# THE WRITING OF INTRODUCTIONS TO ENGINEERING REPORTS AND ARTICLES

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## 1. Introduction

1.1. Throughout college and later life one is periodically required to write essay, a paper, an article, a research report and so on. Generally when writing any of these, and in particular a research report, one goes through the following sections: A. Introduction, B. Review of Literature, C. Method, D. Results, E. Analysis and Discussion and F. References of all these sections (A - F), the Introduction seems to me to be the most difficult and communicatively demanding area, and yet it is the least researched on.

This difficulty reflects the choice that the writers have to make, since they have a wide range of options as to what to include and what not to include, what information to take for granted and what information not to take for granted, what tone to use, what aspects to emphasize and so on.

That this area (introduction) is the least researched on can be substanciated by looking through the materials and bibliographies presently available. It appears that there is a lot of Literature on: Method - Bailey (1981); Brown (1977); Cohen (1977); Hill (1967) etc. Discussion of Analysis and Results - Argyris (1975); Bliss (1983); Bloor (1978); Everitt (1974); Hill & Kerbert (1967); Holsti (1968); Whitley (1983) etc., however, very little has been done on introductions.

1.2. A Survey of the Applied Linguistic Discourse analysis and EST/EAP Literature done by Swales (1981) has shown that so far few investigations into the structure of introductions have been made.

Of the few, West (1980) simply established that - that nominals (for example "x has shown that ..."etc). are more frequent in introductions than elsewhere in scholarly papers. Dubois (1981) dealing with Biomedical article introductions looks at the creation of NP strings and suggests that there is in an introduction a build-up of nouns in an ongoing process of complex NP construction. Oster (1981) surveyed patterns of tense usage in Describing Previous Research. Her hypotheses derive from two articles and therefore cannot be relied upon due to insufficiency of data. Hepworth (1978) gives a singnificant contribution to the study of article introductions. He offers a generalised plot of their structure and claims that they are typically 'problem - solution' text types.

Swales (1981) gives a detailed account of the structure of article introductions. His data is taken from three areas: pure sciences, Biology/Medical fields and social sciences. His main focus is on how writers structured their introductions and hour they commented upon previous research. He has suggested a four-move structure for major types of article introductions. These moves are: Establishing the field; summarising Previous Research; Preparing for Present Research. S ch moves can be compared to Turk and Kirkman's suggestion that introductory materials should:

> "..... state in full the problem you were aiming to solve or the aspect you were setting out to investigate. Why the work was undertaken, what the scope of the study was ..... what limitations of time, personnel and materials were imposed..... an outline of previous relevant data - a survey of the history of related work and a theoretical analysis of problems ..... Anything that fills in the background up to the point at which the work began is relevant to the introductory section."
>
> Turk & Kirkman (1982:64)

Swales and Turk & Kirkman talk about the same thing (the structure of introductions) but use different terminology. For instance Swales' 'Establishing the field' could be equated to Turk & Kirkman's 'Statement of the problem' because ' 'Establishing the field' and 'the statement of the problem' both refer to the same thing, and that is:- what has necessitated the research. However, Swales' 'Summarising Previous Research seems to fall short of the 'historical background information' that is proposed by Turk & Kirkman.

On the whole Turk & Kirkman's components seem to be broader than Swales' moves and thus give room for precision and clarification, in addition they seem to have a wide variety of discourse types. In this study I will therefore use Turk & Kirkman's components which include the statements of the problem, purpose scope, and background information.

1.3. Due to the reasons stated above, (that writing introductions is communicatively demanding, and that very little research has been done on introductions), it is of significant importance that ESP should offer assistance by way of some text and or discourse analysis of introductions and explore the possibility of applying the results of such analyses in the teaching of writing introductions in general and writing of introductions in EST in particular. This paper, therefore, attempts to identify different components in introductions to Engineering reports and articles by studying common language exponents that express the function of these components and to see if these components appear in a certain pattern.

