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Genre Variation in the Introduction of Scientific Papers in Iranian and International Computer Science Journals

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Abstract
Introduction functions as a showcase in research articles (RAs). It motivates the reader to read the rest of the paper. However, writing a well-crafted introduction is a complex task, mainly when the writer generates the manuscript in another language. This study investigated the rhetorical differences/similarities employed in the introductions of RAs published in Iranian and international ISI journals in Computer Sciences (CS) using Swales (2004) CARS model. Two sets of CS RAs (30 each) were randomly selected. Frequency and non-parametric tests were used to examine the differences between the two groups of introductions. The results indicated that M 1 S 1 (Generalizing the topic), M2 1A (Indicating the gap), M3 S1 (Describing the research), M3 S4 (Methods Summary), and M 3 S 6 (Stating research advantages) were used with high frequencies. M 2 S 2 (Announcing positive justification) was absent, and the others were in low preferences. Also, the Analysis illustrated a statistically significant variation between the introductions concerning the use of M3S7 (Demarcating the Research Organization). Findings support genre-based pedagogy in scientific writing classes to make the graduate CS students aware of these rhetorical structures conventional to introductions in CS RAs.

***Keywords*:** Genre Analysis, Computer Science, Research Articles, Introduction

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INTRODUCTION

In linguistics, genre analysis is a thick description of the language used in educational, academic, or professional settings (Bhatia, 2014). This approach provides English-for-specific-purposes (ESP) scholars with a quick perception of text organization throughout an academic genre (Kanoksilapatham, 2012). This branch of research identifies and describes the standard rhetoric features that academicians employ in an academic genre (such as, research article (RA), academic report, presentation, or doctorial or master theses) to make their scientific contributions understood by members of their discourse communities (Swales, 1990, 2004). A scientific discourse community refers to a pool of individuals that have common academic purposes, and use specific rhetorical features to communicate effectively in achieving the goals (Swales, 1990); this construct is a crucial component in genre analysis approaches (Samraj, 2013) since "genres are produced and consumed" (Samraj, 2013, p. 2) in discourse communities.

RA is an essential academic genre whose purpose is to contribute to the progress of science and technology (Peterson, 1961). In every discipline, RA is a conventional means for reporting results to the research community (Shaw, 2003). Swales (2004) maintains that a well-crafted RA is a product that is the result of a complex process.

Researchers conduct genre analysis in RAs to recognize the rhetorical structures to interpret further and learn about the rhetorical behaviors of researchers. The majority of researchers pay scholarly attention to these invisible structures in one particular section of a RA such as abstract (Amuniai, 2019; Behnam & Nikoukhesal, 2014; Behnam & Zamanian, 2015 and Marefat & Mohammadzadeh, 2013), introduction (Behnam & Golpour, 2017; Fakhri, 2004; Jalilifar, 2010; Jalilifar & Vahid Dastjerdi, 2010; Mahzari & Maftoon, 2007; Rezaee & Sayfouri, 2009; Soodmand Afshar, Doosti, Movassagh, 2018), method (Cotos, Huffman, & Link, 2017), result (Bruce, 2009), discussion (Atai & Fallah, 2004; Lubis, 2019; Salmani-Nodoushan & Khakbaz, 2011; Puebla, 2008) or conclusion

(Zamani & Ebadi, 2016) whereas the others qualitatively describe these generic structures in all sections of an RA in a particular field of studies such as Medicine (Nwogu, 1997), Computer Science (Posteguillo, 1999), Law (Tessuto, 2015) and Energy Engineering (Ye, 2019).

In RA, the introduction is a showcase that could motivate the reader to read the rest of the paper. The introduction section creates a convincing situation for highlighting the subsequent results so that a considerable number of readers could be interested in the perspectives of the researcher (Swales & Najjar, 1987). This section "reflects research in a big world, in big fields, in big languages, with big journals, big names, and big libraries" (Swales, 2004, p. 26). Introduction enables the researcher to make the audience convinced of his/her scientific contribution through announcing "the goals, current capacities, problems, and criteria of evaluation that derive from and operate within that discipline" (Zappen, 1983, p. 130).

