CHAPTER ONE

INTRODUCTION

1.0 Background

Any attempt to study written texts will entail an understanding of writing as 'a set of observable human practices' (Brodkey, 1987, p.80) that situate writers and writing practices within a social, psychological and linguistic context. Writing is a sociolinguistic activity owing to its social context of interaction. It is also a psychological activity in the processing of symbolic information and problem-solving. Furthermore, it is a linguistic activity in its use of meaningful language and performance of particular functions in different communities. Thus, the written product or the text is an artifact of the writing system used within the community, and because of this, a knowledge of the wider writing community, such as that of engineering in this study, is essential in writing. It stands to reason then that the multidisciplinary facets of writing would approximate a multidisciplinary approach in the analysis of the product. In response to this, English for Specific Purposes (ESP), in particular, the area of genre analysis, offers a most comprehensive approach that is equipped with a sufficiency of resources from related disciplines in communication studies, ethnography of communication, sociology of language and cognitive studies to meet various needs in textual analysis. It follows that the dimensions of problem-solving in the act of writing can be realized through pragmatics that describes, and sociolinguistics that defines.
1.1 Communication Within Community Context

The knowledge-based economy with its emphasis as a commodity, has created a great need for a more sophisticated and professionally oriented view of communication as a process. The rapid growth of knowledge-based products together with increasing specialization and fragmentation of knowledge have been major factors in this development. This demand, as has been pointed out together with significant advances in social science theory and the accumulation of research findings have provided a more dynamic approach to formal scientific communication study. Among the more important advances in knowledge which underpin the social aspect in written communication, are the increasingly sophisticated articulated ideas about the nature of a community. According to Moe (1959) in his study of a community system, 'a community is a social system or patterned interaction in which certain elements such as goals, norms and roles and authority-power are observable, and in which certain processes such as communication, systemic linkage, and boundary maintenance are operating' (p.29). He contends that it is these elements and processes that characterize the community. Thus such resources of theory provide us with sufficient and relevant information for use in action contexts. This study has, in a broad sense, based its findings within an intellectual and social framework that is constituted by the existing conditions and events in the engineering community.
1.2 Socialization of the Scientific Community

The current sociological issue arising from the field of science is its communal nature. This notion of scientists as members of a community is important in that it underpins scientific behaviour in several ways (Hagstrom, 1965, pp. 10, 12, 39). In particular, there is the need to produce certified knowledge since this is the institutionally sanctioned goal of science. Such a view of science is further corroborated by Kuhn (1962). He suggests that a communal tradition has been established through a complex of values, theories, techniques and problems characterizing a scientific specialty and that it remains shielded from extraneous interference (cited by Blume and Sinclair, 1973, p. 126). Further, it is maintained that the scientific organization is fundamentally geared to the reward system and the social-control mechanism for validation purposes (Gaston, 1970, pp. 718-732). The reward system operates in such a way that rewards are allocated on the basis of an individual's contribution to the body of scientific knowledge, while social validation of contributions is maintained by the selection of well-informed and experienced gatekeepers from within the community itself. (Becher, 1993, pp. 58-60). It is clear that the reward system helps the scientific community to maintain the standards in publication as well as sustain the commitment of scientists, and to invoke sanctions in instances of non-conformity. Thus it is important to note that the communal setting and the norms of socialization influence the scientific production of knowledge. This inter-relationship between text and context underlies the basis of investigation in this study.
1.3 Norms of Scientific Communication

There are also powerful intra-individual norms which govern scientific communication practices (Garvey, 1979, pp.14-17). It appears that much of the success of a scientist is linked to his internalization of the rules, mechanics and norms associated with the whole scientific communication system. Generally, it is expected of research scientists to have a good understanding of the current state of scientific knowledge in the field; and this involves a knowledge of important issues or problems that must be investigated to advance the state of the field and articulate the basic paradigms within which research is conducted. Further, knowledge-making is based on the fact that scientific progress relates to, builds on, extends, and revises existing knowledge. To win recognition in exchange for his contribution, the scientist has to communicate his scientific thoughts, and ideas in a manner that facilitates further interactive communication with scientific information that is related to the present, past and future. This means new scientific information must always be embedded in the contemporary grammar of its subject matter. Additionally, it must be communicated in relation to its contemporary counterparts. In other words, new information must be couched in a way that demonstrates the falsity of existing information, and at the same time, is seen to be related to the same phenomenon or conceptualization dealt with in previous information. This sense of continuity generated results in the impression that the new information represents progress in science. In this way, scientific research is described as being characterized by steady progress. Thus, this study seeks to adopt an approach that can shed light on the nature of scientific communication in the form of recurring patterns of linguistic phenomena.
1.4 Presentation of Scientific Results