## 2. Data and Method

2.1. The data consists of 19 introductions picked randomly from the field of Engineering. 15 of these are introductions to articles and research reports by professionals (professors, Lecturers, assistant lecturers and research fellows) in the field of engineering.

4 of the 15 introductions are written or co-authered by Native S eakers of English. The remaining 4 are introductions to Msc. Theses.

2.2. The Method of analysis consisted of two steps. Firstly, sections of introductions were colour-coded according to the functions they performed. The colour coding helped to see, at a glance, the constituent components of each introduction. In addition it made it easy to see the ordering of components within the introduction. Secondly, components were examined to see what common language exponents are used to express the function of each component.

## 3. Components and their realisation

The components in introductions are realised according to the function they perform.

3.1. Starting with the statement of the problem, there are up to four different ways that authors use to introduce this component. Firstly, the author may state explicitly the problem to which the report is being addressed as in the following example:

> 1. "Many people are faced with the problem to make decisions with regard to ....."(9)

Secondly the author may give a negative evaluation of previous researches implying that his research is necessary because of unsatisfactory results given by previous researches on the problem. He is thus justifying his research by 'picking a hole' or indicating a gap in previous researches as for example in:

> 2. "...there has been developed different kinds of emperical methods of formulae which express Sediment Transport Mechanism. Some of these are very useful while others are far from satisfactory..."(j)

Thirdly the author can introduce the statement of the problem by stating that the research he is doing is central in some way to the discipline for various reasons. One of the reasons the author may give could be that the research has a considerable degree of interest as in the following examples:

3. "... it is useful and of interest to Tanzania..... ..... to have this problem anaysed ...."(j)

4. ".... has led to a growing worldwide interest into...." (g)

Another reason could be that the the research area is recognised as being important as for instance in the following examples:

5 "... in solving a land surveying problem.... a proper survey can be of great importance..."(4)

6. ".... it is apparent that their use in such important field of .... should not be overlooked ...." (n):

7. ".... provision of .... is vital for the improvement of ...." (1)

Sometimes the author can also give a reason to the effect that the problem under discussion is prominent as in:

8. ".... has long been a major issue all over the world ...."(j)

9."An increasing attention has been given to..."(c)

10. "The problem .... is well known to the people ...."(1)

The fourth way that authors use when expressing the statement of the problem is by stating current knowledge about the problem as in the following examples:

11. "Planning .... of Rural Water Supply has received ..... little attention ...(f)"

12. Recent experiences .... have also revealed prevalence of the problem ...."(h)

13. Many rural schemes ... faced operational difficulties ..."(h)

On the whole therefore the statement of the problem can be easily identified because of the different techniques authors use: that is stating the problem explicitly, showing the shortfalls of previous researches, stating that the area or topic of research is central by either interest, importance or prominence and stating current knowledge about the problem. In case the author uses neither of the above techniques, another way of identifying the statement of the problem could be to look for the statement of the purpose or objective. This in most cases signals the problem under discussion through the close relationship that exists between the statement of the problem and the statement of the purpose as will be seen in the next section.

3.2. The statement of the purpose or objective is the section in which the author indicates what he is trying to accomplish. The relationship between the previous component and this one is that whereas in the former the author indicates a 'gap' in the latter he states how he is going to fill up that gap. This relationship can be illustrated by the following examples:

2. "... there has been developed different kinds of emperical methods of formulae which express sediment Transport Mechanism. Some of these are very useful while others are far from satisfactory ...." (j)

14."....we shall try to acriticise the existing data and find out which type of field measurements and theoretical formulae would be suitable ...."(j)

In 2 above the author 'picks a hole' or identifies a gap in previous researches and in 14. He states how they are going to fill up the identified gap i.e. by criticising what has been done and finding out the type of field measurements and theoretical formulae that would be suitable.

