Interdisciplinary perspectives on he quality of abstracts for information retrieval
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Interdisciplinary Perspectives on the Qualities of Abstracts for Information Retrieval

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Abstract

A review of related works shows that ESP teachers generally perceive the abstract as a genre that is taught like the research article, and research focus has been on genre analyses in various disciplines. The important concern of ESP is to facilitate novice writers in producing abstracts for publication or attending conferences. A major question is whether abstracts used in the real world actually reflect prescribed conventions. On the other hand, information studies experts are mainly concerned with abstracts meeting the needs of end-users in information retrieval, and to this end whether abstracts fulfill standard measurements in information systems. A comparison of both perspectives appears to indicate the need for collaboration and awareness raising in both disciplines. ESP teachers need to examine the prospect of adding the complementary dimension of information science to the linguistic scaffolding that they have been providing to learner-writers. A focus group discussion comprising professionals in the discipline of information science, whose expertise and interests include information retrieval, services, management, organization, and systems design, was conducted. The findings from the focus group corroborated that underlying the apparent differing viewpoints between both disciplines there are distinct interdisciplinary overlaps in the concept and objectives of the abstract and abstract writing. These conclusions have significant implications for future research and teaching practice.

Introduction

ESP teaching and research has been developing over the last thirty years. It began with a lexico-grammatical pedagogy for science and technical subjects, to genre issues in both the 80s and 90s, and arriving at the doorsteps of the *new rhetoric* (Freadman, 1994) in the 90s. Currently, it is widely accepted that genre interests have become interdisciplinary

and are no longer considered static in form and structures, but that they are shaped by contexts (Freadman, 1999). Nowadays, at the dawn of the twentieth-first century interests needs to be multidisciplinary for any research phenomena to provide a holistic picture. However, research on abstracts from the ESP as well as information science perspectives have apparently followed distinct directions. ESP teachers have mostly taken a learner-centered and genre-based approach to investigating the abstract in different disciplines. The primary objective has been to assess how closely the prescribed rhetorical structure and language conventions of the genre are practised, and how these findings impinge on classroom teaching. On the other hand, experts in the domain of information retrieval systems have focused on evaluating the abstract content from the perspective of its effectiveness as surrogate tool for information search or discovery. A review on research interest in the abstract genre for both disciplines over the thirty years has been done. Results of the review (see "Review of ESP perspectives" and "Review of Information Science perspectives" in present paper) indicated speculative nuances of commonality between them. Furthermore, the impact of technology on speed of information retrieval has further prompted this need to look at the abstract from the combined viewpoints of these two disciplines. Literature review from both disciplines is presented briefly below to identify these nuances of commonality. Next, we present the findings gathered from a focus group discussion among highly experienced information experts who verify these speculations and provide further insights for pedagogical implications and future research.

Review of ESP perspectives

In the 1960s, language teachers found themselves landed with the responsibility of instructing non-native English scientists and professionals to write acceptably for their new disciplines. Subsequently, these teacher-researchers, also known as ESP teachers-, based their pedagogy on the principle that language is for communication. The most popular practice was the genre approach developed and popularized by Swales (1990). Swales had defined the genre as a communicative event with a common purpose and mutually understood aims shared with participants of the same community. It has structure and standardized communicative constraints, and those who practice frequently and professionally in this genre will have an overt knowledge of its rhetorical features. As a result many ESP writers (Paltridge 1997; Gosden 1995; Mustafa 1995; Sionis 1995; Marshall 1991) have recommended that academic writing instruction should focus on the genre: its communicative purpose, its content structure, and its language conventions. This approach was mainly practised in teaching the research article (RA). Research was based on analyzing the RA or specific sections of it. For example, Swales studied the Introduction section (1981, 1985a, and 1990), and Dudley-Evans (1988) analyzed the discussion section of M.Sc dissertations. However, Nwogu (1997) studied the RA genre of medical articles, and Posteguillo (1999) examined the RA of computer science RA.

However, not as much interest has been placed on studying the abstract genre. Early writers who examined the abstract included Huckin and Olsen (1983) who also applied the genre analysis approach and examined the language conventions of the genre.

