Research Article

TOP REPORTING VERBS IN ELECTRICAL ENGINEERING RESEARCH ARTICLES: EXTERNAL AND INTERNAL FACTORS AFFECTING THE TENSE USE

Nguyen Vi Thong

Yersin University, Dalat, Vietnam
Corresponding author: Nguyen Vi Thong – Email: fldh@yersin.edu.vn
Received: February 06, 2023; Revised: March 24, 2023; Accepted: March 30, 2023

ABSTRACT

This study employs a sociolinguistic framework to conduct an in-depth analysis of how reporting verbs are impacted in research articles on electrical engineering. 160 Electrical research papers containing 4,206 tokens were examined using the R software. The past and present tenses of the top three verbs propose, show, and describe were chosen as the binomial values for the dependent variable tenses. The findings indicate that publication periods (external factor) and verb choice, verb types, and verb voices (internal factors) influence the choice of tense. Additionally, the interaction of the correlations between the factors and the dependent variable is taken into account.

Keywords: electrical engineering; research articles; R; regression; reporting verb

1. Introduction

In the academic discourse community, research articles (RAs) are regarded as a genre that plays a significant role. By use of RAs, researchers may not only disseminate their expertise in their respective domains, but also disseminate novel claims to the academic community as a whole. It is obvious that effective academic writing is essential for academic success. Hyland (2005) emphasizes that academic writers must not only be aware of how to report claims, but also how to establish their positions, or their own position in the claims. To fulfill these objectives, authors must use a variety of academic writing strategies. Appropriate use of reporting verbs is one of the approaches seen as advantageous for reporting claims and establishing positions (Swales 1990, 2004; Thompson & Ye 1991; Hyland 1999, 2001; Charles 2006; Bloch 2009, 2010; Nguyen 2013, 2018). In other words, reporting verbs are one of the useful academic methods that may assist the writer in attaining his or her rhetorical goals of establishing assertions (Charles, 2006).

Recognizing that there has been relatively little research comparing the usage of reporting verbs by English native speakers and EFL Vietnamese speakers, Nguyen (2013) undertook a cross-disciplinary and cross-cultural investigation of the phenomena. As research data for his work, 167 research publications from the fields of Engineering, Mathematics, and Applied Linguistics are selected. The conceptual framework of Nguyen's research is a synthesis of the models of Charles (2006) and Bloch (2010). The results indicate that disciplinary variance, rather than cultural variation, is the primary element influencing the reporting verb usages in journal papers for both speaker groups. It identifies verb groupings and tenses, as well as the rhetorical implications of verbs. It indicates that, regardless of the group to which the authors belong, reporting verbs are often used differently across fields.

Regarding the employment of reporting verbs across disciplines, Rau (2017) has identified the occurrence in electrical engineering and classified the reporting verbs found in research publications in this subject into three categories. Citation verbs are defined as reporting the activity of a preceding author. Self-reporting verbs are used to describe the procedures and contribution of the author of this research. Thirdly, Rau defined Pointing verbs as verbs that direct the reader's attention to a visual and emphasize certain information inside the picture. Since this classification closely relates to the present research, the author chose to adopt this paradigm for his examination of reporting verbs. As indicated by Rau, this indicates that the reporting verbs in this research will be classified into three categories.

Previously, Hyland (1999) investigated the contribution of academic citation practices to the development of disciplinary knowledge. By analyzing 80 research publications in eight disciplines and conducting interviews with professional writers, the author discovered that the frequency with which particular reporting verbs are used in various domains varies. In linguistics, for instance, the most common verbs are *suggest, argue*, and *demonstrate*, but in electrical engineering, the most common verbs are *propose*, *show*, and *describe*. The author therefore argued that discourse choices are impacted by the epistemological and social norms of their respective fields.

Later, in Chen's (2009) research, the issue of reporting verb tenses was fully addressed. It was said that adopting the proper tense is one of the most efficient methods to communicate not just information but also the author's judgment. Chen discovered, via an analysis of the Literature reviews in PhD dissertations, that in both hard and soft sciences, around 80% of reporting verbs are used in the present tense, while only 15% are in the past. In the present research, the tenses in which propose, exhibit, and describe are employed are regarded a dependent variable, with the aim of determining if the tenses of reporting verbs vary according to external variables (time periods and journals) or internal ones (verb types). In other words, the findings may suggest whether or not tense characteristic becomes a trend in academic writing.