It has been pointed out that information must be properly communicated to the scientific community. In connection with this, Duderstadt et al. (1982), writers of an engineering text, say, 'An important aspect of engineering problem solving involves the presentation of results. Even the most elegant and successful results will be for naught if they are not presented in an understandable fashion... A carefully organized presentation of both the analysis and the solution of the problem is essential' (p.82). This emphasis on giving serious attention and thought to the writing up of results indicates that a good presentation is indispensable for succeeding in the engineering profession. On the other hand, it also suggests an undue emphasis on the experimental aspect of science at the expense of a proper presentation of results. It is clear that while good writing skills alone do not justify the publishing of worthless results, poor writing skills invite rejection of scientific knowledge worthy of publication. In general, there is a tendency for an over-emphasis on science to the detriment of the communication skills. To address situations similar to this, English for Specific Purposes (ESP), a focus of language teaching activity, has served as a principled approach to construction and analysis of specialist discourse. It has drawn its resources from the developments in applied discourse analysis as a result of which teaching has become more descriptive with the availability of various linguistic descriptions of language. More recently, ESP has been tapping resources from the area of genre analysis with the result that language has become more explanatory. This is because genre analysis is viewed as 'a multidisciplinary activity, the purpose of which is not simply to describe and analyze textual data but to explain as to why a particular textual genre is constructed, interpreted and used the way it is in specialized
settings' (Bhatia, 1994, p.23). The application of genre in ESP engenders an awareness of the rationale of the type of generic text that learners have to understand before they can write. In this way, specialist language teaching in ESP is forged closer to the professions it serves as can be seen in the mushrooming of educational institutions offering English for professional communication programmes. For example, the Programme in Scientific and Technical Communication which is offered by the University of Washington, presents writing as a process that is closely related with problem-solving and design processes. It also explores the relationship between technical content and the communications context which is defined in term of purpose, use and audience (Coney and Ramey, 1984, pp. 138-143). Thus, increasing integration of ESP with disciplinary situation has accentuated the role of authentic communication in the teaching and learning of professional discourse. This is based on the notion of authenticity of communicative purpose which a particular text is intended to serve within a professional context. For this reason, this study has been based on the article introductions of an international and a local publication.

1.5 The Rationale and Purpose of the Study

This study attempts to examine the formal microlinguistic features of the article introductions of selected international and local electrical and electronics engineering disciplinary communities within a theoretical framework that takes into account information content and the rhetorical structure as well as interactional features. This is to achieve a more adequate characterization of the target texts through investigation of the structure of discourse and the lexicogrammatical resources of language for discourse. In this way, Halliday's (1985, p. xvi) assertion
that a discourse analysis that is not based on grammar is not an analysis, but simply a running commentary on a text, is upheld. Thus, in general, the objectives of this study can be broadly grouped under the following macrolinguistic and microlinguistic levels.

At the macrolinguistic level, the objectives are:

(i) to adopt Swales' CARS Model as the descriptive framework and to adapt it to suit the corpus of this study;

(ii) to find out whether the length as well as the frequency in occurrence of the moves/move-steps is determined by the parameter of sub-discipline or other generic factors.

At the microlinguistic level, the objectives are:

(i) to identify the recurrent, recognizable forms of descriptive linguistic phenomena that are semantically realized in the different moves, and show how the use of such linguistic phenomena is related to their purposes in terms of their functional value;

(ii) to identify the verb tenses and modals that are used in the moves/move-steps and determine their frequency distribution across the moves, and show how they are related to their purposes in terms of their functional value;
(iii) to find out whether generic features vary according to topics expressed in sub-disciplines or whether they are universal to electrical and electronics engineering regardless of sub-disciplines.

