ensure that the oldest stock is used first, when this is required.

Appropriate controls (e.g. quarantining) shall be established to prevent the inadvertent issue/use of goods which are:

- reserved
- obsolete
- defective or damaged in any way.

## 3.4 Packaging

Goods for dispatch shall be packaged in a manner that will ensure they are delivered without damage. Any special packaging requirements detailed by the manufacturer or supplier of the goods shall be followed. Where the goods are identified as being hazardous or dangerous the appropriate handling and packaging measures in accordance with Corporate and Department procedures, statutory requirements, the Australian Dangerous Goods (ADG) Code and International Air Transport Association (IATA) Regulations shall be followed. Packaging shall be carried out by specialised personnel, if necessary.

Any treatment required to be carried out to the goods prior to packaging shall be carried out in accordance with appropriate procedures and/or standards.

All consignment documentation shall be completed and signed by authorised personnel prior to the goods being dispatched.

## 3.5 Preservation

Goods shall be maintained in good condition at all times from the point of receipt to the point of issue. Any special preservation requirements shall be specified by the officer responsible for the end use of the item. Should any preservation material/system be removed at any time it shall be reinstated to the original condition. Items that are 'broken down' into smaller lots shall have a level of preservation applied to them that is equivalent or better than the original.

Items returned to stock shall be inspected, if necessary, prior to placement into the store, to ensure the original standard of preservation is intact. Should preservation arrangements need replacing it shall be applied to the original standard of the item.

## 3.6 Delivery

Records of suitably qualified delivery organisations shall be established and maintained. Except in special circumstances, e.g. the requirement to use specialised freight equipment, deliveries shall be made by organisations selected from these records. Any special requirements for the carriage of goods e.g. handling, segregation, shall be conveyed to the driver *in writing*. Should the receiver of the goods specify any special requirement for the delivery, then those requirements shall be followed.

### **3.7 Records**

Records of all storage, packaging and consignment documentation shall be maintained in the appropriate location and for the appropriate period as determined in the Department Quality Records Register, refer to the Corporate Procedure CORP-QR-1 (Quality Records).

### **4. Definitions**

None.

### **5. Reference documentation**

CORP - QR -1            Quality Records Procedure  
CORP - MATL – 401    Receiving Inspection and Testing of Goods Procedure  
CORP – OHS-015      Dispatch for Transport of Dangerous Goods Procedure



# Internal quality audits

CORP-AUD-1

## Contents

1	1 Purpose
2	2 Scope
3	3 Actions
4	3.1 Responsibility for conduct of audits
5	3.2 Scheduling an audit
6	3.3 Registering an audit
7	3.4 Preparing for the audit
8	3.5 Performing the audit
9	3.6 Management Representative audits
10	3.7 Closing meeting
11	3.8 Reporting the audit
12	3.9 Audit follow-up and close out
13	4 Definitions
14	5 Reference documentation.

## 1 Purpose

The purpose of this procedure is to:

- Establish and maintain a system of planned and documented internal quality audits to verify that quality activities and results comply with planned arrangements
- Determine the effectiveness of the quality system.

## 2 Scope

This procedure applies to all internal quality audits carried out within CORPCO departments.

## 3 Actions

### 3.1 Responsibility for conduct of audits

**Authorising Officer** The Management Representative is responsible for ensuring that scheduled internal quality audits of corporate and departmental procedures are conducted.

**Administrative Oversight** Department managers are responsible for ensuring that scheduled internal quality audits of corporate and department procedures are conducted within their area of responsibility. The audits are conducted by suitably trained internal quality auditors with relevant process knowledge who are, where possible, independent of the area to be audited.

### 3.2 Internal audit schedule

**Approval of internal audit schedule** The Quality Coordinator (QC) establishes and maintains an Internal Audit Schedule for the department. The schedule is approved by the Department Manager or delegate.

**Basis of audit scheduling** Audits are scheduled on the basis of the status and importance of the business activity. Areas where quality problems or potential quality problems may exist may be audited more frequently at the discretion of the Department Manager, Department QC or Management Representative (MR).

45 **Timetable for audit** All Procedures and Work Instructions are audited as early as  
46 possible after implementation.

47 **3.3 Internal Audit Register**

48 The audit to be undertaken is identified in the Internal Audit Register. Details recorded  
49 in the Internal Audit Register are:

- 50 • Audit number
- 51 • Auditor's name
- 52 • Procedures audited
- 53 • Audit date
- 54 • Corrective Action Requests raised
- 55 • Audit Report issue date
- 56 • Name of officer issued with the Audit Report
- 57 • Audit close-out date.

58 **3.4 Role of auditor**

59 **Responsibility** The auditor is responsible for all aspects of the audit, including  
60 registration, preparation, performance and reporting in accordance with the  
61 requirements of this procedure.

62 **Preparation of audit checklist** The auditor must prepare an audit checklist form  
63 which may be either:

- 64 • A copy of the procedure to be audited (to be used as a checklist)
- 65 • A specific checklist of procedure based questions.

66 **3.5 Conduct of audit**

67 **Notification** The auditor advises the auditee (and the auditee's local Quality Controller  
68 and Section Leader if appropriate) of the intended audit, its scope and timing.

69 **Presentation of Evidence** The auditor reviews *objective* evidence to verify that each  
70 item on the checklist is being carried out in compliance with the procedure being audited.

71 **Compliance Procedures** Each item on the checklist is assigned a compliance rating  
72 and this compliance rating is recorded on the checklist. The compliance ratings to be  
73 used are shown in Figure 1.

<i>Compliance rating</i>	<i>Abbreviation of compliance rating used on audit checklist</i>	<i>Meaning of the compliance rating</i>
Satisfactory	S	The activity audited is in compliance with the procedure.
Improvement Possible	IP	An observation of where changes to the activity may result in an improvement to the process outcome.
Nonconforming	NC	The activity audited does not comply with the procedure.
Not applicable	NA	The activity to be audited was not applicable to the particular circumstances.
Not verified	NV	Objective evidence of compliance with the procedure was not sighted.

74 **Figure 1** Compliance ratings to be assigned to checklist items

75

LIBRARY

### 3.6 Audit Process

**Audit Period** Audits of each department are conducted on the authority of the Management Representative at intervals not exceeding 6 months to verify the effectiveness of the quality system.

**Scope of Audit** These audits are focussed on the Quality Controller's responsibilities and activities, and selected quality system 'measures' such as management review, internal auditing, and application of Corrective Action Requests. Auditing of selected procedures as a representative sample is a necessary component of this assessment.

**Audit Officers** Management Representative audits are conducted by qualified auditors from Quality Management Services (QMS). Any nonconformance found results in the issue of QMS-registered Corrective Action Request to the audited department's Quality Controller.

### 3.7 Audit Findings

At the discretion of the department Quality Controller, a closing meeting may be held on completion of the audit, between the auditor, auditee, Quality Controller and others (as determined by the Quality Controller), to discuss the findings of the audit.

### 3.8 Audit Report

**Content** When the audit is completed, the auditor prepares an Audit Report which includes:

- Summary of findings
- Details of any nonconformances found
- Observations of where improvements may be possible.

**Corrective Action Requests** The auditor raises Corrective Action Requests on the nonconformances found. (CORP-CPA-1: 'Corrective and Preventive Action' contains instructions on how to do this).

**Audit Record** The completed Audit Record consists of the Audit Report and the following attachments:

- Checklist
- Corrective Action Requests (if applicable)
- Any other supporting audit documentation.

**Authorising Officers** The completed Audit Report is signed by the auditor and by the Department Quality Controller after reviewing the completed Audit Report.

**Implementation** The Quality Controller processes any Corrective Action Requests raised on nonconformances and raises additional Corrective Action Requests on improvement possibilities when considered appropriate.

The Quality Controller forwards a copy of the Audit Report and attachments to the Department Manager or delegate, with the original placed on official file. (Requirements for this step are set out in CORP-QR-1 'Quality Records').

**Release of Report** The Management Representative has access to all Audit Reports through the Departmental Quality Controller.



115 **3.9 Audit Report Compliance**

116 **Corrective and Preventative Action** The Department's Quality Controller, and  
117 where appropriate, the Department Manager, ensure that immediate and preventive  
118 actions are effectively undertaken. Requirements for this step are set out in  
119 CORP-CPA-1 'Corrective and Preventive Action'.

120 The Quality Controller verifies that actions have been implemented and arrange follow  
121 up audits where required.

122 **Completion** The audit is closed-out on the Audit Register when the Quality Controller  
123 determines that all outstanding actions from the audit have been completed.

124 **4 Definitions**

125 None.

126 **5 Reference documentation**

Quality Records Procedure	CORP-QR-1
Corrective and Preventive Action Procedure	CORP-CPA-1
Internal Audit Register	Form S1755 (preferred format)
Internal Audit Schedule	Form S1751 (preferred format)
Audit Report	Form S1750 (preferred format)
Corrective Action Request	Form S1701 (preferred format)

127

[ NETMAIL ]

[Appendix A to this document is not included]

## Participation in the 'First Look' program for Microsoft NetMail

### Contents

1. Overview
2. Why the corporation should use NetMail
3. The 'First Look' scheme
4. Proposed architecture to implement 'First Look' scheme
5. Proposed strategy for implementation of 'First Look' scheme
6. Resources needed to implement 'First Look' scheme
7. Criteria for evaluating NetMail
8. Strategic issues
9. Cost of participation in 'First Look' scheme
10. Recommendation.

### 1. Overview

**MS-Mail is replaced by MS-NetMail** The Microsoft company has announced a replacement product for Microsoft Mail (MS-Mail), the electronic mail system currently used by our corporation. The new product is Microsoft NetMail (MS-NetMail or 'NetMail'), which is scheduled for release in about January 1996.

**Invitation to trial NetMail** The corporation has been invited by the Microsoft company to participate in a 'First Look' scheme to evaluate a beta-tested version of NetMail. This evaluation will allow early planning for the introduction of NetMail into our network if we decide to use the product. It is likely NetMail will provide important functionality that is missing in the current electronic mail system.

**Recommendation to trial NetMail** This memo recommends that the corporation participate in the 'First Look' program, and recommends the purchase of a suitable server platform for the evaluation.

### 2. Introduction to NetMail

**System requirements** The architecture and interfaces used by NetMail are identical in most respects to those described in the ISTP Electronic Messaging Architecture specification.

**Benefits** The current Microsoft Mail architecture does not provide full functionality. NetMail provides this missing functionality, as follows:

- The ability to access personal mail from a location other than your normal location without significant impact on the network. Currently, the load imposed on the network has a noticeable impact on users of other applications (for example, core applications).
- The ability to access personal mail via a low speed link, such as a dial-up connection for travelling users. Currently, it may take up to 10 minutes to open MS-Mail.

- 45 • The ability to run a mail client User Agent on Sun Workstations
- 46 • The ability to interoperate with other mail systems (such as the VMS-based
- 47 mail used by the Oracle core applications) using standard protocols to access
- 48 the Message Store and the Message Transfer Agent.
- 49 • The ability to manage Message Transfer Agents which may be located at
- 50 remote sites.

51 **Additional functions** Additional functionality provided by NetMail includes:

- 52 • The ability to include Rich Text features in mail messages (for example,
- 53 variable font styles and sizes, bold, underline and italic emphasis, and right,
- 54 left and centre justification).
- 55 • User-customisable views of files and folders.
- 56 • Rule-based filtering for the automated processing of pre-defined message types.

### 57 **3. The corporation as early adaptor**

58 **Introduction** The 'First Look' scheme is expected to be run over about 3

59 months, starting from the end of July 1995. During that time, the corporation is to

60 provide monthly feedback reports to Microsoft on the progress of the evaluation.

61 During the course of the scheme, the corporation will have access to Microsoft

62 Technical Support through their local support agents. It is understood that at the

63 end of the program but prior to the general release of the product, the corporation

64 will be able to continue to use the NetMail system.

65 **Advantages** By participating in the 'First Look' scheme, the corporation gains

66 the following advantages:

- 67 • An assessment of the relative costs and benefits of adopting the product is
- 68 available well before its general release onto the market
- 69 • Additional time for planning the best way to introduce the system into the
- 70 corporation's network is obtained
- 71 • Additional time to prepare the appropriate management and administrative
- 72 mechanisms is obtained.

73 **Technical Support Service** Praxa is one of a number of authorised Microsoft

74 Solution Providers in Australia. In Queensland, Praxa is the only solution provider

75 authorised to participate in the NetMail 'First Look' program. The corporation has

76 worked with Praxa on a number of other projects and found their level of service

77 and competence to be good.

78 **Key objectives** From the corporation's viewpoint, the scheme has 9 objectives:

- 79 1 To prove that NetMail delivers the functionality currently missing from the network.
- 80 2 To prove that NetMail is a stable product on which to build the corporation's
- 81 desktop messaging system.
- 82 3 To gauge the cost of introducing NetMail into the corporation.
- 83 4 To examine the architecture employed by NetMail and to establish X.400
- 84 interoperability with the X.400 components of the ISTP systems.
- 85 5 To evaluate the additional functionality delivered by NetMail.
- 86 6 To determine the architectural options for integrating NetMail into the ISTP
- 87 network (for example, NetMail database residing on an ISTP platform).
- 88 7 To gain a better understanding of the relative values of, and the relationships
- 89 between, the NetMail folder database, the traditional file systems used to
- 90 store MS Office documents, and SoftSolutions.

8 To gain an understanding of the NetMail directory database and its possible relationship with similar systems to be delivered within ISTP.

9 To produce an outline of the type of information to be held in the directory database and its possible uses.

It is *not* an objective of this project to investigate the support and management issues of using Microsoft NT as an application platform, nor is it proposed to prepare an information management plan accommodating both NetMail and SoftSolutions.

#### 4. System Set-up

It is proposed to set up an Intel-based NT server at Head Office, connected to the main PC LAN.

The server required for the NetMail evaluation is an Intel Pentium 90 with 48Mb memory and 1 Gigabyte of disk.

#### 5. Implementation Phases

Due to the complexity of the product, the strategy for the implementation will be prepared in conjunction with Praxa in order to clearly address the goals of the implementation, and to scope the evaluation project. For this reason, the full details of the implementation approach are not available yet.

At this time, it is anticipated that the implementation will follow 6 steps:

- 1 Initially, one or two dedicated Pathworks PCs will be used to establish and prove a stable NetMail environment.
- 2 Selected Pathworks clients will then have the new NetMail mail client installed, to enable them to participate in the evaluation. The NetMail system will be interfaced to the existing mail system so that participants in the NetMail evaluation can still have mail access to the rest of the network.
- 3 Administrative and system management aspects of the NT LAN Manager server will be resolved (for example, addition of LM user accounts and file store allocation/monitoring).
- 4 The group of users on NetMail will then be expanded to incorporate an entire workgroup (for example, ISD Computing Services or all of ISD).
- 5 Interoperability testing with ISTP X.400 systems will be performed.
- 6 Remote client access from dial-up connections, and across the WAN will be evaluated.

#### 6. Technical Support

**External** A prerequisite of participating in the project is a commitment to purchase 24 hours of support from Praxa. Praxa will then provide an additional 24 hours of support free of charge.

It is proposed that Praxa also be employed to establish the NT server platform (that is, to install and configure the operating system) prior to the 'First Look' program commencing. This is anticipated to be 1 days work.

**Internal** Some internal resourcing is required to establish system management and administration procedures for the NT system. However, this work will also be required for other NT based systems that the corporation is, or is about to, establish such as Microstation, IFPS, SMS, SoftSolutions etc and are not specifically included in this project.

**Timeline** The set up of the NetMail system is anticipated to take 1 working day. Involvement of the corporation staff is likely to be full time initially for a week or so,

such as Microstation, IFPS, SMS, SoftSolutions etc and are not specifically included in this project.

**Timeline** The set up of the NetMail system is anticipated to take 1 working day. Involvement of the corporation staff is likely to be full time initially for a week or so, reducing to half time, and then three or four hours a week for the remainder of the program. Resource estimates for the roll out of NetMail, should it be accepted as a product, will be performed when we have a better understanding of what is involved.