Most recently, Nguyen (2018) conducted a more in-depth analysis on the reporting verb *propose* in Electrical Engineering articles. With the aid of the VARBRUL program, 397 tokens from 160 papers on electrical research were examined. As an application value, past tense of *propose* was chosen. The findings indicate that the publication times of the articles and the verb voices are two factors that are independent of the application value. In the meanwhile, tense choice correlates significantly with journal editions and verb types. In various journals, the frequency of past-tense propose varies, and a considerable amount of self-reported suggest is written in the past tense. It was also addressed that despite the limitations of sample size and verb categories, this research held promise for future sociolinguistic analysis of reporting verbs. Therefore, the current study is a development of Nguyen's (2018) research while broadening its range of reporting verbs' investigation.

In continuation of Hyland (1999), Chen (2009), and Nguyen's (2013, 2018) research, the author of the current study intends to analyze in more depth the variables that influence the tense usage of the most used reporting verbs in Electrical Engineering. In light of Geeslin & Long's (2014) identification of time as one of the social elements influencing language usage, the purpose of this research is to analyze how reporting verbs have been utilized throughout different historical periods. This study seeks to address the following research question:

"In the discipline of Electrical Engineering, are the tenses for the most commonly used reporting verbs influenced by external variables (time periods or journal editions) and internal ones (verb choice, verb types, and voices)?

2.   Methodology

2.1.   Corpora

This investigation is based on a corpus of 160 English research papers authored by academics in the area of Electrical Engineering and published in four journals over two distinct time periods. The primary criterion for the selection of time period is Hyland's date of publication (1999). It was determined that the first group would consist of RAs authored roughly between 1994 and 1998. For comparison with the current state of the field, the second set of RAs was gathered between 2018 and the present. The corpora are described in Table 1 in detail.

Table 1. Text corpora

	Journals	1994-1999		2018-Present	
		No of Texts	**Text Length (words)**	**No of Texts**	**Text Length (words)**
1	International Journal of Microwave & Millimeter-wave Computer-aided Engineering (Now known as *Int. J. of RF & Microwave Computer-aided Engineering*) (RF)	20	110,789	20	89,140

2	Journal of Microelectromechanical Systems (JMS)	20	125,237	20	162,608
3	IEEE Transactions on Microwave Theory and Techniques (IEEE)	20	126,418	20	148,053
4	Microelectronics Journal (MJ)	20	143,661	20	139,464
	Total	**80**	**506,105**	**80**	**539,265**

It should be mentioned that the selection of periodicals was deliberate. The selection was made only on the basis of the list of journals used as data in Hyland (1999), so that the comparison could fulfill a particular degree of dependability. In addition, the selected papers should be of comparable length to those in each journal category. The text length does not include the tables, figures, acknowledgements, autobiographies, appendices, or references.

2.2. *Procedures of analysis*

This research is a corpus-based examination of the reporting verbs *propose*, *show*, and *describe*. AntConc 3.2.1 (Anthony, 2011), a corpus tool, was used to create concordances on the search keyword in order to determine the frequency of these three verbs in the data. The program classified all tokens into two groups: reporting verbs in past tenses and those in present tenses (Present tenses = 1 vs. Past tenses = 0), which are two values of the dependent variable tenses. This research intends to analyze, with the aid of the R programming language, the interaction between the dependent variable and internal and external independent variables. Due to the binominal nature of the dependent variable and the categorical nature of the independent variables, it was chosen to investigate the interactions using logistic regression.

First, each token was evaluated based on its publication date and journal. This stage of analysis should disclose if the tenses of *propose*, *show*, and *describe* are employed similarly or differently in the *1994-1999* corpus and the *2018-Present* corpus. In addition, an effort is made to determine whether there is a correlation between the verb tenses and the journals in which they appear. The outcomes of this stage of study may indicate if tenses are influenced by external influences.

Similarly, an examination of internal components was conducted. It was anticipated that the tenses of reporting verbs rely on their verb choice (*propose*, *show*, or *describe*), verb types (*citation*, *self-reporting*, or *pointing*), and verb voices (*active* or *passive*). In addition, it is anticipated that the association between tenses and voices will be investigated. All of the processes of analysis attempt to arrive at a generalization about the use of reporting verbs in the electrical discipline across time periods.