The relevant literature indicates studies extensively investigating the schematic organizations of introduction in different disciplines (Habibi, 2008; Kanoksilapatham, 2005; Nwogu, 1997; Samraj, 2002; Slaim, & Mostari, 2019; Soodmand Afshar et al., 2018; Valipour, Assadi, & Davatgari Asl, 2017; Yayli & Canagarajah, 2014, among others). This line of research grounds on ESP genre analysis (Swales, 1990). This trend of genre investigation details the formal features of the genre (Hyon, 1996) and views it as a set of organized, communicative acts consumed in the discourse community to accomplish the specified academic purposes (Swales, 1990). In genre literature, these invisible classified interactive unities are called *Moves*. Move refers to a communicative act or a discoursal unit that its main function is to transmit the intention of the writer or speaker in a written or spoken text (Swales, 2004). A step is a smaller communicative unit in realizing different moves. According to Swales (2004), "a move is a functional, not a formal unit" (p. 228), and a clause or several sentences could identify it. Each move has a specific communicative function realized by specific linguistic features (Swales, 1990).

The relevant literature shows that ESP researchers have paid scholarly attention to the discourse of introduction in Computer Science (CS) RAs to discover its rhetorical structures (Anthony, 1999; Kanoksilpatham, 2012; Maswanaa, Kanamarub & Tajino, 2015; Shehzad (2006, 2008, 2010, 2011, 2012; Suryani, Yacob, & Abd Aziz, 2015; Posteguillo, 1999). The findings show that this section of CS RAs has experienced some rhetorical variations over time. For instance, the strategies of highlighting the research domain and reference to previous citations were once rare (e.g., Anthony, 1999; Posteguillo, 1999), but currently obligatory in the introduction of CS RAs (Suryani et al., 2015). Besides, today, CS scientists frequently evaluate the design of their study in the introduction of their investigation (e.g., Kanoksilapatham, 2012; Maswanaa et al., 2015; Shehzad, 2012) whereas this strategy was not in their favorites at the end of last century (e.g., Anthony, 1999; Posteguillo, 1999). The shift in the use of these rhetorical options in this section confirms the idea that "[g]enre is a reciprocal dynamic within which individuals' actions construct and are constructed by the recurring context of a situation, context of culture, and context of genres" (Devitt, 2004, p. 31). Genre develops "over time in response to recurring rhetorical needs" (Swales & Najjar, 1987, p. 467) of the members in a scientific discourse community such as CS.

Research has scarcely investigated move-step structures in various sections of RAs generated by Iranian CS researchers (e.g., Esfandiari, 2014; Yazdanimoghadam & Rajaee, 2010). For example, Yazdanimoghadam and Rajaee (2010) comparatively examined the rhetorical variations in the introductions CS RAs published in two languages, English and Persian. This study was significant in that it showed that Move 3 realized complicatedly in the introduction of English RAs' versions. However, the findings of this analysis should be generalized cautiously since the source of the sample is subjective, and it was provided merely by one Iranian CS scholar. Unlike Yazdanimoghadam and Rajaee's investigation, the present study benefits the corpus retrieved from high-indexed journals in CS discipline. Put it simply,

this study comparatively describes the rhetorical structures realized in the introductions of RAs that appeared in leading, prestigious journals in the field of CS. Findings could raise the awareness of Iranian CS researchers (novice or expert) on the rhetorical conventions in the introductions of their manuscripts before targeting publication consideration in CS high-impact factor journals. This investigation examined the move-step differences/similarities used in the introductions of RAs that appeared in Iranian and international ISI journals in Computer Sciences (CS).

LITERATURE REVIEW

Genre in Linguistics

Genre in linguistics points to the way the language is socially used and recognized in a community (Hyland, 2015). It is a type of text that meets the needs of the rhetorical situations in which it functions (Swales & Najjar, 1987). Genre is dynamic (Devitt, 2004), and it develops over time in response to the scientists' recurring rhetorical needs (Swales & Najjar, 1987). Swales' (1990) work on genre investigation motivates English for Specific Purposes (ESP) researchers to analyze the genres concerning the contexts or communities in which they are employed (Hyland, 2015). This is due to the argument that the context determines the communicative function of the discourse consumed in a specific genre (Bhatia, 2014; Hyland, 2015).