A rough estimate of the corporation's total resource requirements is 1 person from Network Services for 3 weeks total (spread over 15 weeks elapsed time).

## 7. Evaluation of the NetMail System

Five criteria will be used to evaluate NetMail:

- 1 The total system cost of NetMail will be estimated using the most appropriate NetMail configuration (dependent on the capabilities of the NetMail architecture) suited to the corporation. Examples of this could be a single NT server located at Head Office running NetMail alongside other applications (for example, SMS or SoftSolutions, or both), or at the other end of the scale, multiple dedicated NetMail servers at each site.
- 2 The bandwidth issue will be assessed by examining the demands made by NetMail on the Wide Area Network, and comparing them with that of the existing mail system. If there is significant reduction such that the addition of an additional 64kbps channel to a site can be avoided, then the cost of that 64kbps channel will be offset against the cost of NetMail.
- 3 The NetMail administration overheads will be compared to the existing regime. The expected reduction in labour will be costed and offset against the cost of the system.
- 4 The value of the needed, but as yet missing, functionality (for example, mail access over dial up links, mail access across the WAN, rule-based filtering, mail redirection, Rich Text format mail messages, and so on) is somewhat subjective and will probably demand a quick survey of client representatives to gauge the depth of need.
- 5 The system and management costs will be offset by sharing the NT platform with other applications (for example, SMS and SoftSolutions) if this proves to be technically possible, and the implementation of the other applications is determined to be likely.

Other evaluation criteria, such as the ability to remotely manage MTA functionality, will be factored into the analysis.

## 8. Benefits of the Change

**Significant Changes** The introduction of NetMail running on an NT server introduces some significant changes in direction from our current strategy for delivering desktop service to the corporation locations. Currently all desktop services are run on an Open VMS platform which is also likely to be running the core applications. To introduce an NT platform into this arrangement must mean either a new processor added to the site, or the conversion of one existing Alpha processor from Open VMS to NT. This latter approach would nullify any existing reliability/resilience features which are currently provided by VMS clustering technology (since there would no longer be a cluster). If we were to take the approach of adding a new processor to run NT and NetMail, the user would then have messaging-related data (public and shared folders) residing on the NT server, and other user data residing on the Pathworks Open VMS server. Although this may not cause problems for users of the system, it introduces additional complexity in

terms of system management and administration. It seems likely that the simplest, most easily managed solution is to move all of the user data, and the executables (for example, MS Office) to the NT server, thus re-establishing a single repository of desktop data. This approach would then dictate a more powerful platform than would otherwise have been required, but may fit well with any current plans to upgrade the existing processing power on site.

**Flow on implications** Moving all of the user data onto the NT platform has three significant flow on implications:

- 1 Although the reliability associated with VMS clustering would still be available for the core applications, the desktop would lose this functionality.
- 2 If all of the desktop is served from an NT platform, the only use for Pathworks would be to support client-connected printers. With some effort to introduce alternative printing arrangements for current client connected printers (for example, pocket print servers or Microsoft Workgroup networking), Pathworks could be removed from the network entirely (PCs and servers).
- 3 The existing administration tools for user account creation/modification, file store management, permission and so on, would need to be reworked so as to fit into the NT system management scheme.

**Potential implications** There is a possibility that the NetMail server process can access folders held on a Open VMS platform using SQL. This approach, although more complex, would give the best of both worlds—Microsoft NetMail functionality from the NT server and DEC reliability from the clustered VMS servers. This architecture will be explored as part of the evaluation.

## 9. Budget

The total estimated project expenditure for external and internal costs is \$24,000.

**External expenses** The estimated costs for external expenses are:

<i>Item</i>	<i>Cost</i>
Purchase of 24 hours of support from PRAXA for the NetMail program + 24 hours free support	\$3,000
Acquisition of a server designated in Appendix A-'Proposed Server'.	\$12,000
Purchase 8 hours of support from PRAXA for the set up of the pre-requisite NT server platform	\$1,000
<b>TOTAL EXTERNAL EXPENSES</b>	<b>\$16,000</b>

**Internal expenses** The estimated costs for internal expenses are:

<i>Item</i>	<i>Cost</i>
One person for 3 weeks	\$8,000
<b>TOTAL INTERNAL EXPENSES</b>	<b>\$8,000</b>

## 10. Recommendation

It is recommended that project approval be sought for the participation of the corporation in the Microsoft 'First Look' program as outlined above at a total cost of \$24,000.

[ ENVIRONMENTAL AUDIT ]

CORPCO

Procedure: CORP-ENVIRO-003

## Environmental audits

### Contents

- 1 Purpose
- 2 Scope
- 3 Actions
  - 3.1 Responsibility for audits
  - 3.2 Audit methodology
  - 3.3 Audit flowchart
  - 3.4 Compliance
  - 3.5 Reporting
  - 3.6 Corrective action implementation
- 4 Definitions
- 5 Reference documentation.

### 1 PURPOSE

The purpose of this procedure is to establish and maintain a comprehensive system of planned and documented environmental audits to verify that quality activities and results comply with planned arrangements and to determine the effectiveness of the environmental system.

### 2 SCOPE

This procedure applies to all environmental audits within CORPCO departments.

### 3 ACTIONS

#### 3.1 Responsibility for audits

The Chief Scientist is responsible for the performance of scheduled environmental audits within CORPCO and for ensuring that the audits are only undertaken by suitably trained and qualified environmental auditors.

Where possible, auditors are to be independent of the area to be audited.

#### 3.2 Audit methodology

**Schedule of audits** The Chief Scientist compiles the schedule for environmental audits for the each twelve month period, and submits this to the Management Committee for approval.

**Timing of environmental audits** The environmental audit schedule is of sufficient scope to ensure that all aspects of the environmental system are audited as early as possible after their implementation.

**Audit schedule weighting** Audits are scheduled on the basis of the status and importance of the activity under review.

**Non-scheduled audits** Areas where environmental issues or potential environmental issues may exist are audited more frequently at the discretion of the Chief Scientist or the Station Manager.

### 3.3 Audit flowchart

**Responsibility** The auditor is responsible for all aspects of the audit, including the preparation, performance and reporting in accordance with the requirements of this procedure.

**Allocation of number** The Chief Scientist allocates the next sequential audit number to each audit from the environmental Audit Register.

**Check list** The auditor prepares a checklist for the environmental audit. The format of the checklist may be one of the following:

- A copy of the procedure to be audited (to be used as a guide)
- A checklist of procedure-based questions.

### 3.4 Compliance

**Advice** The Chief Scientist advises the auditor of the intended audit, its scope and timing. The auditor then arranges the details of the audit with the auditee.

**Implementation** The auditor verifies by means of sighting objective evidence that work practices are being carried out in conformance with the procedure being audited.

**Method** The auditor marks the checklist with comments for each item, including an allocation of status of conformance. The status of conformance is shown as follows:

<b>Abbreviation</b>	<b>Status of conformance, and meaning</b>
S	Satisfactory - The activity audited is in compliance with the procedure.
IP	Improvement possible - The activity audited has some minor inconsistencies unlikely to affect the final outcome.
NC	Non-conforming - The activity audited does not comply with the procedure.
NA	Not applicable - The activity to be audited was not applicable in the particular circumstances.
NV	Not verified - Objective evidence of compliance with the procedure was not sighted.

### 3.5 Reporting

**Method** When the audit is completed, the auditor prepares an Audit Report, using the checklist as the basis of the report. The completed audit report consists of:

- Audit Report
- Checklist
- Corrective Action Requests (if applicable)
- Any other supporting audit documentation.

The completed Audit Report is forwarded to the Chief Scientist.

**Corrective Action Requests** The auditor prepares Corrective Action Requests for all areas identified as being not in conformance with the audited procedure. This includes areas which, though in line with the procedure, may have the potential to be an environmental issue.

Environmental Corrective Action Requests are raised in line with the procedure for Corrective and Preventive Action.



76 **Certification** The completed Audit Report is signed by the auditor, Station  
77 Manager and by the Chief Scientist.

78 **Release and recording of Audit Report** The Chief Scientist issues the Audit  
79 Report to the Auditee and the Management Committee, with a copy placed on a  
80 file pertinent to departmental audits.

### 81 **3.6 Corrective action implementation**

82 **Inception** Following the receipt of the Audit Report and Corrective Action  
83 Requests, the department manager ensures that corrective and preventive action  
84 is undertaken in accordance with the Corrective and Preventive Action  
85 procedure.

86 **Verification** The Chief Scientist verifies that the Corrective and Preventive  
87 actions have been implemented and arranges follow-up audits where required.

88 **Review** The Chief Scientist reviews Corrective Action Requests which have not been  
89 finalised (closed-out) after 2 months.

90 **Closure** When all the Corrective Action Requests arising from an audit have been  
91 closed out, the audit on the Audit Register is closed out by the Chief Scientist.

## 92 **4 DEFINITIONS**

93 None.

## 94 **5 REFERENCE DOCUMENTATION**

95 Audit Register Form QAS-13

96 Audit Report Form QAS-7

97 Corrective Action Request Form QAS-2

98 Corrective and Preventive Action procedure CORP-CPA-1

99 Internal Audit Schedule Form QAS-6

100 Quality Records procedure CORP-QR-1

## APPENDIX 2: DOCUMENTS USED BY THE EXPERIMENTAL GROUP

This Appendix contains the following six procedures:

- Requirements for designing and using fume cupboards
- Processing a purchase requisition and obtaining a purchase order
- Handling, storing, packaging, preserving and delivering of goods
- Conducting internal quality audits
- Recommendation for corporation to participate in the 'First Look' scheme for MS-NetMail
- Conducting environmental audits.

The pagination of some of these procedures has been affected by their insertion into the thesis document. The margin measure for some paragraphs has been adjusted to maintain the same line numbers that were used in the experimental documents. Some procedures which contained a footer are included without that footer because they conflict with the footer of the thesis document. For the same reason, page numbers of the procedures are not included. However, the content upon which questions were based remains unchanged. The form of the footers that have been removed is shown in Figure 26 in Appendix 1

[ FUME CUPBOARD ]

1 LABORATORY HEALTH AND SAFETY PROCEDURE  
2 CORPCO-LABHAS-5250  
3 June 1995

4 **Requirements for designing and using**  
5 **fume cupboards**

6 **Contents**

- 7 • Purpose of fume cupboards  
8 • Types of fume cupboards  
9 • Positioning of fume cupboards  
10 • Fume cupboard airflow systems  
11 • Minimisation of turbulence in fume cupboards  
12 • Discharge of fumes from fume cupboards  
13 • Design of fume cupboards  
14 • Fire protection in fume cupboards  
15 • Lighting in fume cupboards  
16 • Identification label required for fume cupboards  
17 • Using fume cupboards  
18 • Maintenance and testing of fume cupboards  
19 • References.

20 **Purpose of fume cupboards**

21 Fume cupboards are used for all laboratory procedures which have the potential to  
22 generate fumes, dusts or mists, especially those of a hazardous nature.

23 Fume cupboards enable fumes to be safely contained, then conveyed to an outside  
24 discharge point, where they can be dispersed at reduced concentrations.

25 Air extracted through a fume cupboard is not recirculated to other rooms.

26 **Types of fume cupboard**

27 A laboratory may include various types of fume cupboards such as:

- 28 • **Bench-type fume cupboard** A bench-type fume cupboard is constructed so  
29 that work can be enclosed by pulling down a vertically-sliding sash on the front of  
30 the cupboard.  
31 • **Downdraught fume cupboard** A downdraught fume cupboard allows air to be  
32 exhausted across the base of the fume cupboard, during processes where  
33 heavier than air fumes are generated.  
34 • **Recirculating fume cupboard** A recirculating fume cupboard is not  
35 recommended for unrestricted use.  
36 • A recirculating fume cupboard is to be used with AS 2243.9 - 1991.  
37 • **By-pass fume cupboard** A by-pass fume cupboard allows variable portion of  
38 the room air to flow into the working chamber, to prevent excessively high face  
39 velocities at low sash openings.

40 **Positioning of fume cupboards**

41 Fume cupboards are to be located away from doorways, so that in the event of fire  
42 or explosion the exits do not become obstructed.

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43 Positioning of other fume cupboards, traffic flow in the laboratory, and air extraction  
44 systems are to be considered in the design process. Obstacles such as walls,  
45 benches and the access for maintenance also need to be considered, and are  
46 referred to more comprehensively in Section 5900 of these procedures.

47 Ideally, positioning of fume cupboards should be considered at the laboratory  
48 design stage.

## 49 **Fume cupboard airflow systems**

50 **Face velocity required** Fume cupboards must have a minimum face velocity of  
51 0.5 metre per second, with a reserve capability of at least 20% designed into the  
52 extraction system to cover loss of performance in service. This face velocity must be  
53 as uniform as possible across the sash opening.

54 Face velocities in excess of 1.0 m/s through a fully opened sash can lead to local  
55 turbulence in front of the operator, resulting in exposure to fumes and  
56 contaminants.

57 **Fan assistance may be required** When the operation of fume cupboards  
58 causes a significant change in the rate of air extraction from the room, fan-  
59 assisted make-up air may be required to restore airflow balance. A make-up  
60 distribution system must not disturb the fume cupboard airflow pattern or reduce  
61 its operational containment level.

## 62 **Minimisation of turbulence in fume cupboards**

63 **Achieving maximum containment of fumes** To achieve maximum containment  
64 of fumes, fume cupboards are to be as free from turbulence as possible.

65 **Methods to reduce turbulence** Partially closing the sash, reducing room  
66 turbulence and not storing large items in the fume cupboard reduces formation of  
67 eddies within the unit and reduces the risk of the operator being exposed to fumes.

68 If large pieces of equipment are to be used in the fume cupboard, place these on a  
69 platform that has a 2 - 5 centimeter clearance from the bench and which is located  
70 towards the back surface to achieve more efficient airflow and containment.

## 71 **Discharge of fumes from fume cupboards**

72 **Minimum velocity** The fume discharge should be at a minimum velocity of 10  
73 metres per second to minimise downwash on the leeward side of the stack in  
74 accordance with AS 2243.8 - 1992.

75 **Location of point of discharge** The point of discharge should be above the  
76 dynamic wake of the building and vertically upward (at least 3 metres), located as  
77 remote from air intakes as possible in accordance with AS 1668.2 - 1991.

## 78 **Design of fume cupboards**

79 **Materials** All materials used in the construction of fume cupboards are resistant to  
80 any substances to be used in them, easy to clean and have a smooth, non-porous  
81 finish.

82 **Location of utility services** Services within a fume cupboard such as gas,  
83 electricity and water should be positioned to minimise the risk of fire or explosion.  
84 Services such as gas and water should be located inside the fume cupboard,  
85 preferably with the controls located externally and colour coded in accordance with  
86 AS 1345 - 1982.

87 **Location of electricity outlets** As fume cupboards are classified as hazardous  
88 areas (according to AS 2430), electrical outlets are not located within the fume  
89 cupboard as they create an ignition source, are susceptible to corrosion from fumes  
90 and prevent safe manual wash down of the fume cupboard interior.

## 91 **Fire protection in fume cupboards**

92 If a fixed fire protection system is installed in a building, it should be extended to  
93 the fume cupboard in accordance with AS 2243.8 - 1992.

## 94 **Lighting in fume cupboards**

95 **Minimum lighting level** Lighting levels within the fume cupboard must give a  
96 minimum of 400 lux illumination to the work area.

97 **Lighting not to be an ignition hazard** Light sources must be designed so as  
98 not to be an ignition hazard or be able to be corroded by fumes.

## 99 **Identification label required for fume cupboards**

100 A permanent label must be affixed to each fume cupboard in a prominent position.  
101 The label must state:

- 102 • Identification number of the fume cupboard
- 103 • Model number of fume cupboard and name of manufacturer
- 104 • List of air-cleaning devices associated with the fume cupboard (for example,  
105 scrubbers).