3. Results

3.1. *Descriptive statistics*

The following section presents data in response to the research question, which is primarily focused on the interaction between the variables and the tenses of *propose*, *show*, and *describe*. The data set is subsequently coded into category values, which are described in Table 2.

Table 2. Tokens description

Factor group		Past tenses frequency		Present tenses frequency		Total	
		Tokens	(%)	Tokens	(%)		
External	Time period						
	1994-1999	160	4.2	1629	95.8	1789	4206
	2018-Present	101	8.9	2316	91.1	2417	
	Journal edition						
	IEEE	48	4.3	1060	95.7	1108	4206
	RF	31	3.2	946	96.8	977	
	JMS	53	4.9	1030	95.1	1083	
	MJ	129	12.4	909	87.6	1038	
Internal	Verb choice						
	propose	127	33.6	251	66.4	378	4206
	show	116	3.5	3209	96.5	3325	
	describe	18	3.6	485	96.4	503	
	Verb type						
	citation	135	37.9	221	62.1	356	4206
	self-reporting	117	9.5	1113	90.5	1230	
	pointing	9	0.3	2611	99.7	2620	
	Voice						
	active	139	8.7	1452	91.3	1591	4206
	passive	122	4.7	2493	95.3	2615	

Table 2 displays the number of tokens and their respective computed percentage values for each group factor in the data set. The variations in the percentages of the group factors may be readily deduced from a corpus analysis. In general, the proportion of reporting verbs in the past tense is much smaller than in the present tense. However, from a sociolinguistics standpoint, it might be difficult to determine which factors can accurately predict the frequency of verb tenses based just on the percentages of each component group. In order to identify the solution, a logistic regression was conducted in R (see Appendix A for the codes run by R). The sections that follow detail the outcomes of the tests conducted on external factor groups and internal factor groups, respectively.

3.2. *External factors affecting the choice of tenses*

As shown in Table 2, the two types of external factors whose influence on the tense choice of reporting verbs was examined are time periods and journal editions. The interaction of each component and the interaction of the two factors (time period*journal editions) on the dependent variable were tested. The results of the test for external factor regression are shown in Table 3.

Table 3. External factor regression

	Estimate	Std. Error	z value	*p*
(Intercept)	-2.22	0.14	-15.21	0.001
Time	-1.14	0.22	-5.05	0.00
Journal	-0.06	0.07	-0.81	0.41
Time*Journal	0.22	0.11	1.86	0.06

Null deviance: 1956.5. *df* = 4205
Residual deviance: 1913.1. *df* = 4202
AIC: 1921.1

Table 3 reveals that the p-value for intercept is close to zero (0.001), indicating that there is a significant imbalance between the weights of the two values of the dependent variable. It is valid. When the function xtabs() in R was used to tally the frequencies of present tenses and past tenses (Appendix A), it was determined that 3,945 tokens were discovered in present tenses whereas only 261 tokens were found in past tenses.

In terms of the factors' ability to predict the dependent variable, the logistic regression reveals that only the time factor with a significant p value (0.00) exhibits an interaction, but journal editions and the interaction time*journal do not. This finding suggests that the preference for tense use may be discerned based on the publishing era. In other words, the time period variable influences verb tenses. In contrast, the journal (0.42) and time*journal (0.06) variables do not indicate the use of tenses, since their p values are not statistically significant. There is no substantial difference in the use of reporting verbs in the present and past tenses in various journals.

3.3. *Internal factors affecting the choice of tenses*

The three internal factor groups investigated for their interaction with the tense choice of reporting verbs are verb choice, verb types, and voices, as shown in Table 2. The interaction of each factor and the interaction of the three factors (verb choice*verb type*voice) on the dependent variable were examined. The results of the test of internal factor regression are shown in Table 4.

Table 4. *Internal factor regression*

	Estimate	Std. Error	z value	*p*
(Intercept)	-1.01	0.26	-3.90	0.001
Verb	-0.43	0.15	-2.82	0.004
Type	1.31	0.31	4.19	0.05
Voice	-0.95	0.34	-2.79	0.005
Verb*Type	-1.35	0.19	-6.85	0.05
Verb*Voice	0.10	0.22	0.46	0.63
Type*Voice	-0.05	0.40	-0.14	0.88
Verb*Type*Voice	0.06	0.26	0.24	0.81

Null deviance: 1956.5 . df = 4205
Residual deviance: 1459.4. df = 4198
AIC: 1475.4