Hyon (1996) outlined three schools of thought discussing genre in linguistics: (a) North American new rhetoric, (b) systemic functional linguistics, and (c) ESP. ESP analysis of the genre is the most productive approach in the academic genre (Kanoksilpatham, 2012). This perspective examines the linguistic features of a genre (Hyland, 2003), and it considers the genre as a class of organized interactive acts used by the members of a particular academic community (Swales, 1990). The present study grounds on the ESP framework of genre analysis.

Move Investigation in RAs' Introductions

Move analysis was introduced in the 1980s. Since then, moves have been the main focus of genre analysis and, thereby, a prolific body of research investigates these dynamic rhetorical conventions in various discourse communities. A move is a communicative unit or a rhetorical organization that its primary task is to convey the proposition of the writer or speaker in a written or spoken discourse (Swales, 2004). A step is the component of a move, and, thereby, itis smaller than the moves. Hence, at one continuum, a move could be realized in the format of a clause, and at the other through many sentences or even paragraphs (Swales, 1990; 2004). This due to the suggestion that move has “a functional, not a formal unit" (Swales, 2004, p. 228).

Swales' (2004) Create a Research Space (CARS) Model

Swales' earlier works (e.g., Swales, 1981; Swales & Najjar, 1987) on introductions of Research Articles (RAs) gave rise to the Swales' (1990) CARS model (Samraj, 2013). The relevant literature documents that, in the 1990s, this framework motivated researchers to analyze the nature of academic discourse in different parts of RAs, including introduction (e.g., Anthony, 1996; Jalilifar, 2010; Nwogu, 1997; Posteguillo, 1999; Salager-Meyer, 1990). For example, Salager-Meyer (1990) found that more than half of the abstracts were well-organized based on rhetorical features conventional in medical RAs; Anthony (1996) and Posteguillo (1999) investigated all sections of RAs in computer technology.

During the past two decades, this proposed framework has become a popular framework for the examination of rhetorical preferences in the introduction of RAs across different disciplines. However, the interesting point is that the majority of these studies reported on the inefficiency of the model corresponding to some new rhetorical features observed in the introduction sections.

For instance, Nwogu (1997) proposed an obvious and unambiguous framework arguing that her adapted framework could be largely useful for

the description of rhetorical organizations in the introduction of medical RAs introduction. Similarly, Anthony (1996) and Posteguillo (1999) also claimed that Swales' (1990) CARS model could not describe the rhetorical structures in the introductions of RAs in computer technology and, accordingly, they proposed some modifications.

In another study, Samraj (2002) found that researchers in the fields of Wildlife Behavior and Conservation Biology did not pay much attention to highlight their research domain in the introduction of their RAs. Instead, they largely focused on pinpointing the gaps in the research world and, accordingly, justified their research project. Therefore, she modified Move 2 Step1 in Swales's CARS framework and proposed a new step, namely, presenting positive justification, which enables the researchers in these two disciplines to create the niches both in the *real world* and the *research world*.

Swales (2004) accommodated these findings and strengthened the position of his CARS as a discipline-free framework (Yayli & Canagarajah, 2014). The exerted revisions led the Swales' (1990) into Swales' (2004) CARS framework (see Table 1), the one that our investigation develops on. The following table (Table 1) displays this model.

Table 1: Swales (2004) CARS Model

Move 1: Establishing a Territory (citation is required) via
Topic generalization of increasing specificity
Move 2: Establishing a Niche (citation is possible) via
Step1A: Indicating a gap
Step1B: Adding to what is known
Step 2 (optional): Presenting positive justifications
Move 3: Presenting the Present Work via
Step 1: (obligatory): Announcing present research descriptively and/or purposively
Step 2: (optional): Presenting RQs or hypotheses
Step 3: (optional): Definitional clarifications
Step 4: (optional): Summarizing methods
Step 5: Announcing principal outcomes
Step 6: Stating the value of the present research
Step 7: Outlining the structure of the paper