The objectives of a more specific nature are related to investigation of recurrent recognizable linguistic forms at the move-step level as in the following:

(i) to identify varied ways of semantic realizations as in the staking of a claim or citing of literature in defining a problem, or the purpose, results and organizational structure in the presentation of a solution;

(ii) to keep statistical counts when number is obviously the decisive factor as in the number of citations made as per text and sentence, and the number of compound nouns composed of varying number of nouns in explaining a solution; and

(iii) to identify the repeated marked use of linguistic exponents like negative elements and adversative connectors in establishing a gap.
1.6 Research Questions

This study attempts to answer the following research questions:

1. What are the results and developments arising from a comparison between the IEEE and the LA introductions?

2. How does Swales' concept of moves constitute a rhetorical pattern that synthesizes the introduction text? What are the salient parameters in determining the number or length of moves or move-steps that occur in electrical and electronics engineering related research articles?

3. What is the significance of investigating the recurrent, typified forms of descriptive linguistic phenomena that are realized in the different moves? What are these recurrent linguistic forms or quantifiable categories identified in this study?

4. Do the generic features vary according to topics as expressed in the IEEE sub-disciplines or are they universal to electrical and electronics engineering discourse regardless of their sub-disciplines or territory?

5. In what way is a grammatical analysis significant to a genre-based approach? What are the predominant verb tenses and modals that can be identified and how are they distributed across the moves/move-steps? What are the trends that emerge?
6. How is today's writing in electrical and electronics engineering responding to today's realities? For example, it was felt that electrical engineering and electronics are two of the most dynamic and rapidly developing disciplines, so is this evident in the writing in electrical and electronics engineering?

1.7 The Scope

The choice of examining writing in science may be attributed to the expositions of Bazerman (1988, p.6). Firstly, scientific writing is invested with important social and cultural significance and scientific statements are constituent to a world that is constantly re-engineered. There is, secondly, a general consensus to scientific methods of formulating knowledge. Thirdly, scientific discoursal practices have important influences in all disciplines, and lastly, scientific language poses tremendous challenges in the investigation of its formulated scientific statements as important discoveries can further the use of rhetoric. Since the engineering discipline appears to embody many of the features that describe scientific discourse, the corpus of this study has been based on electrical and electronics engineering texts.

Further, several reasons account for the choice of the target genre of this study, the research article. According to Bazerman (1988), it represents continuing realizations of social activity within a socially structured situation (p.128), so, in this sense, it meets the purpose of this study which is to understand texts by taking into consideration how they are created as well as how they are used. Added to this, the research article has endured through the natural sciences for at least three centuries,
and the communal activity of publication that has evolved over time has been embodied and shaped by such rules and practices as are indicative of mature science. The resulting stabilizing effect constitutes the conventionality that regulates language behaviour. This is particularly important as it allows the observation of emerging regularities of forms which is the focus in this study.

This study is centered on the introduction section since this particular section is the first part of the research article, and in being so, it poses a greater challenge for analysis than any other section of the article. Besides, it is in this particular section that the interactions between the writer and different levels of readership are most acute. Moreover, this is also the section where the difficulty of what to include or how broad a context to create for the topic remains to be resolved. Most of all, it offers tremendous opportunities for analysis in view of the range of complexity and variety of problem statements that are couched within a relative short space.

1.8 The Corpus

The Transactions of the Institute of Electrical and Electronics Engineers (I.E.E.E.) is an established, international and refereed publication while the Journal of the Institution of Engineers of Malaysia is its local counterpart since its format follows that of the I.E.E.E. Transactions. The history of those journals provides a necessary backdrop to this study as it yields insights of the writing conventions that explicate the social interactions within the engineering discourse community.
1.8.1 Profile of the Institute of Electrical and Electronics Engineers (I.E.E.E.)

The Institute of Electrical and Electronics Engineers (IEEE) is an international organization of engineers and scientists in engineering, electronics and allied field. It was founded in 1963 by a merger of the American Institute of Electrical Engineers (AIEE) (founded in 1884) and the Institute of Radio Engineers (IRE) (founded in 1912). Its headquarters are in New York City. The purposes are to advance the theory and practice of electrical engineering and the allied arts, and to maintain a high professional standing among its members. Before 1963, the professional groups set up for publishing the transactions were as follows: Audio, Broadcast Transmission Systems, Antennas and Propagation, Circuit Theory, Nuclear Science; Vehicular Communications; Quality Control; Broadcast and Television Receivers; Instrumentation; Radio Telemetry and Remote Control; Aeronautical and Navigational Electronics; Information Theory; Industrial Electronics, Microwave Theory and Techniques; Medical Electronics; Communications Systems; Ultrasonic Engineering Electronics; Engineering Management; Electron Devices; Electronic Computers; Component Parts and Production Techniques. There were 22 technical committees that contributed papers to the Transactions. More professional groups and technical committees such as those on Power System and Biomedical Engineering were set up after 1963. The membership consists of Fellows, Senior Members, Special Members (by invitation only), Members, Associates and Students. The minimum age, years of active service (in the case of Senior Members and Members) and annual dues have been stipulated for each category of membership. The Institute has a membership of more than 400,000. Meetings are held monthly and annually.