## 106 **Using fume cupboards**

### 107 **Before use of the fume cupboard**

- 108 • Ensure the fume cupboard is clean and free from contamination
- 109 • Ensure the fume cupboard is working correctly using an airflow indicator. It is not  
110 enough to know that the fan is switched on.
- 111 • Ensure there is enough space in the fume cupboard for the proposed process to  
112 be carried out.
- 113 • Ensure that all equipment that is required fit into the fume cupboard at the same  
114 time does so. If practicable, place all equipment to be used inside fume cupboard  
115 before starting to verify this requirement.
- 116 • Ensure equipment is positioned towards the centre and back of the cupboard to  
117 reduce disturbance to the airflow at the working aperture?

### 118 **During use of the fume cupboard**

- 119 • Sash positions
- 120 • FULLY OPEN when setting up apparatus process or reagents
- 121 • PARTIALLY OPEN when handling hazardous substances inside the fume  
122 cupboard
- 123 • CLOSED or AS LOW AS POSSIBLE when the process is in operation.
- 124 • Use the minimum quantity of hazardous substances necessary for a particular  
125 process.
- 126 • Where practicable, use reaction rates which minimise hazards such as the  
127 production of excessive fumes or heat.
- 128 • When decanting hazardous substances from bulk stocks, use a decanting bench  
129 fitted with a local exhaust.

### 130 **After use of the fume cupboard**

- 131 • Dispose of any hazardous waste in accordance with legislative requirements.
- 132 • Clean and decontaminate the fume cupboard.
- 133 • Lower the sash enough to minimise the effect of outside disturbances, while
- 134 allowing a satisfactory air flow.

## 135 **Maintenance and testing of fume cupboards**

136 **Isolate fume cupboard from power source during maintenance** During  
137 inspection or maintenance on a fume cupboard, the fume cupboard is to be isolated  
138 from the power source to prevent it being operated.

139 **Maintenance tag to be displayed** During inspection or maintenance on a fume  
140 cupboard, the fume cupboard is to be tagged 'SYSTEM UNDER MAINTENANCE -  
141 DO NOT USE', and any chemicals in the fume cupboard are to be removed.

142 **Inspection of air cleaning devices** Air cleaning devices in fume cupboards are  
143 to be inspected and maintained in accordance with maintenance manuals on a  
144 weekly basis. Trapped contaminants are to be disposed of in accordance with  
145 legislative requirements.

146 **Scheduled testing and maintenance** Half-yearly and annual testing and  
147 maintenance operations are to be conducted in accordance with AS 2243.8 - 1992.  
148 Where fume cupboards are used continuously, more frequent maintenance may be  
149 necessary.

150 **Details of testing and maintenance are to be recorded** Details of all testing and  
151 maintenance operations undertaken are to be recorded.

## 152 **References**

- 153 AS 1345- 1982 CCH Laboratory Safety Manual 1992.
- 154 AS 1668.2 - 1991 Identification of the contents of piping, conduits and ducts.
- 155 AS 2243.8 - 1992 Mechanical ventilation for acceptable indoor-air quality.
- 156 AS 2243.9 - 1991 Safety in laboratories - Fume cupboards.

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[ PURCHASE ORDER ]

GTW 6.7.2/5

# Processing a purchase requisition and obtaining a purchase order

## Contents

- 7. Purpose
- 8. Scope
- 9. Definition
- 10. References
- 11. Method
- 12. Attachments.

### 1. Purpose

To maintain a standard approach for processing a purchase requisition and obtaining a purchase order.

### 2. Scope

Operation of a system for processing a purchase requisition and obtaining a purchase order for Strathville Site.

### 3. Definition

Not applicable.

### 4. References

- GTW 6.7.2 Application of the Procurement Manual: Strathville.
- GTW 6.7.2/3 Receipt of Purchase Requisition/Order Goods for Payment Via MACO.
- GTW 6.6.1/4 Receiving Purchase Order Deliveries.

### 5. Method

**Authorisation** Purchase Requisitions are approved by an officer with the appropriate financial delegation, as set out in the following table:

<i>Amount</i>	<i>Approving officer</i>
\$3,000	Senior Process Investigation Engineer/Principal Metallurgist
\$5,000	Strathville Site Superintendent
\$10,000	Chief Scientist/Chief Process and Combustion Engineer
\$80,000	Manager Technology

**Recording approved Purchase Requisitions** Enter the following details in chronological order into the 'Strathville Purchases Requisition Records' book:

- Purchase Requisition Number
- Supply Company
- Price
- Raised By
- Date.

34 **Obtaining a Purchase Order** To obtain a Purchase Order, forward the approved  
35 Purchase Requisition to Supply Section (Head Office).

36 **Obtaining an urgent Purchase Order number** To have an urgent Purchase Order  
37 number assigned, photocopy the duly completed and approved Purchase Requisition and  
38 fax this to Materials Supply Clerk (Supply Section), requesting an urgent purchase order  
39 number. (A copy of the fax cover sheet is kept in the cupboard next to the fax machine).

40 To obtain the urgent purchase order number, you must look it up using the MACO system  
41 on Screen P07 (see Procedure GTW 6.7.2/3 for Login Procedure). Advise the person who  
42 raised the Purchase Requisition of the purchase order number so that they can ring it  
43 through to the supplier. Advise the person who raised the Purchase Requisition that they  
44 are to inform the supplier that an official purchase order will arrive in the mail within a few  
45 days.

46 If the urgent purchase order is phoned through to the supplier, the original purchase  
47 requisition must be annotated with the words 'CONFIRMATION ONLY' before being  
48 forwarded by internal mail to the Supply Section.

49 **Recording Purchase Order details** Upon receipt of the purchase order from Supply  
50 Section (Head Office), enter the purchase order number into the 'Strathville Purchase  
51 Requisition Records' book, beside the correct PR details.

52 As well, enter the following details from the purchase order into the 'Strathville Purchases  
53 by Section' book (left hand side of page):

- 54 • Order Number
- 55 • Number of different items
- 56 • Progressive number of items for the current month
- 57 • Total amount of order
- 58 • Progressive amount of orders for the current month.

## 59 **Filing of the Purchase Order and Purchase Requisition copies**

60 **Yellow copy forwarded to person who raised Purchase Requisition** The yellow copy  
61 (order advice copy 2) is endorsed with the purchase order number and forwarded to the  
62 person who raised the Purchase Requisition.

63 **Pink, white and originator's copy kept with Purchase Order** The pink (receipt advice  
64 copy 3) and white (assets control copy 4 and originator's copy 5) should be stapled to the  
65 purchase order and filed as follows:

- 66 • Purchase Orders for goods which will be received are stored in a tray marked  
67 'incomplete orders', located in the stores receiving area.
- 68 • Purchase Orders for services are stored in a lever arch file marked 'incomplete orders',  
69 located on the shelf above the Material Supply Officer's desk.
- 70 • Purchase Orders for contracts (for example, lawn mowing - where 1 order covers  
71 approximately a year's work), are stored in the top tray on the left hand side of the  
72 Material Supply Officer's desk.

73 **Completed Purchase Order filed alphabetically** When all the goods/services have  
74 been supplied and the invoices have been receipted for payment, the completed purchase  
75 order shall be filed alphabetically in the lever arch files, located in the bookshelf adjacent  
76 to the Material Supply Officer's desk.



7 See also related procedures:

- 8 • For receipt of goods, see Procedure GTW 6.6.1/4.
- 9 • For receipt of invoice/s, see Procedure GTW 6.7.2/3.

## 0 **6. Attachments**

1 Not applicable.

[ STORAGE OF GOODS ]



PROCEDURE: CORP - MATL - 402

# Handling, storing, packaging, preserving and delivering of goods

## Contents

6. Purpose
7. Scope
8. Special requirements for hazardous and dangerous goods
9. Handling of goods
10. Storage of goods
11. Preservation of goods in storage
12. Packaging of goods for delivery
13. Delivery of goods
14. Maintenance of goods records
15. Definitions
16. Reference documentation.

## 1. Purpose

To establish and document guidelines to manage and control the safe handling, storage, packaging, preservation and delivery of all goods processed by the stores facilities of CORPCO.

## 2. Scope

This procedure applies to the handling, storing, packaging, preserving and delivering of goods from the point of receipt from supplier to point of issue to end user.

## 3. Special requirements for hazardous and dangerous goods

**Details to be recorded on Material Safety Data Sheets** The following details of hazardous and dangerous goods held within Department stores are to be recorded on Material Safety Data Sheets:

- Handling and storage requirements
- Quantities held
- Storage location
- Person(s) responsible for the handling and storage of the goods.

**Staff to be advised of handling requirements for hazardous and dangerous goods** Personnel involved with the handling and storage of hazardous and dangerous goods are to be advised of any special requirements and are to be allowed access to the Material Safety Data Sheets for those goods.

See also the corporate procedure: Dispatch for transport of dangerous goods.

## 4. Handling of goods

**Responsibility for preventing damage and maintaining safety** Personnel handling goods are responsible for ensuring that goods are handled in a manner that:

- Prevents damage and deterioration
- Does not compromise the safety of the handler.

**Goods handling equipment to be appropriately licensed and maintained** Equipment used to handle goods (for example, cranes, forklifts and lifting equipment), is licensed and maintained in accordance with the manufacturer's recommendations, specific corporate or departmental procedures and any statutory requirements.

**Operators of goods handling equipment to be licensed** Only personnel licensed in accordance with the appropriate statutory authority's requirements may operate goods handling equipment. Details of the licence of an operator of goods handling equipment is maintained in the Department's training records.

**Safety practices to be utilised** Safe working practices and safety equipment are utilised as required when handling goods.

**Supplier's goods handling recommendations are to be followed** Should a supplier recommend the method in which goods are to be handled, then those recommendations are to be employed unless departmental procedures pertinent to local site conditions determine otherwise. The advice contained in relevant Material Safety Data Sheets (MSDSs) is to be followed.

## 5. Storage of goods

**Storage containers to be certified** Where required, specialised storage containers (for example, bulk storage containers) require current certification to be issued by the appropriate Authority. Goods are not to be stored in containers for which certification has expired.

**Storage of hazardous and dangerous goods** Hazardous and dangerous goods are to be stored in clearly designated, marked and controlled areas in accordance with appropriate statutory requirements and departmental procedures.

**Storage of flammable and combustible liquids** Flammable and combustible liquids are stored in properly maintained areas that are intended to control any **accidental leakage or escape of the liquids**.

**Storage of compressed gases** Compressed gas cylinders are stored and handled in accordance with manufacturers' instructions.

**Storage of incompatible materials** Incompatible liquids and gases are not stored together.

**Designated storage areas are to be used** Goods are stored in designated areas to ensure they are kept free from damage, deterioration or loss.

**Condition of stored goods is to be regularly assessed** The condition of stored goods is assessed at regular intervals, as determined by Department Procedures, to ensure any deterioration of items (including their preservation treatment) or the expiry of the storage life is detected.

78 **Received goods are to be inspected before acceptance for storage** Goods are  
79 accepted for formal storage after passing a 'Receiving Inspection' process (see CORP-  
80 MATL-401 'Receiving Inspection and Testing of Goods'). After being cleared for use,  
81 the goods are subjected to receipt processing in accordance with the Department  
82 Procedures and the requirements of the corporate Inventory Management System.  
83 Where required, goods are suitably marked or labelled prior to being placed into  
84 storage.

85 **Issue of goods from storage** Items in storage are issued in accordance with  
86 departmental procedures and the requirements of the Corporate Inventory  
87 Management System. Goods are issued on a rotational basis to ensure that the oldest  
88 stock is used first, when this is required.

89 **Controls are implemented to prevent some types of goods from being issued**  
90 Appropriate controls are established to prevent the inadvertent issue or use of goods  
91 which are:

- 92 • Reserved
- 93 • Obsolete
- 94 • Defective or damaged.

## 95 **6. Preservation of goods in storage**

96 **Condition of stored goods is to be appropriately maintained** Goods are  
97 maintained in good condition at all times from the point of receipt to the point of issue.  
98 Special preservation requirements may be specified by the officer responsible for the  
99 end use of the item.

100 **Original preservation arrangements to apply at all times** Should preservation  
101 arrangements be removed at any time, they are to be reinstated to the original  
102 condition.

103 Items that are 'broken down' into smaller lots have a level of preservation applied to  
104 them that is equivalent or better than the original.

105 **Original preservation arrangements to be re-instated for 'returned to stock'**  
106 **goods** Items returned to stock are to be inspected prior to placement into the store to  
107 ensure the original standard of preservation is intact. Should preservation  
108 arrangements need replacing, the new preservation arrangements are of the standard  
109 which applied originally to the item.

## 110 **7. Packaging of goods for delivery**

111 **Dispatched goods are packaged to prevent damage during delivery** Goods for  
112 dispatch are packaged in a manner that ensures they are delivered without damage.  
113 Special packaging requirements detailed by the manufacturer or supplier of the goods  
114 are followed.

115 Treatment required to be carried out to the goods prior to packaging is carried out in  
116 accordance with appropriate procedures or standards.

117 **Hazardous goods are packaged in accordance with all appropriate requirements**  
118 Where the goods are identified as being hazardous or dangerous, the appropriate  
119 handling and packaging measures in accordance with corporate and department  
120 procedures, statutory requirements, the Australian Dangerous Goods Code and  
121 International Air Transport Association Regulations are followed. Packaging is carried  
122 out by specialised personnel, if necessary.

123 **Consignment documentation to be completed by authorised personnel**  
124 Consignment documentation is completed and signed by authorised personnel prior to  
125 the goods being dispatched.

## 126 **8. Delivery of goods**

127 **Records of suitably qualified delivery organisations are maintained** Except in  
128 special circumstances (for example, the requirement to use specialised freight  
129 equipment), deliveries are made by organisations selected from these records.

130 **Instructions to delivery driver are to be in writing** Special requirements for the  
131 carriage of goods (for example, handling or segregation during transit) are to be  
132 conveyed to the driver in writing.

133 **Receiver's delivery requirements are to be followed** If the receiver of the goods  
134 specifies any requirements for the delivery, these requirements are to be followed.

## 135 **9. Maintenance of goods records**

136 Records of all storage, packaging and consignment documentation are maintained in  
137 the appropriate locations and for the appropriate period, as determined in the  
138 Department Quality Records Register. (See CORP-QR-1 'Quality Records').

## 139 **10. Definitions**

140 None.

## 141 **11. Reference documentation**

CORP - QR -1	Quality Records Procedure
CORP - MATL - 401	Receiving Inspection and Testing of Goods Procedure
CORP - OHS-015	Dispatch for Transport of Dangerous Goods Procedure

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LIBRARY

[ QUALITY AUDITS ]



# Conducting internal quality audits

CORP-AUD-1

## Contents

1	Purpose
2	Scope
3	Actions
3.1	Responsibility for conduct of audits
3.2	Scheduling an audit
3.3	Registering an audit
3.4	Preparing for the audit
3.5	Performing the audit
3.6	Management Representative audits
3.7	Closing meeting
3.8	Reporting the audit
3.9	Audit follow-up and close out
4	Definitions
5	Reference documentation.

## 1 PURPOSE

The purpose of this procedure is to:

- Establish and maintain a system of planned and documented internal quality audits to verify that quality activities and results comply with planned arrangements
- Determine the effectiveness of the quality system.

## 2 SCOPE

This procedure applies to all internal quality audits carried out within CORPCO departments.

## 3 ACTIONS

### 3.1 Responsibility for conduct of audits

**Responsibility for scheduled internal audits** The Management Representative is responsible for ensuring that scheduled internal quality audits of corporate and departmental procedures are conducted.

**Responsibility for departmental audits** Department managers are responsible for ensuring that scheduled internal quality audits of corporate and department procedures are conducted within their area of responsibility. The audits are conducted by suitably trained internal quality auditors with relevant process knowledge who are, where possible, independent of the area to be audited.

### 3.2 Scheduling an audit

**Establishing and approving of internal audit schedule** The Quality Coordinator (QC) establishes and maintains an Internal Audit Schedule for the department. The schedule is approved by the Department Manager or delegate.

