Research Article Introductions in the Software Engineering Field: Chinese and English

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Abstract

This research article investigates the rhetorical structures of English and Chinese research articles introductions in the field of software engineering. This article puts many previous and authoritative English and Chinese academic writings into data corpus and finds the patterns and methods for EAP students using to write their English articles. In this study, the method uses an advanced CARS model based on Swales's (2004) framework of moves and steps analysis. The findings answer the two research questions. One is what the structures of English and Chinese RA Introductions are and the other is what the similarities and differences between English and Chinese research article introductions according to the employment of moves and steps are. Different background, culture, education environment and writing patterns are the factors which can affect the differences between English and Chinese research article introductions. One purpose of doing this research is to solve problems of Chinese EAP students when they are trying to write academic papers and the other is to teach English teachers how to help Chinese students' academic writings.

Different patterns of research articles are used in different cultures, like English and Chinese. It's important for novice, the English second-language writers, to master the skills of using the first language rhetorical patterns. English papers also include more details and strict models, while Chinese authors often prefer discoursing features valued in Chinese culture. So the differences between the two cultures may cause problems for Chinese students in writing academic English proses which tend to use logical reasoning and English rhetorical structure(Loi. Evans, 2010). It may be difficult for Chinese students to finish their research papers.

Present studies have discussed about linguistic differences in other field, such as educational technology (Pho, 2008), economics(Jordan, 1988), humanities (Fakhri, 2004). So this study talks about a gap which is in the software engineering field.

One purpose of doing this research is to solve problems of Chinese EAP students when they are trying to write academic papers. The other is to teach English teachers how to help Chinese students' academic writings. This article analyzes many previous and authoritative English and Chinese academic writings, and finds the patterns and methods for EAP students using to write their English articles.

The major research questions addressed in this paper are:

1. What are the structures of English and Chinese RA Introductions?
2. What are the differences and similarities between English and Chinese RA introductions?

1. Methodology

My work takes qualitative and quantitative research methods. Sampled RA introductions in the software engineering of computer science field are taken into consideration. The goal of this

article is to find the patterns and features of English proses and help Chinese students master the English academic writing skills.

1.1. Data collection

It's a mini type research, the data volume may not be very large, so the corpus for this study comprises 20 introductions of research articles (10 Chinese and 10 English) in the field of software engineering of computer science.

Initially, 30 articles were selected from authoritative journals of each language based on judgment sampling. Later, 10 articles were extracted from the 30 articles of each language to form the actual corpus of this present study.

The English research articles, written by first language speakers, were selected from The Journal of IEEE TRANSACTIONS ON SOFTWARE ENGINEERING by Institute of Electrical and Electronics Engineers, International Conference on Computer Science and Software Engineering. The Chinese research articles written by first-language Chinese speakers were selected from 中国科技论文在线（China Science paper Online) and 中国科技报（China Science newspaper). All of these journals are the representatives of prestigious refereed journals in the field of software engineering in the respective countries.

To obtain a random-stratified sample, the total population of 30 articles was first stratified into three subgroups based on publication year. The three subgroups are 1980 – 1989, 1990 – 1999, 2000 – 2010. From the 10 proses which have been selected to build the corpus, three of them are published from 1980 to 1989, three are from 1990 to 1999 and the remaining four are from 2000 to 2010. When collecting data corpus, it's difficult to find eligible articles which are published from 1980 to 1989, especially the Chinese articles. This is because at that time in

China, software engineering was a new technology and wasn't so popular as today. What's more, some papers were produced even without an introduction section.

1.2. The instrument

Swales's (1990, 2004) CARS (Create a Research Space) model was selected to analyse and encode the moves and steps in both sets of articles. But this study makes a use of an advanced CARS Model showing in Fig.1. This model is according to two research papers : One is Research article introductions in Chinese and English:A comparative genre-based study written by Loi and the other is Cultural differences in the organization of research article introductions from the field of educational psychology: English and Chinese by Loi and Moyra Sweetnam Evans.