1.8.2 Profile of the Institution of Engineers, Malaysia (I.E.M)

The Institution of Engineers, Malaysia was founded in 1959 after the nation's independence, with only 60 members. It is the largest institution of engineering in Malaysia with a membership of more than 50% of the total population of engineers in Malaysia. The first Journal publication appeared in 1960, and it serves as an important source of information for the engineering community. Further, it also serves as a clearing house for the exchange of ideas and a forum for the examination of new or old ideas. Besides, it disseminates information and contributes towards the advancement of engineering and technology. The recognition of IEM by the government is seen in its consideration of the IEM corporate members for certain posts in civil service. Further, with the implementation of the Engineers Act, the IEM corporate members can be registered as professional engineers with the Board of Engineers, Malaysia (BEM). For international recognition, it has participated in many international conferences since 1962. To date, IEM is an active member of several international engineering organizations including World Federation of Engineering Organizations (WFEC), Commonwealth Engineers' Council (CEC), Federation of Engineering Institutions of Southeast Asia and the Pacific (FEISEAP), Association of Engineering Education of Southeast Asia (AEESEA) and Asean Federation of Engineering Organizations (AFEO). Generally, publications of IEM conferences fall into the following categories: IEM Journal, IEM Bulletin, Proceedings of IEM
conferences, seminars, symposium, manuals of reports on engineering practices, casual reports and other IEM special publication (Guidelines to the Publications of IEM, 1990, pp. 3-7).

1.8.3 The Reviewer System

This aspect of publication reveals the ways in which genre conventions instantiate the values and epistemology of the engineering discourse community through the authors' efforts to accommodate their reviewers. In the case of the IEEE Transactions, three reviewers assist the technical publications coordinator (TPC) who is the editor who evaluates the paper in terms of their 'unquestionably high quality' and significance in contribution (IEEE Power Engineering Society Publication Guide, 1995, pp. 6, 8). Only technical committee, subcommittee, or working group members may serve as official reviewers. As for the Journal of IEM, the referee should be a corporate member of IEM or graduates with higher degree and 100 referees of various engineering disciplines will be appointed periodically for three terms. The main task of the referees is to uphold the reputation of the journal by excluding contributions that are not original, significant, concise or well-presented (Guidelines to the Publications of IEM, 1990, p. 11). This astringent reviewing of contributions by both the IEEE and IEM certainly calls for a closer examination of what really constitutes a good piece of work in engineering as in the present study.
As an ESP practitioner, Bhatia (1994) points out that getting associated with the professional community is prerequisite for the acquisition of the background knowledge of the discipline (p. 26). With respect to this, the researcher (Sze, 1998) has been based at the Engineering Faculty of the University of Malaya to work with twenty-two academics in an ethnographic study. Bhatia also maintains that one's prior experience of specialist genres can pave the way for the acquisition of a knowledge of the communicative conventions. Here again the researcher feels she has a better grasp of Business English through her working experience in a trade organization as well as in a government department, than by following the dictates of the textbook. However, ESP practitioners generally acquire a knowledge of the communicative conventions of a genre through exposure to current literature. This study stresses the importance of not only learning the genres and conventions that members of a disciplinary community employ but that the ESP practitioner be able to explain why the genre is conventionally written and used the way it does. To reinforce this, Candlin (1993) states that 'ESP need not only linguistic and pragmatic awareness of specialized discourse but also a clear understanding of the relationship between discourse and social structure and social change. Such contexts demand of ESP teachers an intercultural sensitivity which transcends the often exclusive linguistic and textual focus' (cited by Bhatia, 1994, p. 26).
1.10 Limitations