Introduction-Method-Result-Discussion (IMRD)

Today, RAs are developed based on an internationally well-recognized format, namely, IMRD. It is the most standard way for an experimental report (Gonzalez, 2001; Swales, 2004). Before the twentieth century, scientific reports were typically descriptive, and the scientific events were arranged chronologically (Oriokot, Buwembo, Munabi, & Kijjambu, 2011). It is argued that this world-wide accepted arrangement was gradually developed within the twentieth century as the experimental reports started to become structured by reducing the use of the literary style (Gonzalez, 2001; Laskowitz, Drucker, Parsonnet, Cross, & Gesundheit, 2010; Oriokot et al., 2011). In some disciplines such as medicine, IMRD format is commonly considered as a measure for scientific writing skill (Oriokot et al., 2011), and its application is a key criterion for one to be an active member of the scientific discourse community (Gonzalez, 2001; Nwogu, 1997). However, IMRD format is absent in the RAs of some limited disciplinary fields such as CS, information science, biostatistics, or economics (Swales, 2004). The researchers of these scientific discourse communities outline the structures of their manuscripts in the introduction of their research reports. Hence, it seems that outlining the organization of RAs in the introduction is the main factor in not following IMRD format in the RAs of these disciplines (Kanoksilapathan, 2005; Swales, 2004).

Move Analysis in Papers' Introduction

As it was mentioned above, the 1990s were the heyday of rhetorical analyses on different sections of RAs, particularly the introduction. This line of research extended into the new millennium with plenty of persuasions. For example, Kanoksilapatham (2005), among others, analyzed the move-step organizations of 60 research papers in biochemistry discipline. She found that Move 2 (Establishing Niche) was missing in some introduction. She also reported that some Moves recurred many times (cyclicity) in this section.

Habibi (2008) used Swales's (CARS) model to examine the

rhetorical structures in the introductions of ESP, psycholinguistics, and sociolinguistics' RAs. FIndings demonstrated that the framework did not cater to some rhetorical realizations. For example, in some RAs, the writers provided the implication, contributions, and applications of the studies, a Step not available in Swales' (1990) CARS framework.

Using Swales' (2004) CARS model, Yayli and Canagarajah (2014) showed that Move 2 was commonly absent in the introductions of RAs in academic writing discipline and, and the researchers compensated it with an unknown Step, not presented in Swales' (2004) CARS model. Yayli and Canagarajah coined this step as "territorial justification" and subcategorized it under Move 1. Yayli and Canagarajah maintained that territorial justification helped the academic writers to elaborate on the existing gap if they did not have a particular rhetorical device for creating a gap as indicated in Swales' (2004) model.

The literature on move analysis shows that Iranian ESP researchers have further practiced efforts to analyze different sections of Iranian academic written genres rhetorically. The primary purpose of these analyses is mainly to help Iranian academicians to keep their going in their scientific discourse communities.

There are some investigations cross-culturally comparing move-step realizations in introductions of RAs published in two languages (Farina & Rahimi, 2017; Mahzari & Maftoon, 2007; Rezaee & Sayfouri, 2009). For example, Mahzari and Maftoon (2007) examined the frequencies of rhetorical devices in the introductions of English and Persian medical research papers. Categorizing these structures into Swales' (1990) proposed framework, the researchers found that the native English scholars utilized more steps than the Persian writers in organizing the introductions. However, Rezaee and Sayfouri (2009) contrasted these structures in the introductions and the discussions of medical ISI RAs. They reported that both Iranian and English medical scholars exploited move-step structures with quite similar frequencies.

The literature also documents some studies comparatively analyzing

rhetorical structures in the introductions of different disciplines' RAs (e.g., Behnam & Golpour, 2014; Behnam & Nikoukhesal, 2017; Jalilifar, 2010; Soodmand Afshar et al., 2018). Behnam and Nikoukhesal (2017) analyzed the rhetorical preferences in the introductions of two groups of RAs, physical and social sciences. Results showed that there was a variation between the two groups in terms of step distributions although this difference was not statistically significant (2018), in which, the researchers reported that the introductions in applied linguistics and chemistry RAs were rhetorically different in terms of the use of steps. The researchers assigned this rhetorical difference to the disciplinary variation in the use of strategies for Move realizations.