Move 1	Specifying the topic	Step 1	*Claiming centrality
		Step 2	Defining terms/concepts
		Step 3	Presenting the theoretical basis
		Step 4	*Reviewing literature/findings of previous research
Move 2	Making links between past research and present research	Step 1	*Indicating a gap
		Step 2	*Raising a question
		Step 3	*Counter-claiming
Move 3	Introducing the present research	Step 1	*Announcing the purpose
		Step 2	Announcing the focus of the research
		Step 3	Presenting the background of the study
		Step 4	*Introducing the research hypothesis
		Step 5	*Introducing the research questions
		Step 6	*Presenting positive justification
		Step 7	Introducing the implications of the findings
		Step 8	*Claiming the significance of the study

Note: *refers to steps adapted from Swales's (1990, 2004) CARS model.

Fig.1 Advanced CARS Model

From Fig.1, names of the three moves in the Swales's (2004) model have been re-labelled and more steps are added to create an advanced model. In the advanced model, move1 contains 4 steps , move 2 contains 3 steps and move3 contains 8 steps.

The three moves in the CARS model(Swales, 2004) are as follows:

(1) Move 1—Establishing a research territory

(2) Move 2—Establishing a niche

(3) Move 3—Presenting the present work (Swales, 2004)

But in the advanced CARS model, the three moves are:

(1) Move 1—Specifying the topic

(2) Move 2—Making links between past research and present research

(3) Move 3—Introducing the present research

1.3. Coding and analysis

The coding shows that Swales's (1990, 2004) model for introductions could capture the overall rhetorical organisation of RA introductions in the corpus. In the present study, Move 1, Move 2 and Move 3 are labelled as specifying the topic, making links between past research and present research, and introducing the present research respectively.

1.3.1 Move 1

In comparison to Swales's (2004) model, the advanced version of the CARS model has added two steps in Move 1(Specifying the topic) [viz. Move 1 Step 2 (Defining terms/concepts) and Move 1 Step 3 (Presenting the theoretical basis)].

Move 1 Step 2 (Defining terms/concepts)

[E-4] TAME [4] is meant to serve as a framework for research and development activities by providing an integrating umbrella for various software engineering research projects, offering a focus and a laboratory environment for experimentation, and supporting the efficient transfer of technology into practice.

Move 1 Step 3 (Presenting the theoretical basis)

[E-5] The theoretical soundness of a measure, i.e., the fact that it really measures the software characteristic it is supposed to measure, is an obvious prerequisite for its acceptability and use.

[C-7] 逼真性是指3D模型在视觉上给人的感受，以形象、真实感强、视觉和谐为目标；准确性是指3D模型与实际的集合物体之间的误差，几何形状和比例是衡量准确性的主要指标；实时性是指3D模型在视景仿真应用中能满足人眼对连续图像的感受的指标。

1.3.2 Move 2

The two steps in Move 2 (establishing a niche) of Swales's (2004) model [viz. Move 2 Step 1A (indicating a gap)/Move 2 Step 1B (adding to what is known); and (ii) Move 2 Step 2 (presenting positive justification)] have been changed to the following three: (i) Move 2 Step 1 (indicating a gap), Move 2 Step 2 (Raising a question); and Move 2 Step 3 (counter-claiming).

Move 2 Step 2 (Raising a question)

[E-7] In this paper, we extend those ideas to discuss several guidelines that can be used both to improve the quality of on-going and proposed empirical studies and to encourage critical assessment of existing studies.

[C-2] 本文提出一种高性能的浓缩近邻分类器 BDPATCH，它包括编辑、显露和补缀三个阶段。该法同时考虑了识别率和效率两方面的问题。

Move 2 Step 3 (counter-claiming).

[E-5] This situation would be unacceptable in other engineering or mathematical fields.

1.3.3 Move 3

Move 3 (Presenting the present work) of Swales's (2004) model has been changed with the following eight steps: (i) Move 3 Step 1 (Announcing the purpose); (ii) Move 3 Step 2 (Announcing the focus of the research); (iii) Move 3 Step 3 (Presenting the background of the study); (iv) Move 3 Step 4 (Introducing the research hypothesis); (v) Move 3 Step 5 (Introducing the research questions); (vi) Move 3 Step 6 (Presenting positive justification); (vii) Move 3 Step 7 (Introducing the implications of the findings) and (viii) Move 3 Step 8 (Claiming the significance of the study).