**Basis of audit scheduling** Audits are scheduled on the basis of the status and importance of the business activity. Areas where quality problems or potential quality

43 problems may exist may be audited more frequently at the discretion of the Department  
44 Manager, Department QC or Management Representative (MR).

45 **Audit soon after implementation** All Procedures and Work Instructions are audited  
46 as early as possible after implementation.

### 47 **3.3 Registering an audit in the Internal Audit Register**

48 The audit to be undertaken is identified in the Internal Audit Register. Details recorded  
49 in the Internal Audit Register are:

- 50 • Audit number
- 51 • Auditor's name
- 52 • Procedures audited
- 53 • Audit date
- 54 • Corrective Action Requests raised
- 55 • Audit Report issue date
- 56 • Name of officer issued with the Audit Report
- 57 • Audit close-out date.

### 58 **3.4 Preparing for the audit**

59 **Auditor is responsible for all aspects of audit** The auditor is responsible for all  
60 aspects of the audit, including registration, preparation, performance and reporting in  
61 accordance with the requirements of this procedure.

62 **Auditor must prepare a checklist** The auditor must prepare an audit checklist form  
63 which may be either:

- 64 • A copy of the procedure to be audited (to be used as a checklist)
- 65 • A specific checklist of procedure based questions.

### 66 **3.5 Performing the audit**

67 **Auditor gives prior advice of audit** The auditor advises the auditee (and the  
68 auditee's local Quality Controller and Section Leader if appropriate) of the intended  
69 audit, its scope and timing.

70 **Auditor reviews objective evidence** The auditor reviews *objective* evidence to  
71 verify that each item on the checklist is being carried out in compliance with the  
72 procedure being audited.

73 **Each checklist item is assigned a compliance rating** Each item on the checklist is  
74 assigned a compliance rating and this compliance rating is recorded on the checklist.  
75 The compliance ratings to be used are shown in Figure 1.

<b>Compliance rating</b>	<b>Abbreviation of compliance rating used on audit checklist</b>	<b>Meaning of the compliance rating</b>
Satisfactory	S	The activity audited is in compliance with the procedure.
Improvement Possible	IP	An observation of where changes to the activity may result in an improvement to the process outcome.
Nonconforming	NC	The activity audited does not comply with the procedure.
Not applicable	NA	The activity to be audited was not applicable to the particular circumstances.
Not verified	NV	Objective evidence of compliance with the procedure was not sighted.

**Figure 1** Compliance ratings to be assigned to checklist items

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77



### 77 **3.6 Management Representative audits**

78 **Audit intervals not to exceed 6 months** Audits of each department are conducted  
79 on the authority of the Management Representative at intervals not exceeding 6  
80 months to verify the effectiveness of the quality system.

81 **Objective of audits** These audits are focussed on the Quality Controller's  
82 responsibilities and activities, and selected quality system 'measures' such as  
83 management review, internal auditing, and application of Corrective Action Requests.  
84 Auditing of selected procedures as a representative sample is a necessary component  
85 of this assessment.

86 **Audits undertaken by Quality Management Services** Management Representative  
87 audits are conducted by qualified auditors from Quality Management Services (QMS).  
88 Any nonconformance found results in the issue of QMS-registered Corrective Action  
89 Request to the audited department's Quality Controller.

### 90 **3.7 Closing meeting**

91 At the discretion of the department Quality Controller, a closing meeting may be held  
92 on completion of the audit, between the auditor, auditee, Quality Controller and others  
93 (as determined by the Quality Controller), to discuss the findings of the audit.

### 94 **3.8 Reporting the audit**

95 **Auditor prepares an Audit Report** When the audit is completed, the auditor  
96 prepares an Audit Report which includes:

- 97 • Summary of findings
- 98 • Details of any nonconformances found
- 99 • Observations of where improvements may be possible.

100 **Auditor raises Corrective Action Requests** The auditor raises Corrective Action  
101 Requests on the nonconformances found. (CORP-CPA-1: 'Corrective and Preventive  
102 Action' contains instructions on how to do this).

103 **What the completed Audit Report consists of** The completed Audit Record  
104 consists of the Audit Report and the following attachments:

- 105 • Checklist
- 106 • Corrective Action Requests (if applicable)
- 107 • Any other supporting audit documentation.

108 **Audit Report signed by auditor and departmental quality controller** The  
109 completed Audit Report is signed by the auditor and by the Department Quality  
110 Controller after reviewing the completed Audit Report.

111 **Processing of Audit Report by Quality Controller** The Quality Controller processes  
112 any Corrective Action Requests raised on nonconformances and raises additional  
113 Corrective Action Requests on improvement possibilities when considered appropriate.

114 The Quality Controller forwards a copy of the Audit Report and attachments to the  
115 Department Manager or delegate, with the original placed on official file. (Requirements  
116 for this step are set out in CORP-QR-1 'Quality Records').

117 **Management Representative has access to Audit Reports** The Management  
118 Representative has access to all Audit Reports through the Departmental Quality  
119 Controller.

120

120 **3.9 Audit follow-up and close out**

121 **Responsibility for ensuring actions are taken** The Department's Quality Controller,  
122 and where appropriate, the Department Manager, ensure that immediate and  
123 preventive actions are effectively undertaken. Requirements for this step are set out in  
124 CORP-CPA-1 'Corrective and Preventive Action'.

125 The Quality Controller verifies that actions have been implemented and arrange follow  
126 up audits where required.

127 **Close-out of the audit** The audit is closed-out on the Audit Register when the Quality  
128 Controller determines that all outstanding actions from the audit have been completed.

129 **4 DEFINITIONS**

130 None.

131 **5 REFERENCE DOCUMENTATION**

Quality Records Procedure	CORP-QR-1
Corrective and Preventive Action Procedure	CORP-CPA-1
Internal Audit Register	Form S1755 (preferred format)
Internal Audit Schedule	Form S1751 (preferred format)
Audit Report	Form S1750 (preferred format)
Corrective Action Request	Form S1701 (preferred format)

[ NETMAIL ]

[Appendix A to this document is not included]

## Recommendation for corporation to participate in the 'First Look' scheme for MS-NetMail

### Contents

11. Overview
12. Why the corporation should use NetMail
13. The 'First Look' scheme
14. Proposed architecture to implement 'First Look' scheme
15. Proposed strategy for implementation of 'First Look' scheme
16. Resources needed to implement 'First Look' scheme
17. Criteria for evaluating NetMail
18. Strategic issues
19. Cost of participation in 'First Look' scheme
20. Recommendation.

### 1. Overview

**MS-Mail is replaced by MS-NetMail** The Microsoft company has announced a replacement product for Microsoft Mail (MS-Mail), the electronic mail system currently used by our corporation. The new product is Microsoft NetMail (MS-NetMail or 'NetMail'), which is scheduled for release in about January 1996.

**'First Look' scheme to evaluate MS-NetMail** The corporation has been invited by the Microsoft company to participate in a 'First Look' scheme to evaluate a beta-tested version of NetMail. This evaluation will allow early planning for the introduction of NetMail into our network if we decide to use the product. It is likely NetMail will provide important functionality that is missing in the current electronic mail system.

**Participation of corporation in 'First Look' scheme is recommended** This memo recommends that the corporation participate in the 'First Look' program, and recommends the purchase of a suitable server platform for the evaluation.

### 2. Why the corporation should use NetMail

**NetMail is compatible with current messaging architecture and interfaces** The architecture and interfaces used by NetMail are identical in most respects to those described in the ISTP Electronic Messaging Architecture specification.

**NetMail provides more functionality than MS-Mail** The current Microsoft Mail architecture does not provide full functionality. NetMail provides this missing functionality, as follows:

- The ability to access personal mail from a location other than your normal location without significant impact on the network. Currently, the load imposed on the network has a noticeable impact on users of other applications (for example, core applications).
- The ability to access personal mail via a low speed link, such as a dial-up connection for travelling users. Currently, it may take up to 10 minutes to open MS-Mail.

- 43 • The ability to redirect mail to another recipient (for example, when going on leave).
- 44 • The ability to run a mail client User Agent on Sun Workstations
- 45 • The ability to interoperate with other mail systems (such as the VMS-based
- 46 mail used by the Oracle core applications) using standard protocols to access
- 47 the Message Store and the Message Transfer Agent.
- 48 • The ability to manage Message Transfer Agents which may be located at
- 49 remote sites.

50 **NetMail provides additional functionality** Additional functionality provided by  
51 NetMail includes:

- 52 • The ability to include Rich Text features in mail messages (for example,
- 53 variable font styles and sizes, bold, underline and italic emphasis, and right,
- 54 left and centre justification).
- 55 • User-customisable views of files and folders.
- 56 • Rule-based filtering for the automated processing of pre-defined message types.

### 57 **3. The 'First Look' scheme**

58 **How the 'First Look' scheme works** The 'First Look' scheme is expected to  
59 be run over about 3 months, starting from the end of July 1995. During that time,  
60 the corporation is to provide monthly feedback reports to Microsoft on the  
61 progress of the evaluation.

62 During the course of the scheme, the corporation will have access to Microsoft  
63 Technical Support through their local support agents. It is understood that at the  
64 end of the program but prior to the general release of the product, the corporation  
65 will be able to continue to use the NetMail system.

- 66 • **Advantages in participating in the 'First Look' scheme** By participating in  
67 the 'First Look' scheme, the corporation gains the following advantages:
- 68 • An assessment of the relative costs and benefits of adopting the product is  
69 available well before its general release onto the market
- 70 • Additional time for planning the best way to introduce the system into the  
71 corporation's network is obtained
- 72 • Additional time to prepare the appropriate management and administrative  
73 mechanisms is obtained.

74 **Local support for NetMail is provided by Praxa** Praxa is one of a number of  
75 authorised Microsoft Solution Providers in Australia. In Queensland, Praxa is the  
76 only solution provider authorised to participate in the NetMail 'First Look'  
77 program. The corporation has worked with Praxa on a number of other projects  
78 and found their level of service and competence to be good.

79 **Objectives of the 'First Look' scheme** From the corporation's viewpoint, the  
80 scheme has 9 objectives:

- 81 1 To prove that NetMail delivers the functionality currently missing from the network.
- 82 2 To prove that NetMail is a stable product on which to build the corporation's  
83 desktop messaging system.
- 84 3 To gauge the cost of introducing NetMail into the corporation.
- 85 4 To examine the architecture employed by NetMail and to establish X.400  
86 interoperability with the X.400 components of the ISTP systems.
- 87 5 To evaluate the additional functionality delivered by NetMail.

- 88 6 To determine the architectural options for integrating NetMail into the ISTP  
89 network (for example, NetMail database residing on an ISTP platform).
- 90 7 To gain a better understanding of the relative values of, and the relationships  
91 between, the NetMail folder database, the traditional file systems used to  
92 store MS Office documents, and SoftSolutions.
- 93 8 To gain an understanding of the NetMail directory database and its possible  
94 relationship with similar systems to be delivered within ISTP.
- 95 9 To produce an outline of the type of information to be held in the directory  
96 database and its possible uses.

97 It is *not* an objective of this project to investigate the support and management issues  
98 of using Microsoft NT as an application platform, nor is it proposed to prepare an  
99 information management plan accommodating both NetMail and SoftSolutions.

#### 100 **4. Proposed architecture to implement 'First Look' scheme**

101 It is proposed to set up an Intel-based NT server at Head Office, connected to the  
102 main PC LAN.

103 The server required for the NetMail evaluation is an Intel Pentium 90 with 48Mb  
104 memory and 1 Gigabyte of disk.

#### 105 **5. Proposed strategy for implementation of 'First Look' 106 scheme**

107 Due to the complexity of the product, the strategy for the implementation will be  
108 prepared in conjunction with Praxa in order to clearly address the goals of the  
109 implementation, and to scope the evaluation project. For this reason, the full  
110 details of the implementation approach are not available yet.

111 At this time, it is anticipated that the implementation will follow 6 steps:

- 112 7 Initially, one or two dedicated Pathworks PCs will be used to establish and  
113 prove a stable NetMail environment.
- 114 8 Selected Pathworks clients will then have the new NetMail mail client  
115 installed, to enable them to participate in the evaluation. The NetMail system  
116 will be interfaced to the existing mail system so that participants in the  
117 NetMail evaluation can still have mail access to the rest of the network.
- 118 9 Administrative and system management aspects of the NT LAN Manager  
119 server will be resolved (for example, addition of LM user accounts and file  
120 store allocation/monitoring).
- 121 10 The group of users on NetMail will then be expanded to incorporate an entire  
122 workgroup (for example, ISD Computing Services or all of ISD).
- 123 11 Interoperability testing with ISTP X.400 systems will be performed.
- 124 12 Remote client access from dial-up connections, and across the WAN will be  
125 evaluated.

#### 126 **6. Resources needed to implement 'First Look' scheme**

127 **Praxa provides support** A prerequisite of participating in the project is a  
128 commitment to purchase 24 hours of support from Praxa. Praxa will then provide  
129 an additional 24 hours of support free of charge.

130 **Praxa establishes NT server platform** It is proposed that Praxa also be  
131 employed to establish the NT server platform (that is, to install and configure the  
132 operating system) prior to the 'First Look' program commencing. This is  
133 anticipated to be 1 days work.

134 **Internal system management and administration procedures** Some internal  
135 resourcing is required to establish system management and administration  
136 procedures for the NT system. However, this work will also be required for other NT  
137 based systems that the corporation is, or is about to, establish such as Microstation,  
138 IFPS, SMS, SoftSolutions etc and are not specifically included in this project.

139 **Corporate staff resources required** The set up of the NetMail system is  
140 anticipated to take 1 working day. Involvement of the corporation staff is likely to  
141 be full time initially for a week or so, reducing to half time, and then three or four  
142 hours a week for the remainder of the program. Resource estimates for the roll  
143 out of NetMail, should it be accepted as a product, will be performed when we  
144 have a better understanding of what is involved.

145 A rough estimate of the corporation's total resource requirements is 1 person  
146 from Network Services for 3 weeks total (spread over 15 weeks elapsed time).

## 147 **7. Criteria for evaluating NetMail**

148 Five criteria will be used to evaluate NetMail:

149 6 The total system cost of NetMail will be estimated using the most appropriate  
150 NetMail configuration (dependent on the capabilities of the NetMail  
151 architecture) suited to the corporation. Examples of this could be a single NT  
152 server located at Head Office running NetMail alongside other applications  
153 (for example, SMS or SoftSolutions, or both), or at the other end of the scale,  
154 multiple dedicated NetMail servers at each site.

155 7 The bandwidth issue will be assessed by examining the demands made by  
156 NetMail on the Wide Area Network, and comparing them with that of the  
157 existing mail system. If there is significant reduction such that the addition of  
158 an additional 64kbps channel to a site can be avoided, then the cost of that  
159 64kbps channel will be offset against the cost of NetMail.

160 8 The NetMail administration overheads will be compared to the existing  
161 regime. The expected reduction in labour will be costed and offset against the  
162 cost of the system.

163 9 The value of the needed, but as yet missing, functionality (for example, mail  
164 access over dial up links, mail access across the WAN, rule-based filtering,  
165 mail redirection, Rich Text format mail messages, and so on) is somewhat  
166 subjective and will probably demand a quick survey of client representatives  
167 to gauge the depth of need.

168 10 The system and management costs will be offset by sharing the NT platform  
169 with other applications (for example, SMS and SoftSolutions) if this proves to  
170 be technically possible, and the implementation of the other applications is  
171 determined to be likely.

172 Other evaluation criteria, such as the ability to remotely manage MTA  
173 functionality, will be factored into the analysis.