Moves in Computer Science (CS) Papers' Introduction

CS is a fast-growing field of knowledge (Shehzad, 2012). It is a new discipline pioneered in the Anglo-American academic community and rapidly extended to the rest of the world (Soler-Monreal, Carbonell-Olivares, & Gil-Salom, 2011). The members of this scientific community give much credit to publish their scientific contributions in high-indexed journals enthusiastically. To achieve the goal, they need to be consistent with the rhetoric of the CS discipline.

The relevant literature indicates that research on the introduction of CS RAs first started in the 1990s. In a preliminary study, Posteguillo (1999) reported that CS scholars conventionally specified the scope of their research (i.e., Move 1) by the steps of topic generalization and previous works contextualization. The claiming centrality was an optional base. Research justification (i.e., Move 2) largely instantiated through gap indication although this step occurred in lower occurrences. Research statement (i.e., Move 3) was realized through the announcement of the present research, description of main findings, and specification of RA organization.

The problem with Posteguillo's study was that he did not validate his research with informants' insights. In a subsequent study, Anthony (1999)

promoted this gap, and consulted the findings with CS insiders and found that they frequently showed preferences to evaluate their research in Move 3. He also discovered that these researchers immediately defined the difficult concepts after specifying the territory of the research. However, the caution should be taken in generalizing the results of this investigation since the corpus was small restricted to a few numbers of introductory texts in CS RAs.

Research on the introduction of CS' RAs was further developed by Shehzad (2006, 2008, 2010, 2011, & 2012). Her research brought insightful understandings to the nature of rhetorical options in the CS discipline. For example, she attributed the frequent use of outlining the research structure step to the nature of the discipline itself (Shehzad, 2006). She argued that CS scholars preferred to organize things in well-defined boxes to easily retrieve them as they click the box every time. The results of this study challenged the suggestion that CS researchers outlined different sections of their RAs in the introduction sections of the papers merely due to the newness of the field (Cooper, 1985).

Shehzad (2008) further found that the use of Move 2 was slightly more frequent than those observed in Anthony (1999) and Posteguillo's (1999) analyses. She attributed the frequent use of this rhetorical interest to the competitive pressure established in CS discipline. Elsewhere, Shehzad (2010) confirmed that introductions were result-oriented, and CS scientists often described their contributions explicitly in this opening section of their manuscripts.

In another work, Shehzad (2011) found that the step of listing research questions/hypotheses was obligatory in the introductions of CS RAs. Still, in a very detailed analysis, Shehzad (2012) observed that Step of referring to the previous citations did not occur separately, and it imbedded to Move 2 and 3 as well. Move 2 was recursive, and it was usually overlapped by Move 1 and Move 3. She asserted that CS researchers presented their studies primarily in a narrative form rather than a purposive manner. The study also showed that CS scholars wrote a lot about their

techniques and methods applied. Shehzad justified the frequent use of method summarization to the purpose of the new research in CS, which was usually the development of a new method, design, or technique. She argues that the CS researchers probably found this rhetorical strategy as a proper way to introduce the newly developed technique.

Kanoksilpatham (2012) found that CS scholars showed high preferences for the use of centrality announcements, topic generalization, and previous studies contextualization in the introductions of their RAs. She also observed that Move 2 was cyclically overlapped in other Moves. This recursive feature was also evident in Maswanaa et al. (2015), in which the researchers found that Move 1 and 2 realized throughout the introduction of CS RAs.

In the continuation of the contextualized studies, this study comparatively investigates the probable rhetorical differences or similarities in the introductions of RAs published in Iranian and international prestigious journals in CS discipline. The findings of this analysis could raise the awareness of Iranian CS students to the instantiation of move-step structures in the introductions of their manuscript before publication consideration in flagship journals. The following research questions guide this investigation:

1. Is there any statistically meaningful variation between the frequency of moves in the introductions of Iranian and international CS RAs?
2. Is there any statistically meaningful variation between the frequency of steps in the introductions of Iranian and international CS RAs?