Move 3 Step 3 (Presenting the background of the study)

[E-3] The data analyzed in this study were collected by the Software Engineering Laboratory (SEL). Although a controlled experiment was not performed for this study, a carefully matched sample was selected for analysis from the SEL database.

[C-5] 软件复用是在软件开发中避免重复劳动的解决方案，其出发点是应用系统的开发不再采用一切“从零开始”的模式，而是以已有的工作为基础，充分利用过去应用系统开发中积累的知识和经验，如：需求分析结果、设计方案、源代码、测试计划及测试案例等，从而将开发的重点集中于应用的特有构成成分。

Move 3 Step 7 (Introducing the implications of the findings)

[E-6] One indication of this broadening of focus is the nature of recent work in traditionally empirical software engineering research groups.

1.3.4 Move 4

This advanced CARS model was used as the instrument of this study because the additional steps in this model apply to the articles in the corpus.

In addition, one move named as move 4 was added to the current advanced CARS model. When analyzing the papers , some extra content of the introduction was found in some of the academic papers. Several authors have talked about the structures of their whole articles. So

whether this introduction has described the structure of the whole article becomes a judgement of analyzing the data corpus in the field of software engineering.

Move 4—Describing the structure of the whole article

[E-5] The paper is organized as follows. In Section 2, we introduce the basic definitions of our framework. Section 3 provides a set of properties…. We also discuss…. Section 4 contains comparisons …. The conclusions and directions for future work come in Section 5.

[C-4] 本文将讨论软件设计的以下方面：结构设计和详细设计……， 分布是软件系统……， 设计验证……，……，以及软件设计未来的研究方向。

2. Results and discussion

2.1 Three moves

The rhetorical structures and move steps employed in English and Chinese research article introductions, of course, are different. Fig. 2 shows the percentage of the three moves used in English and Chinese RA introductions.

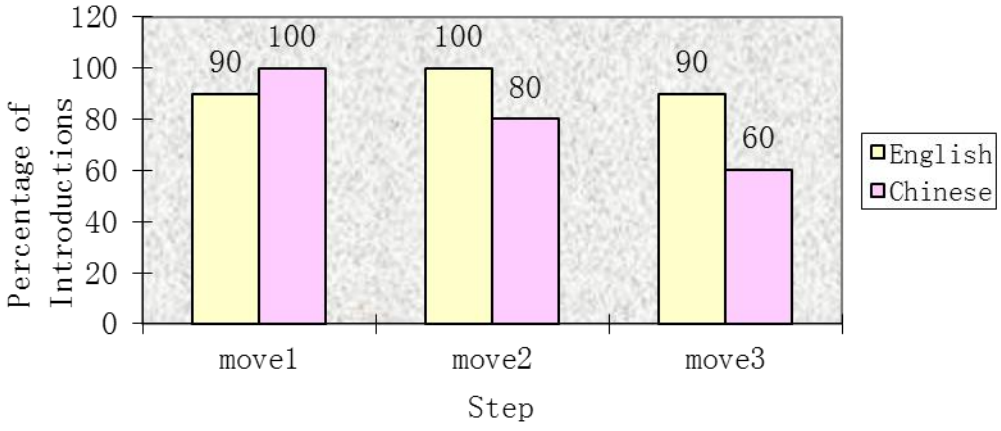

Fig. 2 Percentage of three moves

From this chart, both English and Chinese research article introductions contain the three moves of the advanced CARS model. All of the English introductions have move 2 and all of the Chinese articles use move 1. But Chinese articles use these three moves to a lesser degree than the English do.

2.2 Steps in move 1

Move 1 is specifying the topic . Fig. 3 shows the percentage of the four steps in Move 1 which are included in English and Chinese RA introductions.

