Cross-cultural variation in the hedging of propositions in Greek and English Engineering Research Articles

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ABSTRACT
The aim of this paper is to investigate hedging in Engineering Research Articles written by Anglo-American and Greek Engineers in English. 34 Research Articles (RA) taken from well-established Engineering Journals were analysed as to the number of hedges used by authors, their distribution across the various sections of the articles, and the variation in the expression of hedges. The articles were taken from a hard copy journal and an online journal and separate comparisons were made between articles published in each journal. Variation was observed both at the level of cross-cultural rhetorical strategies as well as at the level of genre and discourse community conventions. The results could be indicative of cultural attitudes towards the expression of certainty and uncertainty in academic writing, as well as genre conventions and regulations of international discourse communities. Moreover, they could raise an awareness of the differences between Greek and English styles of writing and have pedagogical implications for the teaching of academic writing in a foreign language.

1. INTRODUCTION
The aim of this study is to explore use of hedging by writers who belong to the same academic field, but come from different linguistic, educational and cultural backgrounds. The need for this cross-cultural investigation arises from the fact that English has become an academic lingua franca in many fields, especially in the field of Engineering where most publications are in English, and as a result academic communities are largely becoming internationalised (DuszaK, 1997). Members of regional academic discourse communities are absorbed in International discourse communities and are asked to adapt to uniform discoursal standards of academic ideation (DuszaK, 1997). In order for scientists to become members of the international academic discourse communities and publish their work in internationally acclaimed journals, they need to be familiar with the norms and conventions that govern these communities. Mastery of discourse conventions, therefore, appears to be one of the prerequisites to power on the international academic scene (Valero-Garces, 1996).
One of the central academic discourse conventions in the English speaking academic world is the ability of the writer to present new claims with due caution and deference to the community. This convention is known as hedging. The main motivating factor for hedging has been seen to be politeness towards the other members of the discourse community, and the need for scientists to appear as humble servants of the discipline recognising that their claims are provisional and pending recognition by the discourse community (Myers, 1989). In scientific writing hedging is central to effective argument. Every scientific report states a claim which often denies or supersedes the claims of others, and authors are forced to seek the indispensable balance between remaining within a certain consensus with the community and having a new claim to make to justify their publication. Hedging is believed to be one of the main ways of securing this delicate balance (Vassileva, 2000), a rhetorical means of gaining reader acceptance, allowing writers to convey their attitude to the truth of their statements, to anticipate possible objections and to balance conviction with caution (Hyland, 1996a, 1998).

Academic writers need to make a clear distinction between propositions already shared by the discourse community, which have the status of facts, and propositions to be evaluated by the discourse community, which only have the status of claims. Tentative language is one of the signs by which claims may be distinguished from facts (Crompton, 1997). Myers (1989) even goes as far to say that an unhedged claim is not a statement of new knowledge. Hedging is considered very important in the Anglo-American scientific discourse, the mark of a professional scientist who acknowledges the caution with which s/he writes on science (Crisimore and Farnsworth, 1990).

Hedging is a phenomenon shared by most languages, if not all. However, different languages may have quite different linguistic realisations for hedging, or different cultural values and beliefs regarding hedging. Thus, appropriate hedging may be a difficult thing to master in a foreign language (Nikula, 1997). Members of international scientific communities are simultaneously members of national language communities and often transfer their cultural beliefs and rules of appropriateness when they write in a foreign language (Mauranen, 1993a). These cultural differences may, therefore, cause misunderstanding and communication breakdown because the author and the reader do not share the same norms and expectations (Markkanen and Schroder, 1997).

Several researchers have conducted studies either focusing on use of hedging by writers of two different languages, or investigating it among other types of metalanguage. Some are Ventola and Mauranen (1991), who

The present study attempts to add a comparison of Anglo-American and Greek Engineering Research Articles to the above literature, and is based on 34 Research Articles (RAs) taken from well-established Engineering journals. The articles were analysed as to the number of hedges used by authors, their distribution across the various sections of the articles, and the variation in the expression of hedges.

This paper will first present the material and methodology of the study. It will then go on to discuss the results of the analysis and will finish off with some conclusions and pedagogical implications the study could have for the teaching of academic writing in English.