Common Language exponents that express this component are more obvious compared to those of the previous component, because in most cases (15 out of 19 introductions) the objective is stated quite explicitly; the most common expressions used being:

15. "The purpose of this study is ...."(h)
16. "The aim of this work is ....."(i)
17. "It is the aim of this paper to ...."(e)
18. "This paper reports ....."(q)
19. "The primary objective is to ....."q)
20. "Our objective in this paper is ...."(r)
    etc.

Sometimes writers switch to first person pronoun when they come to the statement of purpose (as in 14. and 20. above) even when they have been using the impersonal style in previous components. However, this switch to first person pronoun seem to be very rare, it has occured in only 2 introductions out of the 19 studied.

3.3. The next component according to Turk and Kirkman is the statement of Background information. It has been observed, however, that if this component happers to be long, it is set separate as a Literature Review section which immediately follows the introduction section. In the data studied this component does not appear in 3 introductions and these 3 introductions are followed by a section on Review of Literature.

This component seems to comprise two types of background knowledge; the historical background to the problem i.e. the source and how the problem developed, and the previous researches or studies done on the topic up to the time of the present research. While the former tells us how the problem came into being and/or how it developed, the latter indicates what has been done so far about the problem. Both these types can be illustrated by the following extracts taken from the same introduction:

21. (i) "The application of slow sand filtration as a water treatment has had a bad history in Tanzania... Often many rural schemes which were designed mostly by expatriate Engineers faced operational difficulties due to the extremely short filter runs experienced with slow sand filtration..."

(ii) ".... the initial research work was carried out in the hydraulics Laboratory of the University of Dar-es-Salaam and subsequently ...." (h)

In the above extracts, while (i) gives an account of how the problem originated, (ii) says what has already been done about the problem.

The difference between the two types of background knowledge is further illustrated by the way they have been realised. As can be seen from the examples below, the first type is realised by the mention of historical facts about the problem as follows:

22. "People realised the role....had played for centuries ..." (g)

23. "...Wind driven pumps .... supplied for the last 150 years...." (g)

24. "....Electricity was widely generated in .... ..... by windmills early in this century ...."(g)

25. The engineers of ancient Rome found that ...."(c)

The second type, giving a brief account of previous researches, on the other hand is expressed as follows:

26. "The observations are inferred from..... graphs....Kenneth L. Cook et al have shown that ...."(i)

27. "Investigation on.....was initiated in ....Oates (1933) and Teale & Oates (1943) ...."(c)

28. "So far papers on.... have been published .... (Halemann 1956, Harkin 1960...."(e)

The difference between the first and the second type in the examples above is highlighted by the use of authors and dates in the latter and the non-use of the same in the former. This is probably because previous researches must have been done by somebody at some known point of time in the past while the historical background is a kind of general background knowledge that cannot be directly attributed to any particular author.
The author can also indicate that his work is an extension of investigations in progress; for instance in:

29. "After independence .... have initiated projects on .... and these investigations are still in progress...."(g)

In this case the author has used background information to introduce the present research, and the statement ".... investigations are still in progress" acts as a bridge between the background information and the present research.

3.4. The other component suggested by Turk and Kirkman is the statement of the scope. This usually deals with two aspects: one being the extent to which the materials is covered in the report; for instance, the aspects to be reviewed or analysed might be listed, or the factors connected to a certain problem outlined. The other being limitations or restrictions imposed upon the study/report due to constraints of time, material or personnel, or any limitations necessitating that only certain aspects of a problem are dealt with. However, in the introductions studies, this component occured only once. In this one instance, the author sub-divided the scope into three sub-title as:

30. (i) "Design guidelines for Horizontal Roughing Filters, (HRF)
(ii) Economic comparison
(iii) Assessment of the suitability of applying HRF in rural water treatment practice in Tanzania".

The author here seems to say that he intends to limit his work within the three given areas. Since this component occured only once, further analysis was not possible.