Table 4 demonstrates that verb choice (p=0.004), verb types (p=0.05), voices (p=0.005), and verb choice*verb type (0.05) had significant effects on the tense selection of reporting verbs. In other words, they are factors that influence the selection of tenses. For instance, various verbs (*propose*, *show*, or *describe*) might predict the likelihood of choosing present or past tenses. Likewise, verb types and verb voices may have the same influence on tense selection. In particular, the interaction between the verb choice and the verb types might predict the dependent variable. The interactions of verb choice*voice, type*voice, and

verb choice*type*voice are not predictive of the dependent variable, however. In brief, all internal criteria influence the choice of verb tense in journals of Electrical Engineering.

4.   Conclusion

In an effort to conduct in-depth research of the top reporting verbs including *propose*, *demonstrate*, and *describe* in Electrical Engineering journals, this study has identified factors that significantly influence the verb tenses, which has not been done before. The research also demonstrates R's use in sociolinguistic variation analysis.

The findings indicate that verb tenses are dependent of time periods. This reveals that the use of the verb tenses of *propose*, *show*, and *describe* has evolved throughout time. This finding contradicts Hyland's (1999) conclusion that the usage of reporting verbs in research publications has remained stable throughout time. Thus, compared to the time of Hyland, the reporting verb tense has evolved rather than remained constant. Journal edition, verb choice, verb type, and verb voice all have a role in determining whether reporting verbs are in the past or present tense. Various journals utilize reporting verbs in different ways, which tends to create the journal's identity. As can be observed, linguistic considerations also influence the choice of verb tense.

The study's sample size is still limited, which may alter the study's findings. Furthermore, the research focuses on just three kinds of verbs, making it impossible to generalize the verb phenomena as a whole. Nonetheless, the findings provide an intriguing route for future sociolinguistic analyses of reporting verbs. This work provides regression analysis as a novel and effective way for examining reporting verbs, which has never been done previously.

❖ **Conflict of Interest:** Authors have no conflict of interest to declare.

REFERENCES

Anthony, L. (2011). *AntConc* (Version 3.2.2) [Computer Software]. Tokyo, Japan: Waseda University. Retrived from http://www.antlab.sci.waseda.ac.jp/

Bloch, J. (2009). The design of an online concordancing program for teaching about reporting verbs. *Language Learning & Technology, 13*(1), 59-78.

Bloch, J. (2010). A concordance-based study of the use of reporting verbs as rhetorical devices in academic papers *Journal of Writing Research, 2*(2), 219-244.

Charles, M. (2006). Phraseological patterns in reporting clauses used in citation: A corpus-based study of theses in two disciplines. *English for Specific Purposes, 25*(310-331). doi: 10.1016/j.esp.2005.05.003

Chen, M. (2009). Tense of Reporting in Dissertation Literature Reviews. *Journal of Cambridge Studies, 4*(2), 139-150.

Geeslin, K. L. & Long, A. Y. (2014) *Sociolinguistics and Second Language Acquisition: Learning to Use Language in Context.* New York: Routlege.

Hyland, K. (1999). Academic attribution: Citation and the construction of disciplinary knowledge. *Applied Linguistics, 20,* 341-367.

Hyland, K. (2001). Humble servants of the discipline? Self-mention in researcharticles. *English for Specific Purposes, 20,* 207-226.

Hyland, K. (2005). Stance and engagement: A model of interaction in academic discourse. *Discourse Studies*, 7, 173-292.

Nguyen, V. T. (2013). *A Comparative Study of Reporting Verbs in Research Articles Written by Native Speakers of English and Vietnamese.* (Unpublished master's thesis). Yuan Ze University, Taoyuan, Taiwan.

Nguyen, V. T. (2018). A varbrul analysis on the reporting verb propose in electrical engineering research articles. *International Journal of Language Teaching and Education*, *2*(2), 103-112.

Rau, G. (2017). *Writing Engineering Research Articles: Distinguishing IPTC from IMRD.* (Unpublished draft version.). Department of Electrical Engineering, National Chung Cheng University, Taiwan.

Swales, J. M. (1990). *Genre analysis: English in academic and research settings*. Cambridge: Cambridge University Press.

Swales, J. M. (2004). *Research Genres*. Cambridge: Cambridge University Press.

Thompson, G., & Ye, Y. (1991). Evaluation in the reporting verbs used in academic papers. *Applied Linguistics, 12*(4), 365-382.