METHOD

Corpus

The corpus for analysis was a collection of sixty introductions of RAs in CS. These RAs were purposefully selected from well-known local and international journals (30 from each). RAs were data-based and published in the English language. To get an appropriate representation of the move-step variation in the introduction of CS RAs, the researchers chose papers

restricted to a period of six years (2013-2019). This determination was grounded on the suggestion that genre is dynamic and changes over time in response to the members' needs (Swales & Najjar, 1987). International RAs were authored by international scholars, and Iranian RAs were written by Iranian researchers. The Iranian researchers were affiliated to Iranian universities, and the international scholars formally attached to different academic institutes or research centers across the world.

International RAs were retrieved from the high-indexed, international journals in CS. Iranian RAs were downloaded from the prestigious journals published by top Iranian universities. It is possible to get access to Iranian journals through the portal of Scientific Information Database (https://www.sid.ir/en/journal/) by clicking on the link of ISI Iranian Journals.. Similar to Nwogu's (1997) analysis, the researchers considered the popularity, availability, and representativeness as the main criteria for journal selection. Expert informants including Iranian university professors and Ph.D./MS students in CS nominated the journals as among the leading publications in CS. In their informal conversations with this group of academic members in the CS discourse community, researchers learned that almost all of them strongly desired to get their scientific contributions published in ISI-indexed journals rather than Scopus-indexed ones. Therefore, the researchers determined to examine the rhetorical preferences in the introduction section of papers that appeared in Iranian ISI journals and compare these invisible structures with those realized in the introductions of RAs published in international ISI journals.

It needs to be further mentioned that Iranian journals published RAs in different disciplines including, CS, Mechanical Engineering, Civil Engineering, Electronics Engineering, Information Technology, and many other fields of sciences. However, international journals were mainly dedicated to disseminating knowledge specific to the scope of CS. It needs to be mentioned that, except for some international RAs from the Journal of Computer in Biology and Medicine, all the selected papers did not have

the format of Introduction-Method-Results-Discussion (IMRD) common in empirical RAs. All of the papers, however, possessed introductions.

Data Collection Procedure

Ding (2007) argues that a move can be instantiated in one proposition or several paragraphs. According to Ding, each move has a local goal and together with other moves constructs the overall communicative purpose of the discourse. The researchers conducted a functional-semantic approach to move identification. This approach uses cognitive judgment to identify the main proposition of a written or spoken discourse (Bhatia, 1993; Paltridge, 1994). Moves together with their steps were mainly recognized through their communicative functions in the contexts. Linguistic features were also beneficial in move recognition. To prevent subjectivity in the move and step identification process, an approach similar to that one utilized in Rezaee and Sayfouri's (2009) analysis in the introductions of medical RAs was conducted. Accordingly, five RAs were randomly selected from the sample. One researcher (R1) scrutinized the complete introductions of the selected sample twice within fourteen days. Two CS researchers (R2 and R3) were requested to examine move-step structures in the same sections of the same sample after adequately teaching them on how to identify moves and their constituent steps in the texts.

To measure the degree of the relationship between the two ratings (researcher intra-rater reliability) and between the other ratings (inter-rater reliabilities), three Pearson coefficient correlation tests were performed using Statistical Package for the Social Sciences (SPSS) software, version 20. Table 2 indicates the tests' results confirming the logical consistency in the identification of rhetorical organizations in the introductions of the pilot sample.

Table 2: Intra- and Inter-raters Reliability in Move and Step Identification

Reliability	Raters	Spearman Correlation	Sig. (2-tailed)
Intra-rater	R_1 (1)-R_1 (2)	0.800**	0.0014
Inter-rater$_1$	R_1-R_2	0.606*	0.022
Inter-rater$_2$	R_1-R_3	0.744**	0.001

**Correlation is significant at the 0.01 level (2 tailed)
* Correlation is significant at the 0.05 level (2 tailed)

Then, all of the introductions were carefully read for identifying the moves and steps. The recognized structures were categorized according to Swales' (2004) CARS framework. This framework is more complex and elaborated than originally observed in Swales' earlier works (Shehzad, 2006) since this model enables the genre analyst not only to know what sorts of information is transmitted through the moves and steps but also, to recognize the sequence and order of these rhetorical structures in a specific discourse (Kanoksilapatham, 2012).