3.5. One other component that does not appear in Turk and Kirkman's categories is the statement about the report's organisation. However, since this component is different from the other components, it has in this study, been treated as a separate component. In this component the author indicates how the information is structured in the body of the report; for instance in:

31. ".... in order to establish the problem better .... the difficulties of Rural Water Supply will be discussed in this chapter .... In the following chapters attention is focussed on ...." (f)

The author in 31. Seems to suggest that he has included this section, "in order to establish the problem better...." in other words - saying <u>what</u> subject one is going to talk about may be enough, but adding to it <u>how</u> that is going to be done, adds to better understanding of the subject.

So far, therefore, at least up to five components have been identified although Turk and Kirkman suggest four. Two of the five components, however, seem to occur very rarely. Below is a table that gives a summary on how often each component has occured in the data.

Table: 1. Summary of Components and their frequency across the data

| Components | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o | p | q | r | s | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stat. of Problem | - | - | | | | | | | | | | | | | | | | | | 17 |
| Stat. of Purpose | | | | | | | | | | | | | | | | | | | | 19 |
| Stat. of Background info. | | - | | | | | | | | | - | - | | | | | | | | 16 |
| Stat. of scope | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 |
| Stat. of Organisation | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 |

Table 1 summarises the frequency of components throughout the data. The table indicates that only one compoonent, the statement of the purpose appeared in all introductions studied. The statement of the problem occured in 17 introductions followed by the statement of background information which appeared in 16 out of 19 introductions. The other two components have the lowest frequency appearing in 1 out of 19 introductions.

After having identified the components, I will now move to the second aim of this paper which is to see if there is a certain pattern in which the components appear.

## 4. The Structure of introductions

By the structure of introductions is meant the appearance or order of component within the introductions. In other words it is important, for pedagogical reasons to see whether the components appear haphazardly or whether there is some kind of pattern that they follow. In addition it would be interesting to see if there is a tendency for certain components appearing next to each other. The table below indicates the sequence in which the components appear in the data studied.

Table 2: The sequence of components:

| | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o | p | q | r | s |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stat. of Problem | - | - | 1 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Stat. of purpose | 1 | 1 | 3 | 1 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 |
| Stat. of background information | 2 | - | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 1 | - | - | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| Stat. of Scope | - | - | - | - | - | - | - | 4 | - | - | - | - | - | - | - | - | - | - | - |
| Stat. of Organisation | - | - | - | - | - | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - |

(n.b. numbers 1, 2 .....4 indicate positions occupied by components in each sample. (-) indicates components missing.)

Table 2 shows that the statement of the problem appears in the first position in 13 out of 17 cases, in the second position in 3 out of 17 and in the third position in only 1 out of 17 cases. 2 introductions did not include this component. The statement of the purpose appears 4 times in the first position; 3 times in the second position; and 12 times in the third position. The statement of the background information appears twice in the first position; 12 times in the second position; and twice in the third position. 3 introductions did not include this component.

The table further indicates that in 11 out of 17 introductions the statement of the problem is followed by the statement of the background information and that in 10 out of 16 introductions, the background information is followed by the statement of purpose or objective. This seems to suggest that authors commonly start with the statement of the problem, then the background information which is then followed by the

statement of the purpose probably because it seems logical and more in order for one first to state or establish the problem, secondly, give some background information to the problem and thirdly indicate how one aims to tackle the problem.

5. Conclusion:

There are certain questions that arise out of this study. For instance; how important are the components in introductions? Can some of them be left out? In other words, are these components optional? For instance what can be said about the introductions that are composed of only 1 or 2 components? Do they not qualify as introductions? Or are they simply 'inadequate'? But then who judges what is adequate and what is not adequate?

These questions - and many others, reflect the issue raised at the beginning of this paper, that the area of introductions, is a difficult and communicatively demanding one. The fact remains that the author has numerous options to choose from. Options because he can opt to answer these questions with a 'Yes', 'No' or 'possibly' depending on what he is writing about and who he is writing for. This will determine how much he should include. On the whole, an introduction looks forward to what is going to come in the body of the report; and therefore its adequacy depends on whether it sufficiently informs the reader as to what to expect.

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