## 174 **8. Strategic issues**

175 **Changes to current server architecture indicated** The introduction of NetMail  
176 running on an NT server introduces some significant changes in direction from our  
177 current strategy for delivering desktop service to the corporation locations. Currently  
178 all desktop services are run on an Open VMS platform which is also likely to be  
179 running the core applications. To introduce an NT platform into this arrangement must  
180 mean either a new processor added to the site, or the conversion of one existing  
181 Alpha processor from Open VMS to NT. This latter approach would nullify any  
182 existing reliability/resilience features which are currently provided by VMS clustering

183 technology (since there would no longer be a cluster). If we were to take the approach  
 184 of adding a new processor to run NT and NetMail, the user would then have  
 185 messaging-related data (public and shared folders) residing on the NT server, and  
 186 other user data residing on the Pathworks Open VMS server. Although this may not  
 187 cause problems for users of the system, it introduces additional complexity in terms of  
 188 system management and administration. It seems likely that the simplest, most easily  
 189 managed solution is to move all of the user data, and the executables (for example,  
 190 MS Office) to the NT server, thus re-establishing a single repository of desktop data.  
 191 This approach would then dictate a more powerful platform than would otherwise  
 192 have been required, but may fit well with any current plans to upgrade the existing  
 193 processing power on site.

194 **Implications of server architecture changes** Moving all of the user data onto  
 195 the NT platform has three significant flow on implications:.

- 196 4 Although the reliability associated with VMS clustering would still be available  
 197 for the core applications, the desktop would lose this functionality.
- 198 5 If all of the desktop is served from an NT platform, the only use for Pathworks  
 199 would be to support client-connected printers. With some effort to introduce  
 200 alternative printing arrangements for current client connected printers (for  
 201 example, pocket print servers or Microsoft Workgroup networking), Pathworks  
 202 could be removed from the network entirely (PCs and servers).
- 203 6 The existing administration tools for user account creation/modification, file  
 204 store management, permission and so on, would need to be reworked so as  
 205 to fit into the NT system management scheme.

206 **Resolving server architecture changes** There is a possibility that the NetMail  
 207 server process can access folders held on a Open VMS platform using SQL. This  
 208 approach, although more complex, would give the best of both worlds—Microsoft  
 209 NetMail functionality from the NT server and DEC reliability from the clustered  
 210 VMS servers. This architecture will be explored as part of the evaluation.

211 **9. Cost of participation in 'First Look' scheme**

212 The total estimated project expenditure for external and internal costs is \$24,000.

213 **External expenses** The estimated costs for external expenses are:

<i>Item</i>	<i>Cost</i>
Purchase of 24 hours of support from PRAXA for the NetMail program + 24 hours free support	\$3,000
Acquisition of a server designated in Appendix A-'Proposed Server'.	\$12,000
Purchase 8 hours of support from PRAXA for the set up of the pre-requisite NT server platform	\$1,000
<b>TOTAL EXTERNAL EXPENSES</b>	<b>\$16,000</b>

214 **Internal expenses** The estimated costs for internal expenses are:

<i>Item</i>	<i>Cost</i>
One person for 3 weeks	\$8,000
<b>TOTAL INTERNAL EXPENSES</b>	<b>\$8,000</b>

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## 10. Recommendation

It is recommended that project approval be sought for the participation of the corporation in the Microsoft 'First Look' program as outlined above at a total cost of \$24,000.

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[ ENVIRONMENTAL AUDIT ]

CORPCO

Procedure: CORP-ENVIRO-003

# Conducting environmental audits

## Contents

- 1 Purpose
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  - 3.1 Responsibility for audits
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## 1 PURPOSE

The purpose of this procedure is to establish and maintain a comprehensive system of planned and documented environmental audits to verify that quality activities and results comply with planned arrangements and to determine the effectiveness of the environmental system.

## 2 SCOPE

This procedure applies to all environmental audits within CORPCO departments.

## 3 ACTIONS

### 3.1 Responsibility for audits

The Chief Scientist is responsible for the performance of scheduled environmental audits within CORPCO and for ensuring that the audits are only undertaken by suitably trained and qualified environmental auditors.

Where possible, auditors are to be independent of the area to be audited.

### 3.2 Scheduling of environmental audits

**Initiation of environmental audit schedule** The Chief Scientist compiles the schedule for environmental audits for the each twelve month period, and submits this to the Management Committee for approval.

**Timing of environmental audits** The environmental audit schedule is of sufficient scope to ensure that all aspects of the environmental system are audited as early as possible after their implementation.

**Basis of audit schedule** Audits are scheduled on the basis of the status and importance of the activity under review.

**Environmentally sensitive areas may be audited more frequently** Areas where environmental issues or potential environmental issues may exist are audited more frequently at the discretion of the Chief Scientist or the Station Manager.

41 **3.3 Preparing for environmental audits**

42 **Responsibility** The auditor is responsible for all aspects of the audit, including  
43 the preparation, performance and reporting in accordance with the requirements  
44 of this procedure.

45 **Assigning an audit number** The Chief Scientist allocates the next sequential  
46 audit number to each audit from the environmental Audit Register.

47 **Preparing the environmental audit check list** The auditor prepares a checklist  
48 for the environmental audit. The format of the checklist may be one of the following:

- 49 • A copy of the procedure to be audited (to be used as a guide)  
50 • A checklist of procedure-based questions.

51 **3.4 Conducting environmental audits**

52 **Notification of environmental audit** The Chief Scientist advises the auditor of  
53 the intended audit, its scope and timing. The auditor then arranges the details of  
54 the audit with the auditee.

55 **Conformance to procedure is verified by sighting objective evidence** The  
56 auditor verifies by means of sighting objective evidence that work practices are  
57 being carried out in conformance with the procedure being audited.

58 **Each checklist item is assigned a compliance rating** The auditor marks the  
59 checklist with comments for each item, including an allocation of status of  
60 conformance. The status of conformance is shown as follows:

<i>Abbreviation</i>	<i>Status of conformance, and meaning</i>
S	Satisfactory - The activity audited is in compliance with the procedure.
IP	Improvement possible - The activity audited has some minor inconsistencies unlikely to affect the final outcome.
NC	Non-conforming - The activity audited does not comply with the procedure.
NA	Not applicable - The activity to be audited was not applicable in the particular circumstances.
NV	Not verified - Objective evidence of compliance with the procedure was not sighted.

61  
62 **3.5 Reporting of environmental audits**

63 **Audit Report to be written by auditor and forwarded to Chief Scientist**  
64 When the audit is completed, the auditor prepares an Audit Report, using the  
65 checklist as the basis of the report. The completed audit report consists of:

- 66 • Audit Report  
67 • Checklist  
68 • Corrective Action Requests (if applicable)  
69 • Any other supporting audit documentation.

70 The completed Audit Report is forwarded to the Chief Scientist.

71 **Corrective Action Requests to be raised by auditor** The auditor prepares  
72 Corrective Action Requests for all areas identified as being not in conformance  
73 with the audited procedure. This includes areas which, though in line with the  
74 procedure, may have the potential to be an environmental issue.

75 Environmental Corrective Action Requests are raised in line with the procedure  
76 for Corrective and Preventive Action.

77 **Environmental Audit Report is signed by auditor, Station Manager and**  
78 **Chief Scientist** The completed Audit Report is signed by the auditor, Station  
79 Manager and by the Chief Scientist.

80 **Distribution of Audit Report** The Chief Scientist issues the Audit Report to the  
81 Auditee and the Management Committee, with a copy placed on a file pertinent to  
82 departmental audits.

### 83 **3.6 Following-up audits**

84 **Implementation of Corrective Action Requests** Following the receipt of the  
85 Audit Report and Corrective Action Requests, the department manager ensures  
86 that corrective and preventive action is undertaken in accordance with the  
87 Corrective and Preventive Action procedure.

88 **Verification of implementation of Corrective Action Requests** The Chief  
89 Scientist verifies that the Corrective and Preventive actions have been  
90 implemented and arranges follow-up audits where required.

91 **Corrective Action Requests more than 2 months old** The Chief Scientist reviews  
92 Corrective Action Requests which have not been finalised (closed-out) after 2 months.

93 **Closing-out the Audit** When all the Corrective Action Requests arising from an audit  
94 have been closed out, the audit on the Audit Register is closed out by the Chief Scientist.

## 95 **4 DEFINITIONS**

96 None.

## 97 **5 REFERENCE DOCUMENTATION**

98 Audit Register Form QAS-13

99 Audit Report Form QAS-7

100 Corrective Action Request Form QAS-2

101 Corrective and Preventive Action procedure CORP-CPA-1

102 Internal Audit Schedule Form QAS-6

103 Quality Records procedure CORP-QR-1

104

## APPENDIX 3: DOCUMENT USED BY ALL PARTICIPANTS IN THE TRIAL RUN

This Appendix contains one procedure: Signing of contractual correspondence by authorised personnel.

The original footer of this document is not displayed.

[ CORRESPONDENCE ]



[The exhibits for this document are not included]

PROJECTS DIVISION PROCEDURE FOR

## Signing of contractual correspondence by authorised personnel

PD-DOC-04

### 1. Purpose

To standardise practices which ensure only authorised personnel sign contractual correspondence (letters and facsimiles), and that the correspondence complies with CORPCO Australia Standards Manual for Production of Documents.

### 2. Scope

This procedure applies to all staff who act as an author or signatory of letters and facsimiles during the duration of a project.

### 3. Action

#### 3.1 Composition of letters and facsimiles

Letters and facsimiles are to be written:

- In third person;
- Avoiding personal names;
- Clear and concise;
- Non-dictatorial, non-aggressive;
- One subject per letter;
- With subject heading;
- With file and letter number sequence maintained by the Contract Engineer or the Section Typist.

**Include request for receipt acknowledgement if facsimile has significant contractual content** Facsimiles which are considered to be very important to a contract, for example, the authority to commence a contract (Letter of Acceptance), shall end with the statement "Please fax back acknowledgment of receipt of this facsimile".

**How to deal with contentious issues** Where practicable, contentious issues should be discussed with the other person (respondent's representative) before writing about it. A better and faster result is nearly always achieved by discussion and confirmation of decisions (or clarification of the situation).

**Use yellow/white paper for incoming/outgoing facsimiles** To distinguish between incoming and outgoing facsimiles, the facsimile machine will be loaded with yellow paper to denote incoming facsimiles. Outgoing facsimiles *must* be on white paper.

41 **Follow procedure when sending letters** Letters are to be set out in  
42 accordance with CORPCO Australia, Business Administration Centre letter,  
43 reference 570/1/1 dated 14 March 1995 (P:\GEN\WPDATA\283.DOC).

44 **Use template for standard facsimile format** Standard facsimile format for  
45 Projects Division use (incorporating Projects Division facsimile number) is  
46 available as a wordprocessor template (refer Exhibit 2).

### 47 **3.2 Authorised signing of letters and facsimiles**

48 **Letters to be initialled by responsible officer before authorisation** Letters  
49 are to be initialled on all copies by the responsible officer/s prior to the original  
50 being signed by the authorised signatory.

51 **Correspondence to Contractors to be sent via Contract Engineer** All  
52 correspondence to Contractors shall be directed through the relevant Contract  
53 Engineer or the nominee.

54 **Authorised signatories must comply with procedure** Signing of letters must  
55 comply with CORPCO Australia Administration Procedures (see CORPA-CO-84  
56 K:\CORPROCS\MGT\_SERV\SIGNCORR.DOC).

57 **Authorised signatories** Authorised signatories (for a typical Project) for all  
58 outgoing contractual (external) communications, including facsimiles, are:

- 59 • Manager Projects;
- 60 • Project Engineer;
- 61 • Project Boiler Engineer;
- 62 • Auxiliary Plant Engineer;
- 63 • Project Electrical Engineer;
- 64 • Project Civil Engineer;
- 65 • Project Services Engineer;
- 66 • Senior Contracts Officer;
- 67 • Construction Manager;
- 68 • Civil Construction Engineer;
- 69 • Mechanical Construction Engineer Turbine Area;
- 70 • Mechanical Construction Engineer Boiler Area;
- 71 • Site Administration Officer;
- 72 • Site Services Engineer;
- 73 • Electrical Construction Engineer;
- 74 • EnerTrac Implementation Engineer.

75 **Section Heads may authorise others to sign routine correspondence**  
76 Section Heads may authorise specific personnel to sign routine correspondence,  
77 which is *not* a commercial commitment or a contentious issues (for example,  
78 signing a meeting agenda but not minutes of meeting correspondence).

79 **Signing of correspondence to government, statutory or regulatory authorities**  
80 The Manager Projects, Project Engineer and Construction Manager are the signatories  
81 for letters to State and Federal Government Departments and statutory or regulatory  
82 authorities for matters directly related to the Project and are routine in nature for the  
83 administration of the Project. However, where the incoming correspondence has been  
84 addressed to a Section Head or higher position, refer to CORPCO Australia  
85 Administration Procedures (see CORPA-CO-84 K:\CORPROCS\MGT\_SERV\SIGNCORR.DOC),  
86 for the guidelines of who may sign the response to such correspondence.

87 **Project Engineer and Construction Manager may authorise others to sign**  
88 **correspondence** The Project Engineer and Construction Manager may  
89 authorise specific Section Heads to sign documents where such authority is

90 necessary for the correct and efficient conduct of Projects business, providing  
91 CORPCO Australia Administration Procedures are complied with.

92 **Limitation of Manager Projects delegated authority to sign correspondence**  
93 Authority to sign on behalf of Manager Projects is delegated only to the above  
94 personnel in their respective fields of responsibility on the understanding that  
95 correspondence which has been reviewed and signed on his behalf, does not  
96 incur CORPCO Australia in additional costs, extension or acceleration of  
97 programme without his prior approval.

98 **Signatory to sign 'for' Manager Projects** When signing on behalf of Manager  
99 Projects, the word "for" shall be hand-written by the signatory before "J.A. Brown,  
100 Manager Projects".

101 **Manager Projects only to sign superintendent letters** Superintendent letters  
102 will be signed only by Manager Projects.

### 103 3.3 Destination of letter copies

104 The destinations of the different copies of a letter are set out in the table in Figure 1.

<i>Copy</i>	<i>Destination</i>
Original (letterhead)	To whom it concerns, and Contractors Site Office if required. (Check local work instructions)
Pink copy	Ballarat File
Yellow copy	Site File
Blue copy	Records, Circulation copy (Site)
White copies	Author's file copy, Circulation Copy (Perth Office).

105 *Figure 1 Destination of letter copies*

## 106 4. Exhibits

- 107 1. Typical letter set out (Available on FILE-NEW-CORPletr or Letter; OR K:\TEMPLATE\  
108 CORPLETR.DOT or LETTER.DOT)
- 109 2. Typical facsimile set out (Available on FILE-NEW-CORPfax or Fax; OR  
110 K:\TEMPLATE\ CORPFAX.DOT or FAX.DOT).

## 111 5. References

- 112 • CORPCO Australia Administration Procedures - CORP-CO-84 (Available on  
113 K:\CORPROCS\MGT\_SERV\SIGNCORR.DOC)
- 114 • CORPCO Australia Standards Manual for Production of Documents (Available  
115 on K:\CORPROCS\ DOC\_STDS)
- 116 • Projects Division Procedures Manual PD-DOC-02 - Correspondence.

## APPENDIX 4: QUESTION SHEET

This Appendix contains the Question Sheet used by participants during the experiment.



DOCUMENT RESEARCH PROJECT  
Research conducted in Brisbane, Australia

## Question sheet

### Instructions:

- Answer all questions in the order displayed. There are 36 questions to be answered.
- You are given six documents. You can derive the answers to the questions from these documents. The term in square brackets at the end of a question is the name of the document where the answer to that question may be found.
- Write your answers on this sheet, using the short answer format that you were shown during the oral presentation.
- You may take up to 90 minutes to complete the questions. Please proceed as fast as you can consistent with accuracy.
- Hand in this Question Sheet *immediately* you have finished answering the questions.