With regards to the methodology, the analysis of the lengthy informing section, or Move 2, can be facilitated by using the notion of 'cycles'. In connection with this, Mayor (1993) suggests that cycles containing textual categories describe the transactional, interactional and logical functions of language to approximate the constant shift of focus from one aspect to the other (p.265). It is proposed that the investigation be extended to include the obligatory and optional moves together with the five basic top-level structures frequently used in expository texts such as cause and effect, compare and contrast, categorization, enumeration and generalization. In addition, the present study has focused mainly on the written product when, as suggested by Swales and Crookes (2984), research on writing as a process is also needed so as to explain how such texts are generated. It is felt that findings from the perspective of writing as a process will greatly complement those of writing as a product as in the case of this study. Further, any attempt to view the findings of the present study as representative of the genre of the scientific article as a whole will require further corroboration of the findings of this research through the use of a larger corpus. Moreover, more work has to be carried out on different scientific text types like those of theoretical physics and physical chemistry to find out whether the persuasive strategies adopted by the scientists of this study can serve as an explanation of those used by the scientists in other disciplines. Thus, a lot more work is needed to determine the applicability of the findings of this study to texts of scientific disciplines outside engineering.
On the whole, genre analysis cannot be treated simply as a tool that can be directly used in the analysis of texts. There must be a rhetorical consciousness or an understanding of the basic schematic text structures before application. We have to develop at least a good awareness of, if not a good mastery over the conventions which govern a particular generic communicative activity before one can fully exploit such conventions. In contrast to practical but rather restrictive pedagogical uses of concepts like topic sentences and essay outlines, it is a multidisciplinary activity the purpose of which is not only to analyze but also to explain why a particular genre is used the way it is. This involves coming to grips with paradoxical aspects of genre like dialectical and dialogic perspectives, diachronic and synchronic structure and sites of centrifugal and centripetal contention to understand the workings of its complexity. Finally, an investigation based on this approach demands great patience so it cannot be accomplished within a short time frame. Thus, the genre-based approach is complex and time-consuming, making it difficult for the non-expert user to include it as part of his repertoire of strategies in writing.

1.11 Significance of Genre Analysis

It is evident that a text analysis attempts to extract descriptive rules or principles by studying written texts. This may be carried out, either, at a general level, where principles applicable to all texts are uncovered, or, at a more specific level, where structures commonly used in a type of written texts are used for inferring the schemata or syntactic rules used in the texts. However, in general, most descriptive approaches to the analysis of texts do not provide sufficiently graphic evidence for the perception of underlying regularities and patterns (Perl, 1979, p.
This study exemplifies an approach that views texts as recurrent typified phenomena in the form of quantifiable categories which exhibit 'internal lawfulness' (Bereiter and Scardamalia, 1983, p. 10) and it aims to understand that 'lawfulness' in terms of the communicative purposes and the social context other than the cognitive aspect of the writing process. In further support of this, Candlin and Breen (1970) say, 'Communication we have defined as a process of relating language forms and language behaviour in the context of social events. We have stressed that the conventions that link forms and behaviour ... are variable and need to be constantly negotiated and accepted Communication becomes a convention-creating rather than a merely convention-following activity. It is a social and interpersonal process. Learning to communicate is, as a result, not a matter of digesting a static and predictable body of knowledge, but learning how to interpret, express, and negotiate through and about these conventions' (p. 209). In this way, the approach forges a link between the product and the process as well as that between structure and the resources of language for discourse as well. This leads to an investigation of the linguistic form which is closely related to language function: Hymes (1974) notes that 'social function gives form to the ways in which linguistic features are encountered in actual life. This being so, an adequate approach must begin by identifying social functions, and discover the ways in which linguistic features are selected and grouped together to serve them' (p.196). Thus, this study attempts to give a more adequate characterization of text by analyzing the resources of language for discourse within the rhetorical structure of discourse. It offers a systematic documentation of different linguistic manifestations of social facts by highlighting the kinds of choices that occur in electrical and electronics engineering. These linguistic choices may find expression, as in the case of the present study, in semantic
realizations, verb tense and modal differentiations, or mere linguistic exponents or statistical counts of grammatical or lexical units. However, there is generally only an intuitive understanding of these distinctions in communication contexts among language teachers, so this calls for a sociolinguistic study such as this, to systemize them. Thus, this study also concretizes the attempt to cultivate the sociolinguistic perspective in language teaching by laying special emphasis on language features which typify social meanings. It bridges difficulties arising from textbooks that are apparently silent on sociolinguistics and language teachers who are not sociolinguistically orientated.