2. MATERIALS AND METHODOLOGY

The materials of the analysis were 34 RAs written by native speakers of English in English and native speakers of Greek in English. The term native speakers of English encompasses British, American, Canadian and Australian speakers, however, for convenience's sake, in this paper they will be referred to as Anglo-American writers. The journals where the articles were taken from were: The International Electronic and Electric Engineering (IEEE) Transactions on Communications, Information Theory, Magnetics and Biomedical Engineering, the IEEE Signal Processing Letters, and the International Journal of Electronics, which is published online. An equal number of articles from each publication format were analysed, with 12 articles (6 Anglo-American and 6 Greek) published online and 22 (11 of each L1) published in the hard copy journal.

All the articles published in the IEEE Transactions and IEEE Signal Processing Letters follow a uniform format and presentation adhering to guidelines given by the Journal. They, therefore, consist of an Introduction, Methods, Results/Discussion and Conclusions section, followed by References and Appendices. The articles published on the International
Journal of Electronics follow a similar format. The RAs published in the IEEE journals are longer, 394 lines long each on average (8667 lines were analysed), whereas the articles published online are much shorter, 289 lines long each on average (total 3473 lines). The Anglo-American articles date from 1995 to 2000, while the Greek date from 1991-2000, except one dating in 1989.

The articles were analysed as to the number of hedges used, their distribution among the various sections of the articles and their variation. As hedges were counted all items or sentences that belong to any of the following groups: modal verbs (may, can, might, could, etc.), speculative verbs (propose, suggest, believe) evidential verbs (appear, seem), epistemic adverbs (possibly probably, likely, somewhat, typically, usually), nominalisation (possibility, probability), or other tentative words and expressions that do not fit in any of the above categories (in our approach, in view of these remarks, it is desirable). Hedges can also be realised strategically. As strategic hedges were counted whole sentences that refer to limitations of the study (Due to lack of space, we only discuss few representative simulation experiments...), the methodology or model used (The main disadvantage of the technique is the limited control ...), and possibly to admission of lack of knowledge (However, we point out that our definition of m is neither universal nor complete.)

3. RESULTS AND DISCUSSION
3.1. Number of hedges
All lexical and strategic realisations of hedges were counted in the articles and then were divided by the number of lines of each article to produce the density of hedging in the articles. The following two tables present the number of hedges found in the RAs written by Greek and Anglo-American authors in the online and hard copy journals.

<table>
<thead>
<tr>
<th>Greek RAs</th>
<th>online</th>
<th>hard copy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of hedges</td>
<td>56</td>
<td>102</td>
</tr>
<tr>
<td>No of lines</td>
<td>1575</td>
<td>4559</td>
</tr>
<tr>
<td>Density</td>
<td>0.03</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Table 1: Density of hedges in Greek RAs

<table>
<thead>
<tr>
<th>Anglo-American RAs</th>
<th>online</th>
<th>hard copy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of hedges</td>
<td>130</td>
<td>63</td>
</tr>
<tr>
<td>No of lines</td>
<td>1898</td>
<td>4108</td>
</tr>
<tr>
<td>Density</td>
<td>0.06</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Table 2: Density of hedges in Anglo-American RAs
As can be seen from the tables, authors published online hedge more than authors published in the hard copy journal. The issue of how much varying degrees of academic expertise affects authors' rhetorical choices, comes into play with this observation. Namsaraev (1997), in his study of hedging in Sociological articles in Russian, found that in publications produced by researcher-beginners there is either an excessive concentration of hedging, probably caused by eagerness on the part of the writers to adhere to discourse community conventions, or an absolute lack of them, possibly due to unfamiliarity with these conventions. This distinction between skilled and less skilled writers is also made by Ventola (1997), who is of the opinion that novice writers often have problems with realising their speculations appropriately, and by Duszak (1997), who claims that expert writers are assumed to combine high field expertise with high language skills for the purposes of scientific exposition.

But can online authors be considered novice and less skilled academics while hard copy authors experts? This assumption that authors can not be easily made in this case, as we can have no definite knowledge on the reasons behind authors' choice of publication, whether it is easier to publish inline, or whether there are less strict article acceptance conditions and editing and revising practices.

The results also show that Anglo-American authors hedge more than the Greeks in the online articles but less than the Greeks in the hard copy articles. Questions of the degree to which writers' nationalities and level of expertise affect choices also arise with this observation. Does the native English competence of Anglo-American online authors help them with appropriately tentativising their claims, and could it be that the same English speaking nativeness gives the hard copy Anglo-American authors higher expert status and, therefore, the liberty to diverge from standardised patterns in academic communication? (Duszak, 1997).