### Sample questions:

Question	Your answer
n. What colour paper is used for incoming facsimiles? [ CORRESPONDENCE ]	
n. What is the number of the procedure that authorised signatories must comply with? [ CORRESPONDENCE ]	

Question	Your answer
1. Where are hazardous and dangerous goods to be stored? [ STORAGE OF GOODS ]	
2. Why are electricity outlets not located within fume cupboards? [ FUME CUPBOARD ]	
3. In what circumstances is a Corrective Action Request raised during an environmental audit? [ ENVIRONMENTAL AUDIT ]	
4. Who provides local support for the NetMail 'First Look' scheme? [ NETMAIL ]	
5. What is the number of the procedure covering the receipt of goods? [ PURCHASE ORDER ]	
6. What does a complete Audit Report consist of? [ QUALITY AUDIT ]	
7. When would the fume cupboard sash position be closed during use?[ FUME CUPBOARD ]	
8. When goods are received for storage, what is the process goods have to pass through before being accepted? [ STORAGE OF GOODS ]	
9. How many criteria are to be used for evaluating NetMail? [ NETMAIL ]	
10. What is the identification number of the procedure covering the receipt of goods? [ PURCHASE ORDER ]	
11. What is the minimum face velocity for a fume cupboard? [ FUME CUPBOARD ]	
12. Who is responsible for preventing goods being damaged when the goods are being handled? [ STORAGE OF GOODS ]	
13. What are the advantages of participating in the 'First Look' scheme? [ NETMAIL ]	

More questions on the next page

Question	Your answer
14. Who prepares the environmental audit check list? [ ENVIRONMENTAL AUDIT ]	
15. How does the 'First Look' scheme work? [ NETMAIL ]	
16. Whose signatures are to appear on the Audit Report for an environmental audit? [ ENVIRONMENTAL AUDIT ]	
17. Who prepares the audit checklist? [QUALITY AUDIT]	
18. How do you obtain (or find out) the number that has been assigned to an urgent Purchase Order? [ PURCHASE ORDER ]	
19. What standard of preservation is to be applied to 'returned to stock' goods? [ STORAGE OF GOODS ]	
20. What is the Australian Standard covering the extension of a building's fire protection system to a fume cupboard? [ FUME CUPBOARD ]	
21. Who determines if a closing meeting is to be held at the completion of an audit? [ QUALITY AUDIT ]	
22. What is the total estimated project expenditure for all costs for the NetMail 'First Look' project? [ NETMAIL ]	
23. What happens to the yellow copy of the Purchase Requisition (order advice copy 2) after the Purchase Order has been raised? [ PURCHASE ORDER ]	
24. Who has responsibility for preparing for an environmental audit? [ ENVIRONMENTAL AUDIT ]	
25. What details of an audit are recorded in the Internal Audit Register? [ QUALITY AUDIT ]	
26. When does closing-out of an environmental audit take place? [ ENVIRONMENTAL AUDIT ]	

More questions on the next page

Question	Your answer
27. What are three things that need to be done after using the fume cupboard? [ FUME CUPBOARD ]	
28. Who approves a Purchase Requisition for an amount greater than \$10,000 but less than \$80,000? [ PURCHASE ORDER ]	
29. Where special requirements for the carriage of goods exist, how are instructions to be conveyed to the driver? [ STORAGE OF GOODS ]	
30. What is the minimum lighting level for a fume cupboard? [ FUME CUPBOARD ]	
31. Who assigns an audit number for an environmental audit? [ ENVIRONMENTAL AUDIT ]	
32. There are three implications of changing the server architecture. What are they? [ NETMAIL ]	
33. On what basis are audits usually scheduled? [ QUALITY AUDIT ]	
34. How do you have an <i>urgent</i> Purchase Order number assigned? [ PURCHASE ORDER ]	
35. Who signs consignment documentation? [ STORAGE OF GOODS ]	
36. What words must appear on the original copy of the Purchase Order form if the Purchase Order was earlier phoned through to the supplier? [ PURCHASE ORDER ]	

End of questions

Please hand in this question sheet immediately you have finished.

## APPENDIX 5: DISCLOSURE STATEMENT

This Appendix contains the Disclosure Statement handed to participants prior to completing the Question Sheet.

## DOCUMENT RESEARCH PROJECT

Research conducted in Brisbane, Australia.

# Statement of Disclosure and Informed Consent

Thank you for your interest in this research. Please read this information sheet before participating in the research session.

## **Name of researcher and context of research**

This research is being undertaken by Stuart Hawthorne, 36/49 Colac Street Kedron Qld 4031, as part of the research requirements for a Master of Science (Information Science) degree, under the supervision of Ms Vicky Wilson and Dr Graham McKay, Edith Cowan University, Perth.

## **Disclosure**

**Purpose of the research** The purpose of the research is to determine whether, in expository documents, particular aspects of text format and text content affect how quickly a reader can comprehend meaning contained in the documents.

**Conduct of the research** You are given a Question Sheet containing 36 questions. You are also given six paper documents. The information contained in the documents is used to answer the questions. You are told on the Question Sheet which document contains the answer to each question. The six documents given to half of the participants do not employ the particular aspects of format and content that are being tested while the other half of the participants are given documents that do employ the particular aspects of format and content being tested. The information content in either document version is identical. It is predicted that there will be a statistically significant difference between the total and mean times for each group of participants and these time differences are an indication of the efficiency differential obtained through employment of particular aspects of text format and content.

**Participant involvement** You are required to answer 36 questions based on information contained in the six documents supplied. The principal requirement is that you must peruse the supplied six documents to locate the answers to the questions. Though completion time is the main factor looked at, accuracy of answers is also important.

**Discomfort and risks** It is not likely you will suffer discomfort or be exposed to any risks as a consequence of your participation in the research session.

**Time involved** It is expected the 36 questions can be answered in 30 to 60 minutes. There is a cutoff time of 90 minutes, at which time you will be required to hand in your Question Sheets, whether completed or not.

**Potential benefits to individual and society** The principal potential benefit is a method of presenting expository documents which enables more efficient comprehension of what the document as a whole, and what particular parts of the document, are 'about'. This benefit has favourable implications for the determination of relevance of retrieved information. Relevance determination is the fundamental intellectual activity of any information retrieval system. However, relevance determination is becoming increasingly difficult to carry out efficiently because of the large amounts of potentially-relevant documents able to be returned by contemporary search engines.

**Individual's position or status not prejudiced by choice to not participate** You are free to participate or not to participate, as you think fit, for any reason. Where you may have initially chosen to participate, you are free to withdraw that decision and to stop participating at any time.

Your participation or non-participation has no effect on your grade, station, status or position. No records are kept of the names of participants or non-participants by any person.

**Enquiries** Direct any enquiries concerning the research to Stuart Hawthorne, telephone 3350 4475, or 018 199 987 to leave a voice-mail message, or write to 36/49 Colac Street, Kedron, Qld 4031, or use email: hawthorne@uq.net.au. Independent enquiries can be directed to Ms Vicky Wilson at Edith Cowan University, Perth,

## **Informed consent**

**Informed consent** The Committee for the Conduct of Ethical Research of the Edith Cowan University, Perth, requires that a participant gives *informed consent* to take part in research investigations conducted under degree programmes of the University. Typically, informed consent is indicated by a participant signing the following declaration:

*I (the participant) have read the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this activity, realising I may withdraw at any time.*

*I agree that the research data gathered for this study may be published provided I am not identifiable.*

Necessarily, to provide informed consent by declaration, a participant is required to identify himself or herself. However, in this project, a participant's name is not relevant to the purpose of the investigation and therefore is not required to be recorded. Accordingly, a participant is *not* required to sign an informed consent declaration. Instead, the act of returning a completed Question Sheet is taken as implying informed consent, to the extent of the informed consent declaration set out in italics above.

***Some information is necessarily withheld:*** To ensure findings are not affected by prior knowledge, participants are not informed of the particular aspects being tested before completing the Question Sheet. Accordingly, participants are not, in the strict sense, *fully* informed at the time of participation. However, after completing their Question Sheet and after having their Question Sheet marked with a completion time, participants may retain their Question Sheet, either temporarily or permanently, pending a final decision. After all participants have completed the Question Sheet, or after the 90 minute cutoff time, the researcher will provide, if requested to do so, a full explanation of the particular aspects that were tested. This provides an opportunity for participants, who then will be fully informed, to decide whether to submit or not submit their completed Question Sheet. If a participant submits their completed Question Sheet, such action will be taken as signifying that participant's informed consent.

***Retention of material:*** If you wish, you may retain all material handed to you except the original completed Question Sheet sheet. You may photocopy and retain your completed Question Sheet (after its completion time has been recorded on it) if desired.

## APPENDIX 6: ORIGINAL VERSIONS OF DOCUMENTS USED IN THE EXPERIMENT

This Appendix contains copies of the original documents obtained from the Queensland Generation Corporation. The documents are:

- Fume cupboards
- Processing purchase requisition and obtaining an order
- Handling, storing, packaging, preserving and delivery
- Internal quality audits
- Participation in the 'First Look' Program for Microsoft NetMail
- Environmental audits.

The pagination of some of these procedures has been affected by their insertion into the thesis document. Some procedures which contained a footer are included without that footer because they conflict with the footer of the thesis document. For the same reason, page numbers of the procedures are not included. However, the original content remains unchanged. The form of the footers that have been removed is shown in Figure 26 in Appendix 1



## LABORATORY HEALTH AND SAFETY PROCEDURE

---

**TITLE:** FUME CUPBOARDS  
**INDEX REFERENCE:** 5250  
**REVISION No.:** 1  
**DATE OF ISSUE:** June 1995

---

### 1. GENERAL

Fume cupboards must be used for all laboratory procedures which have the potential to generate fumes, dusts or mists, especially those of a hazardous nature. Fume cupboards enable these fumes to be safely contained, then conveyed to an outside discharge point, where they can be dispersed at reduced concentrations. Air extracted through a fume cupboard is not recirculated to other rooms.

A laboratory may include various types of fume cupboards such as:

- **Bench-type fume cupboard** - constructed so that work can be enclosed by pulling down a vertically-sliding sash on the front of the cupboard.
- **Downdraught fume cupboard** - allows air to be exhausted across the base of the fume cupboard, during processes where heavier than air fumes are generated.
- **Recirculating fume cupboard** - **not** recommended for unrestricted use and should only be used with AS 2243.9 - 1991.
- **By-pass fume cupboard** - allows variable portion of the room air to flow into the working chamber, to prevent excessively high face velocities at low sash openings.

### 2. POSITIONING OF FUME CUPBOARDS

Positioning of fume cupboards should be considered at the laboratory design stage.

Factors such as traffic flow in the laboratory, the location of other fume cupboards and air extraction systems are to be considered in the design process. Obstacles such as walls, benches and the access for maintenance also need to be considered, and are referred to more comprehensively in **section 5900** of this manual.

It is also essential to ensure that fume cupboards are to be located away from doorways, so that in the event of fire or explosion the exits do not become obstructed..

### 3. AIRFLOW SYSTEMS

Fume cupboards must have a minimum face velocity of 0.5 metre per second, with a reserve capability of at least 20% designed into the extraction system, to cover loss of performance in service. This face velocity must be as uniform as possible across the sash opening. Face velocities in excess of 1.0 m/s through a fully opened sash can lead to local turbulence in front of the operator, resulting in exposure to fumes and contaminants.

When the operation of fume cupboards causes a significant change in the rate of air extraction from the room, fan-assisted make-up air may be required to restore airflow balance. A make-up distribution system must not disturb the

fume cupboard airflow pattern or reduce its operational containment level.

#### **4. MINIMISE TURBULENCE**

To achieve maximum containment of fumes, fume cupboards are to be as free from turbulence as possible.

Partially closing the sash, reducing room turbulence and not storing large items in the fume cupboard reduces formation of eddies within the unit and reduces the risk of the operator being exposed to fumes. If large pieces of equipment are to be used in the fume cupboard, place these on a platform that has a 2 - 5 centimeter clearance from the bench and which is located towards the back surface to achieve more efficient airflow and containment.

#### **5. DISCHARGE OF FUMES**

The fume discharge should be at a minimum velocity of 10 metres per second to minimise downwash on the leeward side of the stack in accordance with AS 2243.8 – 1992. The point of discharge should be above the dynamic wake of the building and vertically upward (at least 3 metres), located as remote from air intakes as possible in accordance with AS 1668.2 - 1991.

#### **6. FUME CUPBOARD DESIGN**

All materials used in the construction of fume cupboards are resistant to any substances to be used in them, easy to clean and have a smooth, non-porous finish.

Services within a fume cupboard such as gas, electricity and water should be positioned to minimise the risk of fire or explosion. Services such as gas and water should be located inside the fume cupboard, preferably with the controls located externally and colour coded in accordance with AS 1345 - 1982.

As fume cupboards are classified as hazardous areas (according to AS 2430), electrical outlets are not located within the fume cupboard as they create an ignition source, are susceptible to corrosion from fumes and prevent safe manual wash down of the fume cupboard interior.

#### **7. FIRE PROTECTION**

If a fixed fire protection system is installed in a building, it should be extended to the fume cupboard in accordance with AS 2243.8 - 1992.

#### **8. LIGHTING**

Lighting levels within the fume cupboard must give a minimum of 400 lux illumination to the work area. Light sources must be designed so as not to be an ignition hazard or be able to be corroded by fumes.

## 9. IDENTIFICATION LABEL

On each fume cupboard, a permanent label must be affixed prominently, stating the following information:

- Identification number of the fume cupboard
- Model number of fume cupboard and name of manufacturer
- List of air-cleaning devices associated with the fume cupboard, such as scrubbers etc.

## 10. USE OF FUME CUPBOARDS

### 10.1 Before use, check that:

- the fume cupboard is clean and free from contamination
- the fume cupboard is working correctly using an airflow indicator (it is not enough to know that the fan is switched on)
- there is enough space in the fume cupboard for the proposed process to be carried out
- where practicable, everything required is placed inside the fume cupboard before starting
- equipment is positioned towards the centre and back of the cupboard to reduce disturbance to the airflow at the working aperture

### 10.2 During use, the following procedures should be carried out:

- adopt following sash positions -
- fully open when setting up apparatus process or reagents
- partially open when handling hazardous substances inside the fume cupboard
- lowered as far as possible when the process is in operation
- use the minimum quantity of hazardous substances necessary for a particular process.
- where practicable, use reaction rates which minimise hazards such as the production of excessive fumes or heat.
- when decanting hazardous substances from bulk stocks, use a decanting bench fitted with a local exhaust.

### 10.3 After use the operator should:

- dispose of any hazardous waste in accordance with legislative requirements.
- clean and decontaminate the fume cupboard.
- lower the sash enough to minimise the effect of outside disturbances, while allowing a satisfactory air flow.

## 11. MAINTENANCE AND TESTING

- Whilst inspection or maintenance is being carried out, the fume cupboard must be isolated from the power source to prevent it being operated.
- The fume cupboard must be tagged "**System under maintenance – Do not use**", and any chemicals present must be removed.
- On a weekly basis any air cleaning devices in fume cupboards should be inspected and maintained in accordance with maintenance manuals. Trapped contaminants are to be disposed of in accordance with legislative requirements.
- Six monthly and annual testing and maintenance operations should be conducted in accordance with AS 2243.8 - 1992. All operations undertaken should be recorded.

*Note: Such maintenance and testing programs should be used as a guide for minimum requirements only. Where fume cupboards are used continuously, more frequent maintenance may be necessary.*

## 12. REFERENCES

1. AS 1345- 1982 Identification of the contents of piping, conduits and ducts.
2. AS 1668.2 - 1991 Mechanical ventilation for acceptable indoor-air quality.
3. AS 2243.8 - 1992 Safety in laboratories - Fume cupboards.
4. AS 2243.9 - 1991 Safety in laboratories – Recirculating fume cupboards.
5. CCH Laboratory Safety Manual 1992.



# CORPCO Corporation

Form S330

<b>Document</b> TECHNOLOGY DEPARTMENT WORK INSTRUCTION	<b>No.</b> GTW 6.7.2/5	
	<b>Edition No.</b> B	<b>Edition Date</b> 31/05/95
<b>Subject</b> PROCESSING PURCHASE REQUISITION AND OBTAINING AN ORDER	<b>Revision No.</b> 0	<b>Revision Date</b> 31/05/95
	<b>Section</b> TECH	<b>Page 1 of 5</b>

## PROCESSING PURCHASE REQUISITION AND OBTAINING AN ORDER

5						
4						
3						
2						
1						
0	31/05/95	EDITION B NEW CORPORATE TITLE & NAME CHANGE	C. CERISE	B. BLACK	R. GREEN	M. WHITE
<b>REV</b>	<b>DATE</b>	<b>REVISION DESCRIPTION</b>	<b>AUTHOR</b>	<b>CHECK QA COMPLIANCE</b>	<b>CHECKED</b>	<b>APPROVED</b>
	13/05/94	ORIGINAL DOCUMENT	C. CERISE		R. GREEN	R. BLUE

CORPCO COPYRIGHT

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### 1. PURPOSE

To maintain a standard approach for processing a purchase requisition and obtaining a purchase order.