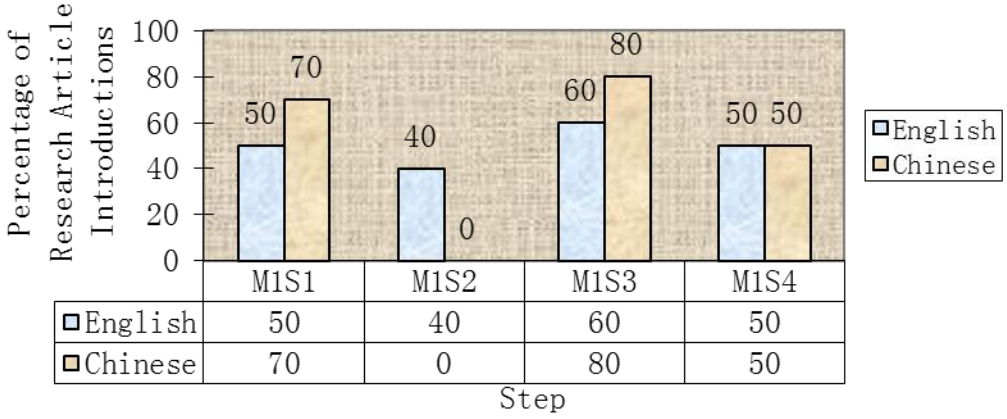

Fig. 3 Percentage of move1

In Move 1 (specifying the topic), Move 1 Step 1 (Claiming centrality) was found to have emplyed by both English and Chinese writers (50% and 70% respectively).

Move 1 Step 2 (Defining terms/concepts) differs between the two sets of introductions in that it is found in 40% of Enlish introductions while it is totally absent from Chinese introductions.

Even though the two sets of data favour Move 1 Step 3 (Presenting the theoretical basis), Chinese introductions employ Move 1 Step 3 proportionately more than English introductions, with the occurrences of the step in 80% and 60% of the introductions respectively.

The percentage of English article introductions is equal to that of Chinese article introductions.

The number of Chinese article introductions which include these steps is more than English except M1S2 (defining terms/concepts). This may be because Chinese educational conception is different from English. Chinese students are not persuades to create new things, like new terms or concepts.

2.3 Steps in Move 2

Move 2 is making links between past research and present research . Fig. 4 shows the percentage of the three steps in Move 2 which are included in English and Chinese RA introductions.

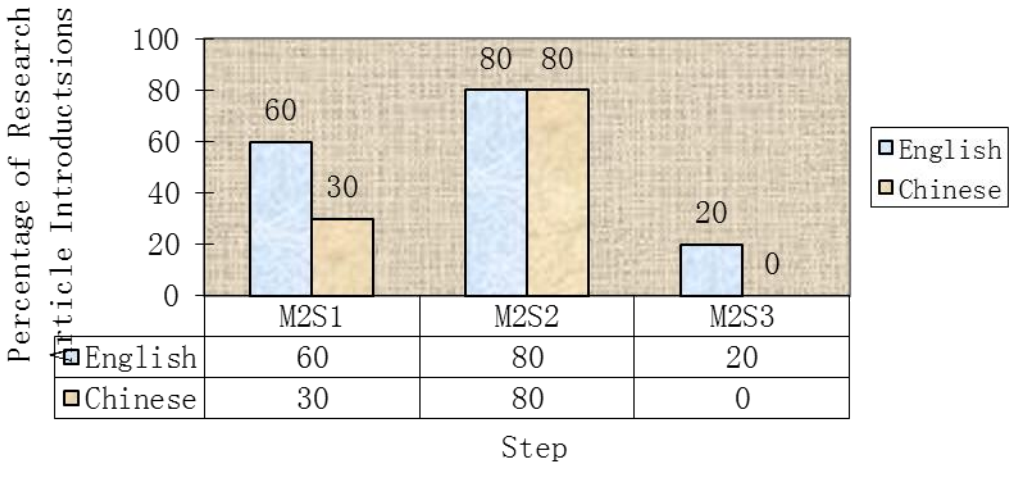

Fig. 4 Percentage of move2

It’s easy to find that English articles contain more steps of move2 (Making links between past research and present research) than Chinese do.

The lesser emplyment of Move 2 Step 1 (indicating a gap) in Chinese RA introductions suggests that Chinese authors do not put as much emphasis on indicating the gaps of past studies as their native English-speaking counterparts do.

For the Move 2 Step 2 (Raising a question), the percentage of this step used in English and Chinese research paper introductions are the same.

There is no Chinese article introductions containing Move 2 Step 3 (Counter-claiming), while 20% English articles use this step.