ĐỘNG TỪ TƯỜNG THUẬT HÀNG ĐẦU TRONG CÁC BÀI NGHIÊN CỨU KĨ THUẬT ĐIỆN: NHỮNG YẾU TỐ BÊN TRONG VÀ BÊN NGOÀI ẢNH HƯỞNG ĐẾN VIỆC SỬ DỤNG THÌ

Nguyễn Vĩ Thông

Trường Đại học Đà Lạt, Việt Nam
Tác giả liên hệ: Nguyễn Vĩ Thông – Email: fldh@yersin.edu.vn

TÓM TẮT

Nghiên cứu này sử dụng một mô hình ngôn ngữ xã hội để tiến hành phân tích chuyên sâu về tác động của các động từ tường thuật trong các bài báo nghiên cứu về kĩ thuật điện. 160 tài liệu nghiên cứu về điện chứa 4206 mẫu dữ liệu đã được kiểm định bằng phần mềm R. Các thì quá khứ và hiện tại của ba động từ hàng đầu bao gồm đề xuất (propose), thể hiện (show) và mô tả (describe) đã được chọn làm giá trị nhị thức cho các thì biến phụ thuộc. Các kết quả chỉ ra rằng thời gian xuất bản (yếu tố bên ngoài) và lựa chọn động từ, loại động từ và thể của động từ (yếu tố bên trong) ảnh hưởng đến việc lựa chọn thì. Ngoài ra, sự tương tác của các mối tương quan giữa các yếu tố và biến phụ thuộc cũng được tính đến.

Từ khóa: *kĩ thuật điện; bài báo nghiên cứu; R; hồi quy; động từ tường thuật*

APPENDIX A: Results of coding in R

> tense=read.delim("verbtense.txt")

> head(tense)

```
  TENSE TIME JOURNAL VERB TYPE VOICE
1   0    0     0    0    0    0
2   0    0     0    0    0    0
3   0    0     1    0    0    0
4   0    0     1    0    0    0
5   0    0     2    0    0    0
6   0    0     2    0    0    0
```

> tencor=glm(TENSE~TIME*JOURNAL, family = "binomial", data = tense)

> summary(tencor)

Call:

glm(formula = TENSE ~ TIME * JOURNAL, family = "binomial", data = tense)

Deviance Residuals:

```
   Min     1Q   Median    3Q     Max
-0.4538 -0.4278 -0.3057 -0.2826  2.6060
```

Coefficients:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -2.22140   0.14604 -15.211  < 2e-16 ***
TIME          -1.14018   0.22551  -5.056 4.28e-07 ***
JOURNAL       -0.06202   0.07664  -0.809   0.4184
TIME:JOURNAL   0.22279   0.11924   1.868   0.0617 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

(Dispersion parameter for binomial family taken to be 1)

```
    Null deviance: 1956.5  on 4205  degrees of freedom
Residual deviance: 1913.1  on 4202  degrees of freedom
AIC: 1921.1
```

Number of Fisher Scoring iterations: 6

> xtabs(~TENSE, data = tense)

```
TENSE
   0    1
3945  261
```

> tencor=glm(TENSE~VERB*TYPE*VOICE, family = "binomial", data = tense)
> summary(tencor)

Call:
glm(formula = TENSE ~ VERB * TYPE * VOICE, family = "binomial",
    data = tense)

Deviance Residuals:
    Min   1Q   Median   3Q   Max
-1.8910 -0.4226 -0.1359 -0.1010 3.2501
Coefficients:
           Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.01803   0.26049 -3.908 9.30e-05 ***
VERB   -0.43533   0.15412 -2.825 0.00473 **
TYPE   1.31147   0.31254   4.196 2.71e-05 ***
VOICE   -0.95384   0.34140 -2.794 0.00521 **
VERB:TYPE   -1.35354   0.19753 -6.852 7.26e-12 ***
VERB:VOICE   0.10608   0.22619   0.469 0.63906
TYPE:VOICE   -0.05802   0.40259 -0.144 0.88540
VERB:TYPE:VOICE 0.06533   0.26502   0.246 0.80530

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
(Dispersion parameter for binomial family taken to be 1)
    Null deviance: 1956.5 on 4205 degrees of freedom
Residual deviance: 1459.4 on 4198 degrees of freedom
AIC: 1475.4
Number of Fisher Scoring iterations: 7