Further variation can be found in the distribution of hedges across the various sections of the articles as well as in the variety of hedging strategies employed by authors. The following two sections will examine these two sources of variation.

3. 2. Distribution of hedges
As stated in the previous section, most of the articles published in the IEEE Transactions and IEEE Signal Processing Letters follow the format Introduction, Methods, Results/Discussions and Conclusions. However, there are some deviations from this format: two articles have not got a section just for the presentation and discussion of Results, but combine Methods and Results and then have concluding remarks in the end. One
article written by an American academic omits the Conclusion section altogether. Only one article written by Greek academics comprises Methods and Results in one section, while all the rest follow the standard format. In the International Journal of Electronics the format is the same, but deviations can be observed here as well. Two articles written by Greek academics combine Methods and Results, while one article by an Anglo-American academic combines Discussion and Conclusions in one section.

The analysis revealed that the distribution of hedges across the four sections varies depending on the type of publication. The distribution of hedges in the online journal differs from the distribution of hedges in the hard copy journal in the RAs of both Greek and native speakers of English authors (See figures 1 and 2 below).

![Hedges distribution in Anglo-American RAs](image1)

**Figure 1: Hedges distribution in Anglo-American RAs**

![Hedges distribution in Greek RAs](image2)

**Figure 2: Hedges distribution in Greek RAs**

In the Anglo-American RAs a similar number of hedges can be found in the Introductions and Methods of both formats of publication, with the most notable differences being in the Results and Conclusions. In RAs written by Greek authors a considerable number of differences can be found across the two sub-genres. Online authors hedge more in the Introductions and Methods sections, while hard copy authors hedge more in Results and Conclusions.

Differences are found, however, across L1s, as well. The figure below presents a comparison of the distribution of hedges in the online journal in Anglo-American and Greek RAs.
A different pattern can be observed in the distribution of hedges across the various sections of the articles. Anglo-American authors consistently hedge their propositions in all sections, and are especially careful to show their deference to the discourse community when introducing the aims of their research and when drawing their conclusive claims. Hedging increases in the Results/Discussion section where authors argue for their claims.

In the Greek RAs, however, one can observe dramatic changes, with hedges escalating in the Methods section, a section which is the least obviously rhetorical part and, therefore, needs little hedging (Hyland, 1998a), then dramatically dropping down in the Results and Conclusions sections, where authors usually deliver their propositions more cautiously. It seems that Greek authors so not hesitate to sound certain and categorical in their discussions and conclusions and emphasise the value of their results and the contribution of their research.

In the hard copy journal the picture is somewhat different: (see figure 4)
The hedging pattern is more similar between the two L1s, and the dramatic ups and downs in the distribution of hedges across article sections are not there in the Greek articles. The greater difference between the two patterns seems to be in the Results (where Greeks hedge more) and Conclusions sections (where again Anglo-American academics are more tentative). It can be observed that the behaviour of hard copy authors is more uniform than that of on line authors, which could probably be attributed to more experience and greater familiarity of hard copy authors with the regulations of the discourse community or possibly to stricter guidelines given by the journal.

Attempting a more detailed analysis of authors’ rhetorical strategies in introductions and conclusions, an observation that can be made is the different rhetorical techniques authors of different nationalities use, which again are differentiated depending on the format of publication. For example, in their hard copy journal Introductions Greek authors tend to create a niche for their own research by evaluating and criticising pervious research or models (this technique can be found in 5/11 hard copy articles):

1. Bowel sound patterns in normal people have not been clearly defined, as only a small number of them have been studied. The trivial processing methods which have been involved in [6], [7] have also been a problem.
2. Unfortunately the method used for noise reduction in [8] was based only on assumptions...
3. These techniques are often unreliable a limited to special cases.

while Anglo-American authors do that to a much smaller degree (2/11). Anglo-American authors seem to prefer to state the importance of their research more moderately by simply outlining the advantages of their method or model:

4. The other group, which includes the method we propose in this paper, optimises detection...
5. The carrier recovery scheme described here is intended for systems..., it is applicable... it reduces the effects...
6. In this paper we describe a form of the FIF that simplifies its implementation and allows it to be used for reconstruction.
The situation is reversed in the Greek online articles, where only 2 out of 6 Greek authors employ this technique, as opposed to 4 out of 6 Anglo-American.