2.4 Steps in Move 3

Move 3 is introducing the present research. Fig. 5 shows the percentage of the eight steps in Move 3 which are included in English and Chinese RA introductions.

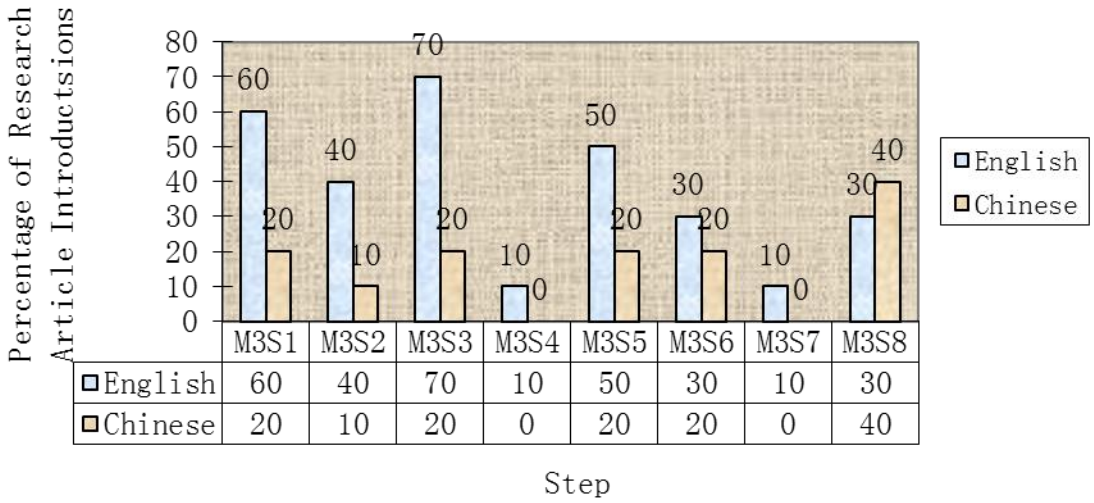

Fig. 5 Percentage of move3

In Move 3 (Introducing the present research), English Research articles use Move 3 Step 6 (Presenting positive justification) more than Chinese articles.(30% and 20% respectively). But Chinese introductions employ Move 3 Step 8 (Claiming the significance of the study) more than English introductions.(30% and 40% respectively), because the Chinese writers' apparent reticence in highlighting the value of their own work might be related to a desire to avoid being considered "tai lou "(too clear/explicit)'' (Snively, 1999:135). Humility is highly valued in the teaching of Confucius and is generally observed in Chinese society. According to Confucius's teaching, a "gentleman"(chun tzu) should possess this ethos: "deference (humility) ", "tolerance", "making good one'sword", "diligence" and "generosity" (Analects 17:6, Ames and Rosemont, trans, 1998:204). So the Chinese author don't like to claim the significance of their study.

Move 3 Step 4 and Move 3 Step 7 occur in 10% of English academic article introductions. In contrast, this step is totally absent in the Chinese introductions.

Some noteworthy differences are observed between the two sets of introductions in the employment of Move 3 Step 1 (Announcing the purpose), Move 3 Step 2 (Announcing the focus

of the research), Move 3 Step 3 (Presenting the background of the study), Move 3 Step 5 (Introducing the research questions).

It's obviously that English authors prefer move 3 more than Chinese authors.

2.5 Move 4

Move 4 is describing the structure of the whole article. Fig. 7 shows the percentage of Move 4 included in English and Chinese RA introductions.