In the classroom, ESP teachers have used the abstract as a tool for their writing curriculums (Davis 1991). The abstract is also viewed as a promisory preview (Swales 1990; Salbiah 2000) for conferences.

Recent research interest in the abstract reflected a more specific and deeper concern. The predominant questions include, How can non-native writers learn to write effective abstracts for their discourse communities (Salager-Meyer 1990; Santos 1996)? Do real world academic writing and workplace publications follow the conventions or guidelines set and prescribed for abstract writing (Posteguillo 1996; Koegh 1994)? And, has the abstract genre undergone evolutionary changes over the years, as have the main research articles (Berkenkotter and Huckin, 1995)?

Salager-Meyer (1990) studied abstracts from medical journals because of the frequent criticisms on badly written medical abstracts as being uninformative, misleading and lacking in internal structure. Results of her analyses revealed that many abstracts had no purpose statement and no conclusion and there was a prevalence of illogical sequencing in their move organization, and there were also flaws in the paragraph structuring and overlapping semantic concepts straddling between paragraphs. Salager-Meyer proposed that novice writers should be given good models to emulate.

Santos (1996) studied how abstracts could be characterized in terms of their textual organization, and analyzed other key features of this genre. He selected 94 abstracts from three leading journals in Applied Linguistics. Santos found a prevalent five-move model with submoves: Situating the research, presenting the research, describing the method, summarizing the results, and discussing the results. He concluded that his resultant schematic pattern could provide pedagogical advantages to non-native learner-writers in reading and writing abstracts.

Posteguillo (1996) focused on how discipline variations affect the abstract genre. He did not find the consistent use of IMRD structure of Swales (1990) in the computer science abstracts he examined, although he found similar structures. Consequently, he did not fully comply with Swales in that abstracts reproduce the IMRD structure, but agreed that abstracts do reproduce the structure of its full text. He concluded that these results have pedagogical implications.

Keogh (1994) examined the structural and stylistic features of a corpus of 48 abstracts written by scientists and engineers for their workplace publications. He found that textbook guides recommended the use of active structures but his sample showed an almost even mix of active and passive sentences. While academic texts stress the importance of the conclusion and recommendation sections his sample seldom included these. He concluded that in the real world practice a lot of academic advice tends to be discarded.

Finally, Berkenkotter and Huckin interviewed seven scientists extensively to examine their research article reading habits. They found that these scientists practised a

scanning for interesting new information strategy, for example they would read the title and then the abstract to 'size up' critical information and decide next on whether to read the full document. Next they selected a corpus of 350 journal articles to examine how research papers structure and information organisation have changed to accommodate present-day reading habits of scientists who have little time and who are faced with information overload. They found that titles and abstracts now tend to be more informative to cater to the needs or current readers. For example abstracts are now inherent parts of papers, and they have become longer and more informative, particularly in providing results and conclusions of studies so that readers may find it unnecessary to read the full document.

From the studies above, it would appear that ESP interest in the abstract has increased in recent years and remains largely genre-related and understandably pedagogical. However, writers like Salager-Meyer and Posteguillo have overtly raised concern over the effects of technology on current speed of information flow, and Berkenkotter and Huckin have in their study observed how the abstract has become a significant surrogate document in information gathering. In view of this development among ESP experts it would make sense to corroborate their research with information science experts.

Review of Information Science (IS) perspectives

During the 60s and 70s, advanced technologies in information transfer methods have enabled a proliferation of information on the electronic information systems (Lorenz 1969). Users were faced with problems of having to filter out constant streams of information inundating their systems, and the abstract, which is a 'mini' version of the full document, became a useful surrogate tool for quick and effective information retrieval. The 80s (Hills 1983) and 90s were landmarks that saw further technological advancements in high-speed computerization and later the Internet facilitated even more widespread and expedient information retrieval. Although information in full texts can now be efficiently retrieved and free text searching is possible, information experts like Pinto and Lancaster (1999) confirmed that abstracts are still useful and explained how full texts often contain details that cloud efficient identification of significant and precise information. Chowdhury, (1999) and Fidel (1986) added that availability of full-text and multimedia information in digital forms has increased the importance of the abstract in scholarly publications.