Researchers benefitted Kanoksilapatham's (2005) approach to classify the obligatory, conventional, or optional status of a move; accordingly, an obligatory move realizes in 100%, the conventional move occurs between 60 - 99%. If the frequency of a Move falls below 60%, the move is considered optional.

Moves and steps were statistically calculated and tabulated. A series of statistical non-parametric tests (i.e., 14 Chi-square tests) were performed by SPSS software (version 20) to see whether there was any significant statistical difference between the two groups' RAs concerning the use of moves and steps in the introduction sections.

Results

Generally, results illustrated no statistically meaningful variation between the frequencies of moves in Iranian and international introductions since the p-values (levels of significance) were 1.000, 1.000, and 0.896, respectively (asymp·sig > 0.05). According to the results, Iranian and international CS researchers used three moves almost with similar frequencies in the introductions of their RAs.

Table 3: Frequency, Percentage, and the Results of Chi-Square Tests on Identified Moves

Moves	M1	M2	M3
Frequency in Iranian RAs	30	29	29

Percentage in Iranian RAs	100%	96.6%	96%
Frequency in international RAs	30	29	30
Percentage in international RAs	100%	96%	100%
x^2	0.00	0.00	0.017
Asymp. Sig	1.000	1.000	0.869

Table 3 displays the frequency, percentage, and the results of Chi-Square tests concerning the occurrences of different steps in the introductions of Iranian and international CS RAs.

Table 4: Frequency, Percentage, and Results of Chi-Square Tests on Identified Steps

Moves	M 1	M 2			M 3						
Steps	S1	S_1A	S_1B	S_2	S_1	S_2	S_3	S_4	S_5	S_6	S_7
Iranian RAs	30	30	3	0	28	0	1	28	6	27	29
Percentage	100%	100%	10%	0	93%	0	3.3%	93 %	20%	90%	96%
International RAs	30	30	1	0	30	2	2	29	1	29	19
Percentage	100%	100%	3.3%	0	100%	6.6 %	6.6%	96%	3.3%	96%	63 %
x^2	--	--	1.071	--	2.06	2.06	0.35	0.35	3.571	1.071	10.417
Asymp. Sig	1	1	0.3	1	0.15	0.15	0.55	0.55	0.059	0.59	0/001

As indicated in Table 4, these groups of CS scholars used the individual steps almost with similar frequencies in the introductions of their papers. However, one Chi-square test showed a statistically meaningful variation between these scientists in the use of Outlining Research Structure Step in introductions (asymp·sig<0/05, Table 4). The amounts of the p-value (level of significance) for all other comparisons were larger than 0.05.

DISCUSSION

The findings of this study showed that Iranian and international CS scholars were probably sensitive to the significant functions of the rhetorical organization in the introductions of their RAs. This awareness might have been sharpened up by their massive exposure to the introductions of other high-quality papers or by their advantage to gain constructive feedback from anonymous reviewers. The high preference of Iranian and international CS researchers in the frequent use of these moves in the introduction of their RAs (Table 3) is supported by previous studies (Anthony, 1999; Kanoksilpatham, 2012; Maswanaa et al., 2015; Posteguillo, 1999; Shehzad, 2012; Yazdanimoghadam & Rajaee, 2010) confirming the obligatory status of these macro-rhetorical structures in the introductions of CS RAs.

Realization of Move 1

Move 1 (*Territory Establishment*) is an obligatory rhetorical option to Swales (2004) CARS model, and it enables the writers to provide background information on the topic of interest. In this move, the tone of the researcher is neutral, and he/she attempts to provide factual information relevant to the point of the research area (Habibi, 2008).

The results of this study showed that Iranian and international CS researchers used different types of strategies to increase the specificity of their research domains: (a) they expressed the importance of the issues in CS research (Example 1 and 2); (b) they frequently referred to previous investigations (Example 3 and 4); (c) they provided factual information (neutral statements) about the phenomenon under investigation (Example 5). In the majority of introductions, these rhetorical strategies were usually occurred together (Example 3).