Another major difference is to be found in the Conclusions sections. Most online Anglo-American authors (5/6) hedge their conclusions:

7. It is possible that the NS methods used might be made even more efficient by refinement.
8. We hope that our results will inspire interest in the use of...
9. It might be worth investigating the effect of...
10. We speculate that the observed statistics on real networks are ultimately due to...
11. We suggest that this experimental approach is a useful addition to the tools available to the designer.

while only in 1 out of the 6 online Greek articles was the conclusion hedged. The rest of the authors sounded rather emphatic in their conclusions and were sure to stress their good results:

12. The proposed CNN was able to generalise efficiently, even when trained for a small fraction of the input/output samples of the CA evolution. The CNN was completely successful in learning...
13. A novel technique linearising the deadband non-linearity of a DC motor is presented and is well-suited for a DC motor... This method is simple and is well-suited for most small motors.
14. The experimental results derived show that a very satisfactory almost linear response can be achieved.

The situation is not similar in the hard copy articles. There Anglo-American and Greek authors hedge their conclusions to the same degree (in 4 out of the 11 articles in both cases). However, the number of hedges found in the conclusions of Anglo-American papers is greater due to the utilisation of multiple hedges by Anglo-American authors:

15. Although only modest examples were given, the simplicity of the approaches described should permit a wide variety of fractal reconstructions.
16. As a first attempt in this direction we have proposed .... Although the initial results seem promising, several research problems remain to be explored. It would be convenient to develop... It might also be useful...
17. There is also potential to extent this work...
as opposed to single items of hedges in Greek articles:

18. In this paper we have proposed a unified approach...
19. We have suggested use of ...as means of initialising estimators...
20. These results indicate severe system performance degradation
21. which make Anglo-American conclusions read more tentative than the Greek.

3. 3. Variation of hedges

Variation of hedges was analysed separately in the hard copy and online journal and comparisons were made across L1s and formats of publication. A first and general observation is that Anglo-American authors vary the hedging expressions they use, while Greek writers have preferences for certain lexical expressions of hedges.

But let us begin by examining the situation in the RAs written by Greek Engineers. As can be seen in the following two figures that depict the variation of hedges in both the hard copy and online journal, the use of modal verbs prevails, followed by speculative verbs and epistemic adverbs. Evidential verbs and other expressions are used in rather small percentages. There is no nominalisation in either format. Authors who are published online tend to utilise less strategic hedges than authors published in the hard copy journal.

![Comparison of hedges variation in Greek RAs](image-url)

*Figure 5: Comparison of hedges variation in Greek RAs*
In the RAs written by Anglo-American Engineers again modal verbs prevail, followed by speculative verbs in the hard copy and evidential verbs in the online format. Nominalisation is again minimal in both formats. Resembling the case of Greek authors, hard copy authors tend to use more strategic hedges than online authors. A greater percentage of use of other tentative expressions is observed, which can suggest greater individual variation (see figure 6 below)

![Comparison of hedges variation in Anglo-American RAs](image)

*Figure 6: Comparison of hedges variation in Anglo-American RAs*

The greatest similarity in the choices of authors can be noted in the prevalence of modal verbs. Modal verbs are probably used to such a great degree by both Greek and Anglo-American authors as they generally exhibit a higher degree of detachment than other forms of hedging (Vassileva, 2000), and tend to downplay the person making the evaluation (Hyland, 1998), largely due to the fact that they are mostly found in impersonal constructions.

Examples include:

22. Alternative snubbers may be used to facilitate...
23. A number of desirable snubber energy recover energy functions and requirements can be listed, which would be applicable to both turn-on snubbers...
24. A study of how the numbers and location of optima vary with search space in these problems might be revealing in this context
25. Modulations of the electron beam could affect the operation
26. ...it should be possible to apply...
However, some modal verbs are preferred over others by Engineers in the articles analysed, and the next section discusses the variation in the use of modal verbs.

3.3.1. Modal verbs

The following two figures portray the modal verb variation in articles written by Greek authors. As can be seen not all modal verbs are used by Greek authors, but only four of them. This is another similarity with Ventola’s (1997) observations. She writes that Finnish academics also preferred certain probability expressions and showed less variation in their choices of probability expressions as opposed to English writers. *Can* is the modal verb that prevails in both formats of publication, with *may* occupy the second bigger portion of the pie in the hard copy journal, and with the only two other modals utilised being *could* and *might*. In the online journal the distribution of modals is more even. *Could* is the second best preferred modal here, followed by *may* and last comes *should*.