Consequently, information science writers paid great attention to producing guides to effective abstracting. They include writers who are experts on indexing and abstracting (Collision 1971; Borko and Bernier 1975; Rowley 1982; Cleveland and Cleveland 1983; and Lancaster 1991). Together they summed up the characteristics of a good abstract as one that has *brevity*, *accuracy* and *clarity*, but the over riding criterion of an abstract is whether it serves the needs of the users.

Other information professionals followed up with institutionalized standards, the most significant being American National Standard Institute commonly called ANSI Z39.14-1979, and International Standards ISO 214:1976. Such prolific literature on prescriptions for abstract writing belies the great concern of information professionals or experts in evaluating the quality of abstracts and on regulating the production of this surrogate

A number of studies were conducted to assess readability using readability formulas, comprehension measures, or both. Dronberger and Kowitz (1975) suggested that the measurement of readability could provide an assessment of one phase of an information system. They explored abstracts published in Research in Education (RIE), and whose full documents were stored in Educational Resources Information Center (ERIC). Results showed that the reading level of abstracts was significantly higher than the reading level of source documents because of its concise nature and condensed information. However, it also showed that readability measurement does provide a useful technique for evaluating abstracts. Tenopir and Jacso (1993) measured the quality of abstracts based on style and readability, the extent to which the ANSI standard is observed, and exhaustivity of the abstract. They found that passive voice, prepositions, too many sentences per paragraph, too many words per sentence, and too many syllables per word all lowered readability. However, exhaustivity or extent of content coverage of source documents could not be so easily tested because of individual user needs.

In more recent studies, information professionals (Wheatley and Armstrong 1997) have conducted several major studies on abstract production for online services, a direction to which the ESP researcher may need to shift. Finally, Pinto and Lancaster (1999) based their study on judging the quality of authored abstracts in terms of exhaustivity, accuracy, readability, cohesion, brevity, and cost. They found that although the computer has enabled easy availability of full texts in electronic forms this has not reduced the value of human produced abstracts.

Motivation for Focus Group

So far, the aforementioned review of related works seems to indicate that the content of abstracts is a major focus of information experts, and qualities like exhaustivity, accuracy, readability, organization and cohesion are deemed highly relevant. However, from the viewpoint of ESP, these qualities could speculatively be related to linguistic issues although at this point such conclusions are not readily apparent or distinct. In order to verify this speculation a focus group discussion was conducted among information science specialists or "specialist informants" after Bhatia and Dudley-Evans (Bhatia, 1993 and Dudley-Evans, 1986). The attempt to consult these specialist informants corroborates step number 7 of Bhatia's seven step process in analysing any academic or professional genres, a step which, apart from the works of Dudley-Evans and Bhatia, has not been practised more frequently as it should be in ESP. A total of seven information experts in the Information Studies Division at the School of Communication and Information Studies,

Nanyang Technological University participated in the study. The aim of the discussion was to uncover the actual nuances, opinions, recommendations and focus of the information experts with regards to the abstract as a tool in retrieval and dissemination.

The Focus Group

The participants are highly experienced professors who offer courses in library science, information organization and management, information retrieval and information systems design and programming at postgraduate level. Some of the participants are also journal reviewers and editors as well. Thus a comprehensive representation of information experts whose opinions, comments and recommendations would be highly reliable and respected is secured for this validation study. The objective of the discussion was to validate the claim that although there may be apparent differences in the way the language and information experts perceive, research, and qualify the abstract, there are in reality underlying similarities that can be better utilised to enhance abstract genre pedagogy for novice writers.

The discussion was held in a specially designed and equipped room for focus group discussions. The room was equipped with both audio and video recording facilities, and a one-way glass partition that enabled unobtrusive observation during the live discussion. The discussion room accommodated a maximum of 12 participants sitting around a large square table (2mx2m) that had built-in microphones at intervals of about a meter around the table. Built-in cameras captured the images of the participants from all four angles. The discussion was scheduled for 90 minutes, and the entire session was video recorded.