### 2. SCOPE

Operation of a system for processing a purchase requisition and obtaining a purchase order for Strathville Site.

### 3. DEFINITION

Not applicable.

### 4. REFERENCES

- GTW 6.7.2 Application of the Procurement Manual: Strathville.
- GTW 6.7.2/3 Receipt of Purchase Requisition/Order Goods for Payment Via MACO.
- GTW 6.6.1/4 Receiving Purchase Order Deliveries.

### 5. METHOD

#### 5.1 Authorisation

The Materials Supply Officer is responsible for carrying out the following instructions.

PR's (Purchase Requisitions) must be approved by an officer with the appropriate financial delegation, see below.

\$ 3,000	Senior Process Investigation Engineer/Principal Metallurgist
\$ 5,000	Strathville Site Superintendent
\$10,000	Chief Scientist/Chief Process and Combustion Engineer
\$80,000	Manager Technology

## **5.2 Recording Completed PR's**

Enter the following details in chronological order into the 'Strathville Purchases Requisition Records' book (located on the shelf above the Material Supply Officer's desk):

PR Number  
Supply Company  
Price  
Raised By  
Date

## **5.3 Obtaining a Purchase Order**

The PR should then be forwarded to Supply Section (Head Office) for processing of the purchase order.

### **5.3.1 Obtaining an Urgent Purchase Order Number**

Photocopy the duly completed and approved PR and fax to Materials Supply Clerk (Supply Section), requesting an urgent purchase order number. (A copy of the fax cover sheet is kept in the cupboard next to the fax machine.)

To obtain this purchase order number, you must look it up using the MACO system on Screen P07 (see Procedure GTW 6.7.2/3 for Login Procedure). Advise the person who raised the PR of the purchase order number so that they can ring it through to the supplier. They shall be instructed also to advise the supplier that an official purchase order will arrive in the mail within a few days.

If the purchase order is phoned through to the supplier, the original purchase requisition must be annotated with 'CONFIRMATION ONLY' before being forwarded by internal mail to supply section.

## **5.4 Recording Purchase Order Details**

Upon receipt of the purchase order from Supply Section (Head Office), enter the purchase order number into the 'Strathville Purchase Requisition Records' book, beside the correct PR details.

Also, enter the following details from the purchase order into the 'Strathville Purchases by Section' book (left hand side of page), located on the shelf above the Material Supply Officer's desk:

Order Number  
Number of different items  
Progressive number of items for the current month  
Total amount of order  
Progressive amount of orders for the current month

## **5.5 Filing of the Purchase Order and PR's Copies**

The yellow copy (order advice copy 2) shall be endorsed with the purchase order number and forwarded to the person who raised the PR.

The pink (receipt advice copy 3) and white (assets control copy 4 and originators copy 5) should be stapled to the purchase order and filed as follows:

- Purchase Orders where goods will be received are stored in a tray marked 'incomplete orders', located in the stores receiving area.
- Purchase Orders for services are stored in a lever arch file marked 'incomplete orders', located on the shelf above the Material Supply Officer's desk.
- Purchase Orders for contracts (eg. lawn mowing - where 1 order covers approximately a years work), are stored in the top tray on the left hand side of the Material Supply Officer's desk.

#### **5.6 Receipt of Goods**

See Procedure GTW 6.6.1/4.

#### **5.7 Receipt of Invoice/s**

See Procedure GTW 6.7.2/3.

#### **5.8 Completion of Purchase Order**

When all the goods/services have been supplied and the invoices have been receipted for payment, the completed purchase order shall be filed alphabetically in the lever arch files, located in the bookshelf adjacent to the Material Supply Officer's desk.

## **6. ATTACHMENTS**

Not applicable.



# CORPORATE PROCEDURE FOR HANDLING, STORAGE, PACKAGING, PRESERVATION AND DELIVERY

CORP - MATL – 402

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## Contents

1. Purpose
  2. Scope
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    - 3.1 General
    - 3.2 Handling
    - 3.3 Storage
      - 3.3.1 General
      - 3.3.2 Entering storage
      - 3.3.3 Items in storage
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    - 3.5 Preservation
    - 3.6 Delivery
  4. Definitions
  5. Reference Documentation
- 

## 1. Purpose

To establish and document guidelines to manage and control the safe handling, storage, packaging, preservation and delivery of all goods processed by the Stores facilities of CORPCO.

## 2. Scope

This procedure applies to handling, storage, packaging, preservation and delivery of goods from the point of receipt through to and including the issue to the end user within the stores facilities of CORPCO.

## 3. Actions

### 3.1 General

Records shall be maintained of goods held within Department Stores that require special treatment, e.g. hazardous goods. Details shall include:

- handling and storage requirements
- quantities held
- storage location
- person(s) responsible for the handling and storage of the goods.

Personnel involved with the handling and storage of goods shall be advised of any special requirements. Material Safety Data Sheets (MSDSs) for those goods that require special treatment shall be made available.

Reference should also be made to the Corporate Procedure 'Dispatch for Transport of Dangerous Goods'.

## **3.2 Handling**

All personnel handling goods shall be responsible for ensuring that goods are handled in a manner that will:

- prevent damage and deterioration
- not compromise the safety of the handler.

Any equipment used to handle goods e.g. cranes, forklifts, lifting equipment, shall be maintained and licensed in accordance with the manufacturer's recommendations, specific Corporate/Department Procedures and any Statutory Authority's requirements. Only personnel licensed in accordance with the appropriate Statutory Authority's requirements shall operate specialised handling equipment. The details of the operator's licence/s shall be maintained in the Department's Training Records. Safe Working Practices and safety equipment shall be utilised as required when handling goods.

Should a supplier recommend the method in which goods are to be handled, then those recommendations shall be carried out unless Department procedures pertinent to local site conditions determine otherwise. The advice contained in relevant Material Safety Data Sheets (MSDSs) shall be followed.

## **3.3 Storage**

### **3.3.1 General**

All specialised storage containers e.g. bulk storage containers, shall, where required, have current certification issued by the appropriate Authority. No goods shall be stored in containers for which certification has expired.

All hazardous goods shall be stored in clearly designated, marked and controlled areas in accordance with appropriate statutory requirements and department procedures. Flammable and combustible liquids shall be stored in properly maintained areas that will control any accidental leakage or escape of the liquids. Compressed gas cylinders shall be stored and handled in accordance with manufacturers' instructions. Incompatible liquids and gases shall not be stored together.

All goods shall be stored in designated areas that will ensure they are kept free from damage, deterioration or loss. The condition of stock shall be assessed at regular intervals, as determined by Department Procedures, to ensure any deterioration of items (including their preservation treatment) or the expiry of the storage life date is detected.

### **3.3.2 Entering storage**

Goods shall only be released for formal storage after passing a Receiving Inspection, refer to CORP-MATL-401 (Receiving Inspection and Testing of Goods). After being cleared for use, the goods shall be subjected to receipt processing in accordance with the Department Procedures and the requirements of the corporate Inventory Management System. Where required, goods shall be suitably marked and/or labeled prior to being placed into storage.

### **3.3.3 Items in storage**

Stock items shall be issued in accordance with Departmental Procedures and the requirements of the Corporate Inventory Management System. Goods shall be

issued on a rotational basis to ensure that the oldest stock is used first when this is required

Appropriate controls (e.g. quarantining) shall be established as necessary to prevent the inadvertent issue/use of goods which are:

- reserved
- defective
- quarantined
- rejected
- obsolete
- damaged in any way.

### **3.4 Packaging**

Goods for dispatch shall be packaged in a manner that will ensure they are delivered without damage. Any special packaging requirements detailed by the manufacturer or supplier of the goods shall be followed. Where the goods are identified as being hazardous or dangerous the appropriate handling and packaging measures in accordance with Corporate and Department procedures, statutory requirements, the Australian Dangerous Goods (ADG) Code and International Air Transport Association (IATA) Regulations shall be followed. Packaging shall be carried out by specialised personnel, if necessary.

Any treatment required to be carried out to the goods prior to packaging shall be carried out in accordance with appropriate procedures and/or standards.

All consignment documentation shall be completed and signed by authorised personnel prior to the goods being dispatched.

### **3.5 Preservation**

Goods shall be maintained in good condition at all times from the point of receipt to the point of issue. Any special preservation requirements shall be specified by the officer responsible for the end use of the item. Should any preservation material/system be removed at any time it shall be reinstated to the original condition. Items that are 'broken down' into smaller lots shall have a level of preservation applied to them that is equivalent or better than the original.

Items returned to stock shall be inspected, if necessary, prior to placement into the store, to ensure the original standard of preservation is intact. Should the preservation need replacing it shall be applied to the original standard of the item.

### **3.6 Delivery**

Records of suitably qualified delivery organisations shall be established and maintained. Except in special circumstances, e.g. the requirement to use specialised freight equipment, deliveries shall be made by organisations selected from these records. Any special requirements for the carriage of goods e.g. handling, segregation, shall be conveyed to the driver *in writing*. Should the receiver of the goods specify any special requirement for the delivery, then those requirements shall be followed.

### **3.7 Records**

Records of all storage, packaging and consignment documentation shall be maintained in the appropriate location and for the appropriate period as determined in the Department Quality Records Register, refer to the Corporate Procedure CORP-QR-1 (Quality Records).

### **4. Definitions**

None.

### **5. Reference Documentation**

Quality Records Procedure (CORP - QR -1)

Receiving Inspection and Testing of Goods Procedure (CORP - MATL - 401)

Material Safety Data Sheets

Delivery Organisation Records

Dispatch for Transport of Dangerous Goods Procedure (CORP-OHS-015)



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## CORPORATE PROCEDURE FOR **INTERNAL QUALITY AUDITS** CORP-AUD-1

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### **Contents**

1. Purpose
  2. Scope
  3. Actions
    - 3.1 Audit Responsibilities
    - 3.2 Scheduling the Audit
    - 3.3 Registering the Audit
    - 3.4 Preparing for the Audit
    - 3.5 Performing the Audit
    - 3.6 Management Representative Audits
    - 3.7 Closing Meeting
    - 3.8 Reporting the Audit
    - 3.9 Audit Follow-up and close out
  4. Definitions
  5. Reference Documentation
- 

### **1. Purpose**

The purpose of this procedure is:

- to establish and maintain a system of planned and documented internal quality audits to verify that quality activities and results comply with planned arrangements, and
- to determine the effectiveness of the quality system.

### **2. Scope**

This procedure applies to all internal quality audits carried out within CORPCO departments.

### **3. Actions**

#### **3.1 Audit Responsibilities**

The Management Representative (MR) is responsible for ensuring that scheduled Internal Quality Audits of Corporate and Department Procedures are conducted.

Department Managers are responsible to ensure that scheduled internal quality audits of Corporate and Department Procedures are conducted within their area of responsibility. The audits shall be conducted by suitably trained internal quality auditors with relevant process knowledge who should, where possible, be independent of the area to be audited.

#### **3.2 Scheduling the Audit**

The Quality Coordinator (QC) shall establish and maintain an Internal Audit Schedule for the department. The schedule shall be approved by the Department Manager or delegate.

Audits shall be scheduled on the basis of the status and importance of the business activity.

All Procedures and Work Instructions shall be audited as early as possible after implementation.

Areas where quality problems or potential quality problems may exist may be audited more frequently at the discretion of the Department Manager, Department QC or Management Representative (MR).

#### **3.3 Registering the Audit**

An Internal Audit Register shall be maintained. The register shall include:

- Audit Number
- Auditor's Name
- Procedures Audited
- Audit Date
- CARs Raised
- Audit Report Issue Date
- Name of Officer Issued with the Report
- Audit Close-out Date

#### **3.4 Preparing for the Audit**

The auditor shall be responsible for all aspects of the audit, i.e. registration, preparation, performance and reporting in accordance with the requirements of this procedure.

The auditor shall prepare the audit checklist format which may be either:

- (a) a copy of the procedure to be audited (to be used as a checklist),
- (b) a specific checklist of procedure based questions.

### **3.5 Performing the Audit**

The Auditor shall advise the auditee (and the auditee's local QC and Section Leader if appropriate) of the intended audit, its scope and timing.

The auditor shall verify by means of reviewing objective evidence that work practices are being carried out in compliance to the procedure being audited.

The checklist format selected shall be marked with comments for each item including an allocation of status of compliance. These shall be:

- (a) S : Satisfactory - The activity audited is in compliance with the procedure.
- (b) IP : Improvement Possible - An observation of where changes to the activity may result in an improvement to the process outcome.
- (c) NC : Nonconforming - The activity audited does not comply with the procedure.
- (d) NA : Not applicable - The activity to be audited was not applicable to the particular circumstances.
- (e) NV : Not verified - Objective evidence of compliance with the procedure was not sighted.

### **3.6 Management Representative Audits**

Audits of each Department shall be conducted on the authority of the Management Representative (MR) at intervals not exceeding 6 months to verify the effectiveness of the quality system. These audits shall predominantly focus on the QC's responsibilities and activities and selected quality system 'measures' such as Management Review, Internal Auditing and application of Corrective Action Requests. Auditing of selected procedures as a representative sample is a necessary component of this assessment.

MR audits shall be conducted by qualified auditors from Quality Management Services (QMS). Any nonconformances found shall result in the issue of QMS registered CARs to the audited department's QC.

### **3.7 Closing Meeting**

At the discretion of the department QC, a closing meeting may be held on completion of the audit, between the Auditor, Auditee, QC and others as determined by the QC to discuss the findings of the audit.

### **3.8 Reporting the Audit**

On completion of the audit, the auditor shall prepare an Audit Report which shall include:

- summary of findings
- details of any nonconformances found
- observations of where improvements may be possible.

The Auditor shall raise CARs on the nonconformances found. (Refer to the Corrective and Preventive Action Procedure CORP-CPA-1.

The completed Audit Report shall be signed by the auditor and reviewed by the Department QC.

The QC shall process any CARs raised on nonconformances and raise additional CARs on improvement possibilities when considered appropriate.

The completed Audit Record shall consist of the Audit Report and the following attachments:

- Checklist
- Corrective Action Requests (if applicable)
- Any other supporting audit documentation.

The QC shall forward a copy of the Audit Report and attachments to the Department Manager or delegate, with the original placed on official file. (Refer Quality Records procedure CORP-QR-1).

The MR shall have access to all audit records through the Departmental QC.

### **3.9 Audit Follow-up and close out**

The Department's QC, and where appropriate, the Department Manager, shall determine actions to ensure that immediate and preventive actions are effectively undertaken (refer Corrective and Preventive Action Procedure, CORP-CPA-1).

The QC shall verify that the actions have been implemented and arrange follow up audits where required.

The audit shall be closed-out on the audit register when the QC determines that all outstanding actions from the audit have been completed.

## **4. Definitions**

None.

## **5. Reference Documentation**

Quality Records Procedure	CORP-QR-1
Corrective and Preventive Action Procedure	CORP-CPA-1
Internal Audit Register	Form S1755 (preferred format)
Internal Audit Schedule	Form S1751 (preferred format)
Audit Report	Form S1750 (preferred format)
Corrective Action Request	Form S1701 (preferred format)



# Participation in the 'First Look' Program for Microsoft NetMail

## 1. Introduction

Prior to corporatisation, the electricity industry association adopted the Microsoft Office suite as its desktop application suite, and Microsoft Mail as its mail user agent. This corporation is also committed to this approach. Microsoft has announced the release of its NetMail product, scheduled for around January 1996. NetMail is Microsoft's strategic product for mail/messaging, and it will supersede the existing mail product. The corporation has been invited to participate in a 'First Look' scheme whereby we get to evaluate a Beta tested version of the product to gauge its capabilities. This will also allow early planning for its introduction into our network should the evaluation be successful and we decide to use the product. NetMail is likely to be very significant for the corporation offering important functionality that is currently missing.