![Modal verbs, Greek RAs-hard copy](image1)

![Modal verbs-Greek RAs-online](image2)

**Figure 7: Variation of modal verbs in Greek RAs-hard copy**

**Figure 8: Modal verbs variation in Greek RAs-online**

Anglo-American authors (see figures 9 and 10) were found to use all modal verbs available even though the most prevalent ones are *may* and *might*. In the online journal *may* occupies the biggest part of the pie, while the use of all the other modals is limited. The situation is more balanced in the hard copy journal, where *may* and *might* are used almost equally, followed by *can* and *could*, and *would* and *should* in identical percentages respectively.
May and might are two of the most commonly occurring modal verbs in samples of academic writing as has been found by other researchers too (Butler, 1990, Vassileva, 2000). However, Greek authors tend to use can, may and could, in that order of occurrence. A possible explanation for these preferences can be the different realisations of these modal verbs in the Greek language and transfer from different functions of these modal verbs in Greek. However, a detailed discussion of these differences are outside the scope of this paper.

4. CONCLUSIONS AND PEDAGOGICAL IMPLICATIONS

The cross-cultural comparison of hedging in Greek and Anglo-American Engineering RAs has indicated variation in all three levels of the analysis, which were number of hedges used by authors, distribution of hedges across articles sections and variation in the expression of hedges. The variation seemed to depend both on the format of publication as well as the writers’ native language. Authors who publish online were found to behave differently than authors who publish in hard copy journals, but these differences were not always similar across first languages.

In general, authors of online articles appeared to hedge more than authors of hard copy articles and vary less the expressions they use. There was also more variation in the choices of Anglo-American and Greek on line authors than hard copy authors. This could be attributed to different levels of authors’ expertise, possibly different standards of article acceptance in the two journal formats, or degrees of article editing and revising.

Anglo-American Engineers, on the whole, were found to use more hedges, distribute them more evenly across article sections, and vary the expressions they use more than their Greek colleagues. These differences between the choices of writers with different first languages could be due to different degrees of familiarity with International discourse community conventions, or differences in regional discourse community conventions.
International discourse communities are mostly anglicised so writers who have been socialised in an Anglo-American educational system may be more familiar with these conventions, having been given strict guidelines regarding what constitutes effective academic writing. On the other hand, it could be that in the Greek educational system there are different conventions to be followed and that more emphasis is placed on content rather than on form. It may be that what matters is what one writes and not how they write it, and that this idea of the scientists having to show deference to the discourse community when presenting new claims and to protect their face from potential criticism does not exist in Greek academic communities. Greek people have been claimed to be a nation that exhibits positive politeness (Sifianou, 1992), so the smaller utilisation of hedges in the RAs written by Greek authors could be indicative of a desire to emphasise a sense of in-group solidarity, and therefore no need to save face.

Another possibility could be that Greek writers transfer different realisations of hedges in Greek when they write in English, which make them more comfortable with some expressions over others. Further research is needed, however, possibly in other academic fields and genres as well, to validate these findings and allow for generalisations.

The findings could have pedagogical implications as regards the teaching of academic writing in English. When writing in a foreign language writers face problems not only on the level of grammatical structures, syntax or vocabulary, but on the level of rhetorical strategies and academic conventions, as well (Kaplan, 1966). Full-fledged membership in a discourse community seems to be associated with the concept of genre literacy or disciplinary members’ awareness of relevant communicative conventions that operate in academic reading and writing practices (Motta-Roth, 1998).

The genre in question in this paper is the research article. Research articles are not simple narratives of research activities but complexly distanced reconstructions of such activities, deriving from a need to anticipate negative reactions to the knowledge claims being advanced and to gain reader acceptance and community consensus. This need explains the long-standing use of hedges as a rhetorical device both for projecting modesty and caution, and for diplomatically creating research space (Swales, 1990, Hyland, 1996b). Articles can be refused by journals for various reasons, but as Swales (1990) writes, the key for successful publication is ‘rhetorical awareness’ or ‘ability to guess how referees will react to a particular text’. It becomes apparent, therefore, that for scientists to publish in journals, to exert an influence in the field, to be cited, it is necessary to understand and know how to strategically utilise the genre in question. Genres are the media through which members of the scientific
discourse community communicate with peers, provide information and comments, and further the community’s goals. Understanding the genres of written communication in one’s field and conforming with the regulations of the relevant discourse community are, therefore, two essential factors for professional success (Berkenkotter and Huckin, 1995).

5. REFERENCES