Three days before the session, a set of nine questions was given to the participants to outline the main issues of discussion (Appendix A). The thesis of the discussion was "Current technological advancements in information dissemination and retrieval have posed an additional challenge to Language providers. It is no longer enough to focus only on teaching rhetorical structures and linguistic conventions of the genre, instead, there is the need to meet the needs of writing abstracts for the WWW environment". Throughout the session, active participation among all members of the group was observed.

Results and Discussion

In the course of the discussion, some of the nine questions were found to be redundant, and unforeseen aspects of the abstract surfaced for discussion. The findings from the study are summarized and organized into six sub headings as follow:

Setting the parameters for discussion: Defining the type of the abstract genre

Although the first question on the effects of technology on the abstract was presented, the IS experts thought it was more appropriate to begin the discussion by setting some basic parameters. First it is important to consider the type and purpose of abstracts

under discussion. The type of abstract determines its product variations; there are descriptive, informative, critical, and review abstracts based on the different purposes and environments in which they are found. For example, the informative abstracts focus on results and conclusions and are preferred in technical documents; descriptive abstracts are shorter and merely provide abbreviated descriptions of the contents of the original documents, and critical abstracts go a step further to give an evaluation of the original documents.

Similarly, it is as important to identify the purpose for the specific type of abstract selected. For example, an abstracting agency that aims to use the abstract to reach a global audience may decide that the descriptive type abstract is appropriate; on the other hand an abstract may be used in a book review and in this case the critical abstract is preferred. Whether the abstract under discussion is authored by the original writer, or with human assistance, or by machine extraction it would be a pedagogical enhancement to create this awareness of typological distinctions in the classroom. Although this definition step is elementary, most ESP studies have so far focused mainly on the informative abstract.

Another significant factor that could affect abstracts is the knowledge field. It is acknowledged by IS experts that different knowledge fields have different objectives for using abstracts. In this respect the abstract content and structures may vary. For example, abstracts in medical articles are structured under subheadings, a feature not practiced in other knowledge fields; abstracts in mathematical or chemical engineering fields use specific "unique identifiers" which are highly specialised terminology like mathematical symbols, but which are used to aid faster retrieval.

What are the effects of technology on abstracts? Are electronic abstracts inherently different from traditional print-based abstracts?

The IS participants are of the opinion that changes in environment are not responsible for affecting qualities of abstracts as long as the abstract purpose remains. For example, an authored abstract taken from a journal paper like IEEE Transactions or Association for Computing Machinery (ACM) and put into an abstract database, or even on an electronic platform like Internet does not need to be rewritten or adapted because it is the same abstract. Whether the abstract is used in print or Internet it should not impact or affect its value. However, at other times an original authored abstract could be modified by human assistance because of specific abstract or information agency objectives or policies. For example the abstract agency may want to modify original abstracts so that they reach a wider audience on the Internet to include the less technically trained readers. Electronic abstracts could be different because they have been generated automatically by machine, but these have no comparison with human produced abstracts and learners do not need to be concerned with them. Another reason that could impinge on the type of abstract is the result of overwhelming information flooding the systems and compelling the length and amounts of information in the abstract to be very brief and usually descriptive.

A point in future direction was brought up for discussion. In order to facilitate cross-referencing to full texts, online abstracts could have hyperlinks in various parts of the document to cater to different needs of the user. For example, if the user is interested in only the results of the study a link could be made to the result section of the full document. All these links are only a click away, whereas in the traditional environment, time and distance are constraints and such cross-referencing is not possible. However, the utility is possible provided the abstract in question is accompanied by its full document. [This also implies that the abstract content should cover all the various pertinent sections of the complete document for without such coverage, it would be impossible to create these hyperlinks to the affected sections] So far this idea has remained as a proposition. There was also the suggestion to include metadata such as author information, number of words, and publication details and other utilities as retrieval tools to assist the user in IR, but these have limitations and are thought best left to the professional indexers and other IR systems designers.

What desirable qualities should abstracts have to increase their visibility and retrievability in IR systems?