This memo recommends that the corporation participate in the 'First Look' program, and recommends the purchase of the prerequisite server platform for the evaluation.

## 2. Why the corporation should use NetMail

The architecture and interfaces used by NetMail are very similar to those described in the ISTP Electronic Messaging Architecture specification, so it fits in well with our system requirements.

There are several important areas of functionality currently missing from the existing mail / messaging implementation due to constraints imposed by the current Microsoft Mail architecture. These are:

- The ability to access personal mail from a location other than your normal location without significant impact on the network. Currently the load imposed on the network has a noticeable impact on users of other applications (eg core applications).
- The ability to access personal mail via a low speed link, such as a dial-up connection for travelling users. Currently this takes up to 10 minutes just to open MS Mail.
- The ability to redirect mail to another recipient, when going on leave for example.
- Mail client (User Agent UA) which will run on Sun Workstations
- Standard protocols to access the Message Store (MS) and the Message Transfer Agent (MTA) to allow interoperability with other mail systems such as the VMS based mail used by the Oracle core applications.
- The ability to remotely manage MTAs which may be located at remote sites.

All of the above functionality should be provided by NetMail. Other useful functionality provided by NetMail includes:

- The ability to include Rich Text features in mail messages (eg variable font styles and sizes, bold, underline and italic, right, left and centre justification etc).
- User customisable view of files and folders.

- Rules based filtering for the automated processing of pre-defined message types.

Since there is no other identified solution to the missing functionality described above, it is desirable that NetMail proves to be satisfactory and can thus be employed to fill these gaps in the existing system.

### **3. The 'First Look' Program**

By participating in the 'First Look' scheme the corporation gets to evaluate the product well before its general release onto the market, and to assess the relative costs and benefits of its adoption. Plans can be formulated on the best way to introduce the system into the the corporation's network, and the appropriate management and administrative mechanisms prepared. During the course of the evaluation, the corporation will have access to Microsoft Technical Support through their local support agents PRAXA. It is understood that at the end of the program, the corporation will be able to continue to use the NetMail system prior to the general release of the product.

The duration of the 'First Look' program is anticipated to be around 3 months starting from the end of July 1995. During that time the corporation will produce monthly feedback reports to Microsoft to advise on progress, problems, comments etc.

### **4. Why PRAXA**

PRAXA is one of four or five authorised Microsoft Solution Providers in Australia. In Queensland, PRAXA are the only solution provider authorised to participate in the NetMail 'First Look' program. the corporation has worked with PRAXA on a number of other projects and found their level of service and competence to be good.

### **5. Objectives of the Project**

The objectives of the project are as follows:

- To prove that NetMail delivers the functionality currently missing from the network.
- To prove that NetMail is a stable product on which to build the corporation's desktop messaging system.
- To gauge the cost of introducing NetMail into the corporation.
- To examine the architecture employed by NetMail and to establish X.400 interoperability with the X.400 components of the ISTP systems.
- To evaluate the additional functionality delivered by NetMail.
- Determine the architectural options for integrating NetMail into the ISTP network (eg NetMail database residing on an ISTP platform).
- To gain a better understanding of the relative values of, and the relationships between, the NetMail folder database, the traditional file systems used to store MS Office documents, and SoftSolutions.
- To gain an understanding of the NetMail directory database and its possible relationship with similar systems to be delivered within ISTP.

- To produce an outline of the type of information to be held in the directory database and its possible uses.

It is not a goal of this project to investigate the support and management issues of using Microsoft NT as an application platform, nor is it proposed to prepare an information management plan accommodating both NetMail and SoftSolutions.

## **6. Proposed Architecture**

It is proposed to set up an Intel based NT server at Head Office, connected to the main LAN.

The prerequisite server for the NetMail evaluation is an Intel Pentium 90 with 48Mb memory and 1 Gigabyte of disk.

## **7. Proposed Strategy for Implementation**

Due to the complexity of the product, the strategy for the implementation will be prepared in conjunction with PRAXA in order to clearly address the goals of the implementation, and to scope the evaluation project. For this reason the full details of the implementation approach are not available yet. However, it is anticipated that the implementation will follow the outline given below.

- Initially, for a couple of weeks say, one or two dedicated Pathworks PCs will be used to establish and prove a stable NetMail environment.
- Selected Pathworks clients / users will then have the new NetMail mail client installed, to enable them to participate in the evaluation. The NetMail system will be interfaced to the existing mail system so that participants in the NetMail evaluation can still have mail access to the rest of the network.
- Administrative and system management aspects of the NT / LAN Manager server will be resolved (eg addition of LM user accounts, file store allocation / monitoring etc).
- The group of users on NetMail will then be expanded to incorporate an entire workgroup (eg ISD Computing Services, or all of ISD etc).
- Interoperability testing with ISTP X.400 systems will be performed.
- Remote client access from dial-up connections, and across the WAN will be evaluated.

## **8. Resourcing**

A prerequisite of participating in the project is a commitment to purchase 24 hours of support from PRAXA. They will then provide an additional 24 hours of support free of charge.

It is proposed that PRAXA also be employed to establish the NT server platform (ie install and configure the operating system) prior to the 'First Look' program commencing. This is anticipated to be one days work.

The set up of the NetMail system is also anticipated to be one days work. Involvement of the corporation staff is likely to be full time initially for a week

or so, reducing to half time, and then three or four hours a week for the remainder of the program. Resource estimates for the roll out of NetMail, should it be accepted as a product, will be performed when we have a better understanding of what is involved.

There will also be some internal resourcing required to establish system management and administration procedures for the NT system. However, this work will also be required for other NT based systems that the corporation is, or is about to, establish such as Microstation, IFPS, SMS, SoftSolutions etc and are not specifically included in this project.

A rough estimate of the the corporation's resource requirements is 1 person from Network Services for 3 weeks total (spread over 15 weeks elapsed time).

## **9. Criteria for Adopting NetMail**

It goes without saying that the adoption of NetMail will be worthwhile if the benefits it delivers in terms of real cost avoidance (eg reduced bandwidth needs), cost reduction (eg lower administrative overheads), and needed functionality, outweigh the associated system costs and the additional management overhead. This will be determined as follows.

First the total system cost of NetMail will be estimated using the most appropriate NetMail configuration (dependent on the capabilities of the NetMail architecture) suited to the corporation. Examples of this could be a single NT server located at Head Office running NetMail along side other applications (eg SMS and/or SoftSolutions), or at the other end of the scale, multiple dedicated NetMail servers at each site.

The bandwidth issue will be assessed by examining the demands made by NetMail on the Wide Area Network, and comparing them with that of the existing mail system. If there is significant reduction such that the addition of an additional 64kbps channel to a site can be avoided, then the cost of that 64kbps channel will be offset against the cost of NetMail.

The NetMail administration overheads will be compared to the existing regime. The expected reduction in labour will be costed and offset against the cost of the system.

The value of the needed, and as yet missing, functionality (eg mail access over dial up links, mail access across the WAN, rules based filtering, mail redirection, Rich Text format mail messages etc) is somewhat subjective and will probably demand a quick survey of client representatives to gauge the depth of need.

The system and management costs will be offset by sharing the NT platform with other applications (eg SMS, SoftSolutions etc) if this proves to be technically possible, and the implementation of the other applications is determined to be likely.

Other benefits of NetMail such as the ability to remotely manage MTA functionality, will be factored into the analysis.

## **10. Strategic Issues**

The introduction of NetMail running on an NT server introduces some significant changes in direction from our current strategy for delivering desktop service to the corporation locations. Currently all desktop services

are run on an Open VMS platform which is also likely to be running the core applications. To introduce an NT platform into this arrangement must mean either a new processor added to the site, or the conversion of one existing Alpha processor from Open VMS to NT. This latter approach would nullify any existing reliability/resilience features which are currently provided by VMS clustering technology (since there would no longer be a cluster). If we were to take the approach of adding a new processor to run NT and NetMail, the user would then have messaging related data (public and shared folders) residing on the NT server, and other user data residing on the Pathworks Open VMS server. Although this may not cause problems for users of the system, it introduces additional complexity in terms of system management and administration. It seems likely that the simplest, most easily managed solution is to move all of the user data, and the executables (eg MS Office etc) to the NT server, thus re-establishing a single repository of desktop data. This approach would then dictate a more powerful platform than would otherwise have been required, but may fit well with any current plans to upgrade the existing processing power on site. Moving all of the user data onto the NT platform has flow on implications.

Firstly, although the reliability associated with VMS clustering would still be available for the core applications, the desktop would lose this functionality.

Secondly, if all of the desktop is served from an NT platform, the only use for Pathworks would be to support client connected printers. With some effort to introduce alternative printing arrangements for current client connected printers (eg pocket print servers or Microsoft Workgroup networking), Pathworks could be removed from the network entirely (PCs and servers).

Thirdly, the existing administration tools for user account creation / modification, file store management, permission and so on, would need to be reworked so as to fit into the NT system management scheme.

There is a possibility that the NetMail server process can access folders held on a Open VMS platform using SQL. This approach, although more complex, would give the best of both worlds - Microsoft NetMail functionality from the NT server, DEC reliability from the clustered VMS servers. This architecture will be explored as part of the evaluation.

## 11. Costings

It is proposed to adopt the strategy outlined above ie

1. The corporation to participate in the Microsoft 'First Look' program for the NetMail product.
2. An NT server configured appropriately for NetMail be purchased.
3. PRAXA be contracted to commission the NT server.
4. Prerequisite support services be purchased from PRAXA for the 'First Look' program.

The estimated costs for external expenses are:

• Purchase 24 hours of support from PRAXA for the NetMail program +24 hours free support	\$3,000
• Acquisition of a server designated in Appendix A – 'Proposed Server'	\$12,000
• Purchase 8 hours of support from PRAXA for the set up of the pre-requisite NT server platform	\$1,000
TOTAL:	<u>\$16,000</u>

Estimated internal labour costs will be:

One person for three weeks \$8,000

The total estimated project expenditure is therefore \$24,000

## 12. Recommendation

It is recommended that project approval be sought for the participation of the corporation in the Microsoft "First Look" program as outlined above at a total cost of \$24,000.

Form S1745  
(Amd 5/95)



## CORPORATE PROCEDURE FOR

# ENVIRONMENTAL AUDITS

CORP-ENVIRO-003

### Contents

1. Purpose
2. Scope
3. Actions
  - 3.1 Audit Responsibilities
  - 3.2 Initiating the Audit
  - 3.3 Preparing for the Audit
  - 3.4 Performing the Audit
  - 3.5 Reporting the Audit
  - 3.6 Audit Follow-up
4. Definitions
5. Reference Documentation

### 1. Purpose

The purpose of this procedure is to establish and maintain a comprehensive system of planned and documented environmental audits to verify that quality activities and results comply with planned arrangements and to determine the effectiveness of the environmental system.

### 2. Scope

This procedure applies to all environmental audits within CORPCO departments.

### 3. Actions

#### 3.1 Audit Responsibilities

The Chief Scientist is responsible for the performance of scheduled environmental audits within CORPCO and for ensuring that the audits are only undertaken by suitably trained and qualified environmental auditors. Auditors shall, where possible, be independent of the area to be audited.

#### 3.2 Initiating the Audit

The Chief Scientist shall draft and submit an environmental Audit Schedule, for the ensuing twelve months, to the Management Committee for approval.

The schedule shall be of sufficient scope to ensure that all aspects of the environmental system are audited as early as possible after their implementation.

Audits shall be scheduled on the basis of the status and importance of the activity under review.

Areas where environmental issues or potential environmental issues may exist shall be audited more frequently at the discretion of the Chief Scientist or the Station Manager.

#### 3.3 Preparing for the Audit

The auditor shall be responsible for all aspects of the audit, i.e. its preparation, performance and reporting in accordance with the requirements of this procedure.

The Chief Scientist shall allocate the next sequential audit number to each audit from the environmental Audit Register.

The auditor shall prepare the audit checklist format which may be either:

- (a) a copy of the procedure to be audited (to be used as a guide); or
- (b) a checklist of procedure based questions prepared.

#### 3.4 Performing the Audit

The Chief Scientist shall advise the auditor of the intended audit, its scope and timing. The auditor shall then arrange the details of the audit with the auditee.

The auditor shall verify by means of sighting objective evidence that work practices are being carried out in compliance with the procedure being audited.

The checklist format selected shall be marked with comments for each item including an allocation of status of compliance. These shall be as follows:

- (a) **S:** **Satisfactory** - The activity audited is in compliance with the procedure.
- (b) **IP:** **Improvement Possible** - The activity audited has some minor inconsistencies unlikely to affect the final outcome.
- (c) **NC:** **Non Conforming** - The activity audited does not comply with the procedure.
- (d) **NA:** **Not Applicable** - The activity to be audited was not applicable in the particular circumstances.



- (e) **NV: Not Verified** - Objective evidence of compliance with the procedure was not sighted.

### **3.5 Reporting the Audit**

Subsequent to the audit, the auditor shall prepare an Audit Report, using the compiled checklist format as the basis. The report shall be issued to the Chief Scientist upon completion.

The auditor shall prepare Corrective Action Requests (CARs) for all areas identified as being not in compliance with the procedure and for areas, though in line with the procedure, which may have the potential to be an environmental issue.

Environmental CARs shall be completed in line with the procedure for Corrective and Preventive Action.

The completed audit report shall consist of:

- (a) Audit Report
- (b) Checklist
- (c) Corrective Action Requests (if applicable)
- (d) Any other supporting audit documentation.

The completed Audit Report shall be signed by the auditor, station manager and by the Chief Scientist.

The Chief Scientist shall issue the audit report to the Auditee and the Management Committee, with a copy placed on a file pertinent to departmental audits.

The Chief Scientist shall have access to all audit report files.

The Internal Audit Register shall be updated by the Chief Scientist.

### **3.6 Audit Follow-up**

Following the receipt of the Audit Report and Corrective Action Requests (CARs), the department manager shall determine actions to ensure that corrective and preventive action are undertaken (refer Corrective and Preventive Action procedure).

The Chief Scientist shall verify that the Corrective and Preventive actions have been implemented and arrange follow up audits where required.

The Chief Scientist shall review CARs not closed out on a bi-monthly basis.

When all the audit's CARs have been closed out, the Audit on the Audit Register shall be closed out by the Chief Scientist.

## **4. Definitions**

Nil.

## **5. Reference Documentation**

Corrective and Preventive Action procedure	CORP-CPA-1
Quality Records procedure	CORP-QR-1

Corrective Action Request Form	QAS-2
Audit Report Form	QAS-7
Internal Audit Schedule Form	QAS-6
Audit Register Form	QAS-13

## APPENDIX 7: ANSWERS TO QUESTIONS ON THE QUESTION SHEET

Question number	Lines containing the answer in ...	
	Control group documents	Experimental group documents
1	65-69	62-64
2	86-88	88-90
3	70-73	71-74
4	74-76	74
5	77	78
6	100-104	103-107
7	121	123
8	77	79
9	144	148
10	77	78
11	49-50	50-51
12	44	38-39
13	68-73	68-73
14	47	47-48
15	59-65	58-65
16	76-77	78-79
17	62	62
18	40-41	40-41
19	112-114	105-109
20	90-91	92-93
21	88	91
22	207	212
23	59-61	60-62
24	42-44	42-44
25	50-57	50-57
26	90-91	93-94
27	129-132	131-134
28	25-26	25-26
29	119-120	130-132
30	93-94	95-96
31	45-46	45-46
32	191-200	196-205
33	41-44	41-46
34	36-39	36-39
35	123-124	103-104
36	47	47
<b>Sample questions</b>		38-40
		54-56

**Table 6** *Answers to questions on the question sheet*

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