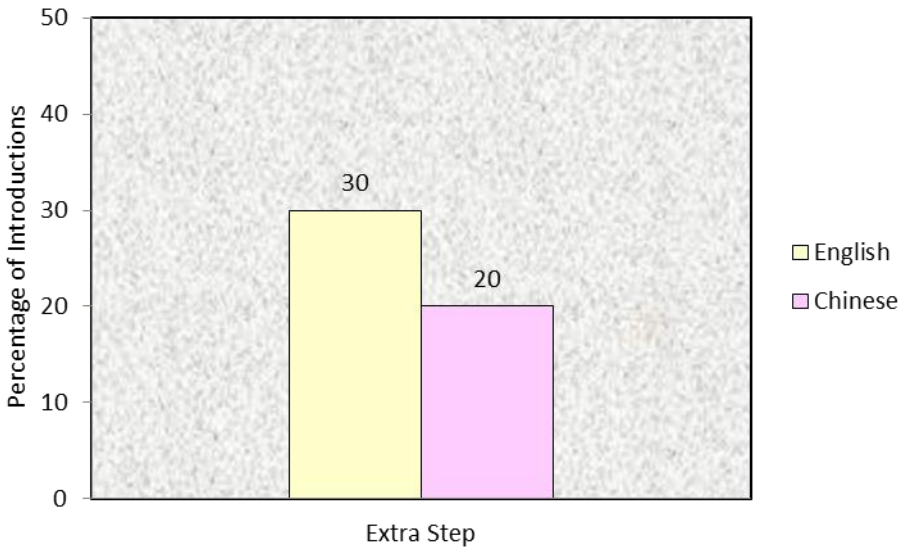

Fig. 6 Percentage of extra move

The extra move is the move 4 (Describing the structure of the whole article). This move occurs in 30% of the English RA introducions, whereas it occurs in only two Chinese introductions.

2.6 Comparison of the data corpus by three generations

The data corpus is classified into three groups by generation. Three articles are during 1980-1989, three articles are during 1990-1999, and the other four are during 2000-2010. Fig. 7 displays the details of each article in the data corpus.

NAME	Year	Move1	Move2	Move3	Extra Move
英文					
An Experiment in	1981		2	1,4	Y
Software engineering Project	1984	2,3	3		
Evaluating Software	1987	2,3,4,	2	3,5	
Presenting Software	1992	1,2,4	1,2,	1,2,3,5	
Property-based Software	1996	1,2,3,4	1,2,3	1,2,3,5,6,8	Y
Qualitive Methods in	1999	1,3	1	1,2,3,5,7,8	
Preliminary Guidelines	2002	1,3,4	2	2,3,5,6	
Reformulating software	2003	3	1,2	1,6,8	
Variability and Reproducibility	2009	4	1,2	3	Y
Application of 80/20	2009	1	1,2	1,3	
中文					
软件可靠性	1985	1,3,4	1,2	2,5,6	
补缀式浓缩	1988	1,3,4	2		
软件设计技术	1989	3,4	2		
软件按工程技术	1994	3,4		1,8	Y
软件复用	1999	3		3,5,6,8	
土地利用规划	1999	1,4	1,2	1,3	Y
软件工程化3D	2008	1,3	2		
面向Agent	2000+	1,3	2		
ILC管理	2000+	1,3	2	8	
软件工程理论GIS	2000+	1	1,2	8	

Fig. 7 Comparison by generations

In 1990s, authors like to use more moves and steps than the other generations. Moreover, English articles contain more steps in Move 3 than Chinese in 1990s and 2000-2010, but less in 1980s. Going through the whole table, Chinese authors don't prefer to use move3 and their RA introductions are always shorter than English RA introductions.

2.7 Analysis of this study

Different background, culture, education environment and writing patterns are the factors which affect the differences between English and Chinese research article introductions.

English academic article introductions maybe more rigorous and discuss more details, while Chinese academic article introductions maybe more brief and often express the authors' moral characters.

Meaningful researches, logical structure, clear arguments and strict attitude are still necessary to create an academic paper and we'd better know more about how to write in the language you want to use and obey the rules of a different culture.

3. Conclusion

This study talks about the structures of English and Chinese RA Introductions and analyzes the differences and similarities between English and Chinese RA introductions. Almost all English and Chinese RA introductions employ the three moves (Move 1, Move 2, Move 3) which are provided by the advanced CARS model based on Swales CARS model (2004).

The results of this study is meanful, because it help both students and teachers know more about how to write English research article introductions and it also lays foundations for the future language studies.

There is no doubt that something needs to be improved. The data corpus need to be more larger than in this study, although it's a mini type reseach. More experiments and surveys will be better, because it helps the findings to be more accurate and convincing.

Future studies can focu on these three areas. Cross-Linguistics (eg., Software Engineering and other majors, like biology), Cross- Language (eg., English and other languages, like France) and other research questions (eg., how to organize the structurs in Conclusion section).

Overall, this study can be conducive to EAP students for writing English academic papers.

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