In an ideal situation, it is desirable for the abstract to be produced by a specialist in the knowledge field, who is also trained in abstract writing. However, this is very difficult to achieve and is very expensive. Instead, a more important consideration is to note the reasons why people use abstracts. Different users have different needs. This is especially so on the Internet where the abstracts reach a much wider audience, where some are experts in the field and others not. Based on this user consideration, readability and exhaustivity of content representation are important variables especially for researchers who use abstract as surrogates or as decision-making tools for reading source documents. The minimum quality is to aim for high readability in abstracts. Abstracts should be written in simple and direct language so that they are easily comprehensible to both experts and non-experts. In terms of exhaustivity, abstracts should contain sufficient and significant content representation to function effectively as surrogates. Finally, the practice of providing standard retrieval tools like keywords is also a means to enhance the abstract quality. It increases visibility and retrievability of abstracts on the retrieval systems.

It would appear that the ESP or language provider has the important dual-role of both providing the rhetorical structures and language conventions of the abstract and training novice writers to produce abstracts of high readability. Where exhaustivity and representation of content are concerned, engaging the collaboration of subject specialists could be a solution.

Should abstract writers be taught the standard information retrieval tools used in IR systems?

On whether abstract writers should be taught the standard retrieval tools used in IR systems, the IS experts were of the opinion that key words are important, although they

should not become the main objective for writing abstracts. For example, related terms like *transputers* and *parallel processing* should be represented in the text as a semantic group for greater audience reach through key word search. Semantic webs/thesaurus and tweaking of key words to fit retrieval needs could also be employed. On this point, a suggestion that links to these key words could be made to specific semantic groupings or semantic webs for users seeking on key word search alone was offered.

However, the IS experts also pointed out one drawback in using all these features. Over enthusiastic writers may "abuse" the facility in order to ensure greater accessibility to their abstracts. Such activity would cause spamming problems on IR systems. One suggestion to counter this possibility was to ensure that abstract writing maintain stipulated standards in order to control or prevent such “abuse” by over zealous writers.

The IS experts also stressed that only significant key words should be offered because it is only through using them that users can obtain correct or relevant information from the whole gamut of information available on the systems. Furthermore, in pioneering research and for new frontier knowledge, key words must first exist in the text before abstractors can make use of such a utility. To this end it is significant that the abstract is very important because it is here that new terms are introduced and communicated by authors, and later they may become the key words for search.

On whether ESP teaching should incorporate indexing knowledge, the IS experts explained that indexing requires one to *read the document technically,* and to have the expertise to pull out the right information from the various parts of the document for the abstract. To do this professional indexers are required. Moreover indexers do not depend on abstracts alone. For example, indexers may have access to some unique identifiers that abstract writers may not have.

Next, the use of rating utility is another facility available to assist the abstract user during retrieval. Reference to the rating of the abstract could assist the user in determining the relevance and significance of the full document. There was further suggestion that the rating utility is perhaps more important for abstracts on print than on Internet, one reason being users would be provided professional assessments of the quality of the abstracts, which would help them decide whether the full document is worth reading or purchasing. From the knowledge management viewpoint, having a standard rating tool is probably very useful, but it is very expensive and is not easily available. Moreover, even if one wants to provide a rating system the author cannot do it, because writers are very subjective in the assessment of their own writing. Such a system requires an independent professional body. This led to the general consensus that this utility is more useful in the filtering process later rather than at the process of writing.

In summary, the implication is that abstract writers should have greater awareness of the search engine or the agency they are writing for. Writers should realize the agency objectives of using their abstracts, and the key words that are crucial and pertinent for

cross-referencing. However, the more technical capabilities like incorporating metadata, and rating utility should be left to the information experts. Thus, it would appear that the ESP practitioner's role is still linguistically based.

How do IS experts rate the three aspects of an abstract: linguistic competency, content, and representation?

Different viewpoints emerged in the discussion of linguistic competency. First, the term linguistic competency was clarified as referring to lexico-grammatical accuracy and use of language. To the IS experts it was clear that although they agreed that language is important it is the content representation that is more significant. This is especially true in the case of technical subject matter where the content is valued more than the eloquence of expression. To IS experts the communicative competence of writers is more important than merely language or grammatical accuracy. But to the editor, language is as important if not more important than the content in abstract. This is mainly because the abstract is a tool for communicating new information to users and as such the message must be succinctly and effectively communicated to achieve the purpose of its production. To this end writers must call upon their linguistic competence so that the content can work for them. Overall, the IS experts concluded that linguistic competency is important but should not take precedence over content representation of the abstract.

The experts then identified several abstract-writing constraints: Brevity or word limit would affect exhaustivity of the abstract representation. Length and content structure would in turn depend on the type of abstract and agency requirements. Domain, journal, instructions by agencies would also limit an author's objectives of abstracting and the type of language depends on the technicality of subject matter. While these constraints are outside the jurisdiction of the author, readability and linguistic qualities, which are important aspects of the abstract, are within the author’s control. Simplicity is the key to writing readable abstracts. In order to improve the readability the writer would need linguistic skills. Linguistic skills would impinge clarity, conciseness, and precision, while ensuring good cohesive and coherent text relationships at the same time. A point was raised that often writers do not present content exhaustively and the reason cited was lack of linguistic competence. There is also the need not only to know what input information should be included in the abstract, but that it be presented communicatively and meaningfully to the user. Thus, writers must consider the uses and needs of readers. One of the experts went as far as to say that an abstract must be as good as if not better than the full document because of its surrogate significance. When asked to rate their opinion on which aspect of the abstract they would consider very important on a scale of 1-3 the consensus was returned in the following order beginning with the most important.

1. **Content:** By this rating they emphasized the significance of content presentation and content representation of information in the full document.

2. **Linguistic competency:** This refers to lexico-grammatical accuracy aspect of linguistic competence.

3. **Exhaustivity:** This refers to the comprehensiveness in representing the content of the full document and reflecting its salient information.

However, from the ESP perspective, content impinge on language heavily. First, language is the resource for representing the content, and it is also the vehicle for presenting the content in a manner that is comprehensible and communicative, or makes sense to the user-reader of the abstract. From this discussion it is clear the ESP role remains mainly in the area of communicating meaning through linguistic competency.

How can language providers collaborate with information experts for better pedagogy?

Some significant points were brought up in this discussion. First, the IS experts felt that it is very important for the writer to realize the purpose and type of abstract that is required, and the environment in which it is being retrieved. For example, in the WWW environment writers should realize that they are reaching a much wider and varied audience. This would comprise specialists as well as non-specialists. In this environment writers would need to ensure that their abstracts cater to this large readership by writing more explicitly and including more cohesive devices to increase readability. On the other hand, where the audience is highly specialized and in-house, and where information is currency within the specific discourse community there is less need for too much explicitness. For example there will be no necessity to include non-content words like "This paper aims to…" or "The results of this study show…".

Often, by the time the abstract reaches the IS expert it is in the final product state and little can be done to alter or improve it, apart from rewriting a new abstract. So to save cost the ESP practitioner could have the important duty of ensuring that writers produce a readable and useful abstract. Moreover, the IS expert may not have the skills of writing the abstract itself although they have the expertise in determining a desirable abstract. So the ideal situation is for the ESP practitioner to fill this gap. The production of the abstract may be represented in a continuum, with the ESP practitioner and the IS expert at the helms of both ends. The ESP practitioner would guide the abstract writer in the process of producing the abstract, while the IS expert would evaluate whether the abstract serves its purposes and the needs of the users.

However, if the need arises IS experts may have to involve the services of professional abstractors or supply specialist retrieval tools to assist the information seeker. The ESP teachers, on their part, may have to either develop teaching materials and strategies to help writers to identify relevant content, write concisely and precisely so that

the end product is a clear, simple and highly readable surrogate of the full document, or collaborate with specialist informants.

The discussion ended on the final note that the most important quality of the abstract is its content representation and that an abstract may still be an effective surrogate even if the language use is not error-free. However, having said that the IS experts are still in agreement that linguistic competency and rhetorical structuring of content are enhancing elements of abstract writing, and the last recommendation is to write clearly and keep the abstract simple.

Conclusion

The study has found that ESP teachers have been and continue to be highly concerned with coaching novice writers in the linguistic and structural aspects of abstracts for the discourse communities. Moreover, research has concentrated on examining printed texts in traditional journals and corporate in-house reports. On the other hand, information experts have been focused on investigating the benefits for writing the surrogate and stressing the seriousness of the abstracting business. They have suggested professional training and application of strict processing rules, which require abstractors to be knowledgeable in the abstracting process as well as the specialist content area. In order to establish common ground at this level of professionalism ESP instructors should also direct their learner-writers to be knowledgeable about the requirements of international standards and meet end-user needs on IR systems.

Next, information professionals are mainly concerned with measuring the accuracy and exhaustivity of the abstract because of their concerns for user needs. It would thus benefit ESP instructors to encourage their learner-writers to focus more on content quality and view the abstract in a larger context of information seeking and retrieval on information systems.

Information experts place great value on readability of the text, and stress the importance of clarity, structure, and brevity. This is perhaps the strongest bridge between information science and linguistics. ESP instructors could handle this responsibility of training the novices to write concisely, make precise lexical word choices, structure clear simple and direct sentences to facilitate comprehensibility, organize information elements coherently and cohesively, and ultimately become better author abstractors for the information systems.

Finally, the impact of technology on the informative abstract genre is perhaps the most significant outcome of the focus group discussion. It could be concluded that ESP teachers need to add the IS dimension to the linguistic scaffolding that they have been building for novice writers. There is the need to raise greater awareness in issues related to the use of abstracts on WWW environments:

- That speed of accessibility is one crucial factor to consider when writing and disseminating information
- That while ESP instructors have mainly focused on informative abstracts, multiple versions of abstracts can be created for various end-users
- That coinage of new vocabulary is best launched in abstracts for frontier works of knowledge
- That provision of key words that are included in semantic groupings has the potential of giving their abstracts wider reach
- That creating hyperlinks in an abstract could help focused researchers to easily access the writer's detailed research data

Future research is needed to explore the possibility of incorporating information utilities such as hyperlinks, and relating to semantic webs in the production of the abstract text. This awareness may not be translated into teaching materials because of their technicalities, but drawing writers' attention to these capabilities would help to expand their perception of the abstract and its potentials. Thus in the ESP classroom it would be beneficial for learners to be aware that technology like online facilities could affect the structures and qualities of abstracts most in terms of structure, length and speed of circulation. Awareness in these aspects prepares learners to write more purposefully for the general audience, who may not be technical experts. However, this bridge between ESP and IS can only be built if ESP experts acknowledge their interdependency on information science, and continue to study and uncover the common ground between them in order to draw useful implications for course design and teaching.

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Appendix 1

Current technological advancements in information dissemination and retrieval have imposed an additional challenge to the abstract writing pedagogy. It is no longer enough for language providers to focus only on structural and linguistic accuracy but an additional dimension on meeting the needs of abstracts in the www environment must be considered.

1. Studies have shown that electronic abstracts (e.g. those in Internet directories and Internet gateways) are different from traditional online database abstracts derived from print-source environment (LISA, ERIC). Based on your experience as an information provider and manager, what is your opinion? How far do you think this claim is true?

2. In this environment of technology, how can **author abstracts** meet the requirements of electronic IR systems so that they would stand the best chances of being retrieved?

3. Specifically, are there certain vocabulary terms or data about the abstract that would make it more responsive to IR systems?

4. Should or can standard information organization and retrieval tools of IR, e.g. subject headings, thesaurus, and controlled vocabulary, be **taught** so abstract writers will better cater to the requirements of IR systems?

5. Some researchers have said that, an ideal 'Internet abstract' should include metadata such as user guidance, assessment of authority, discussion of physical attributes, judgements of quality, or pointers to alternative sources. (Wheatley, 1997). To what extent would you agree?

6. How significant is **linguistic accuracy** of an abstract to information experts as selection criteria for retrieval systems? Please explain.

7. How does linguistic accuracy **compare** with **content representation and exhaustivity** of the abstract in the selection process? Please explain.
8. In your opinion, what common concerns do information experts share with language providers about the art of abstract writing?

9. How can language providers collaborate with information experts so that they can be better informed to effectively cater to the changes in technology and information systems?