[**Move 1, Step 1**] The use of Wireless Sensor Networks (WSN) in healthcare applications is *growing fast in recent years* [emphasis added]… The wireless body sensor network *plays an important role* [emphasis added] for healthcare monitoring applications. For these applications, *it is essential*

[emphasis added] to be able to reliably collect physiological readings from humans via body sensor networks. (Example 1, Iranian RA introduction)

[**Move 1, Step 1**] Over the past decades, *great progress* [emphasis added] in the development of pMRI methods has taken place, thereby producing a number of related parallel imaging reconstruction techniques and strategies. Currently, *the most well-known* [emphasis added] are SiMultaneous Acquisition of Spatial Harmonics (SMASH) [1], SENSitivity Encoding for fast MRI (SENSE) [2], and GeneRalized Auto-calibrating Partially Parallel Acquisitions (GRAPPA) [3]. (Example 2, International RA introduction)

[**Move 1, Step 1**] Object-orientation is a *popular approach* [emphasis added] which is… There are *many approaches* [emphasis added] in the literature for developing object-oriented programs from Object-Z specifications. *Rafsanjani and Colwill [6]* [emphasis added] presented… In [7], *Fukagawa et al***.** [emphasis added] built upon the work of [6] to propose… *Johnston and Rose [8]* [emphasis added] presented another method… (Example 3, Iranian RA introduction)

[**Move 1, Step 1**] Using the combination of vascular structures and keratinized (scaly) areas gives… *Pan et al.* [emphasis added] noted the importance of… *Zalaudek et al.* [emphasis added] noted that scale… In another study, *Zalaudek* [emphasis added] notes that… (Example 4, International RA introduction)

[**Move 1, Step 1**] The idea of an information age replacing the industrial age has been around for about forty years. In this new era an incessant flow of information…. Those who can filter out the important bits, however, will have an edge… Today we have the full feedback loop… For many people in the computerized world, producing and using digital information are... Extracting information from these digital traces is more than an academic endeavor… A classic example of such products is search engines and… In the last few years, companies extracting news and trends from… (Example 5, International RA Introduction)

Based on Swales' (2004) CARS model, we categorized all of these rhetorical interests within one step, namely, the topic generalization of increasing specificity. Although it was not possible to quantitatively document the amount of these rhetorical strategies, our qualitative analysis revealed that Iranian and international CS scholars frequently enjoyed these rhetorical structures in specifying their research territories. The frequent use of this step in Iranian and international CS introductions supports the argument that in Move 1 the research paper writers in all areas of investigations intensively specify their area of research before describing their work (Swales, 2004).

In any case, Posteguillo (1999) and Anthony (1999) did not consider these rhetorical strategies (i.e., calming importance of research, reference to previous works, and topic generalization) obligatory in introductions of their CS corpus. Anthony attributed the infrequent use of citations to the lack of a good breadth of knowledge in CS discipline, which made the computer researchers not refer to the previous works. However, recent investigations reported on the obligatory status of these rhetorical preferences in the introductions of CS RAs (Maswanaa, et al., 2015; Shehzad, 2012; Yazdanimoghadam & Rajaee, 2010). Therefore, these rhetorical structures, once optional, are now obligatory in the introductions of CS RAs. This finding supports the suggestion that genre is a conventionally structured construct, but, at the same time, it is dynamic and exerts propensity for innovation to meet the needs of the new rhetorical contexts (Bhatia, 2014).
Generally, this investigation illustrated that there was not any statistically meaningful variation between the Iranian and international CS scholars concerning the use of Move 1 (Table 3). This finding holds valid in the case of its only one step, that is, topic generalization of increasing specificity (Table 4). Put simply, all of the introductions rhetorically featured with this obligatory move along with its only-one constituent, the step of topic generalization. This finding is in line with Anthony (1999), Kanoksilapatham (2012), Maswanaa, et al., (2015), Shehzad (2006, 2010, 2012), Esfandiari (2014), and Yazdanimoghadam and Rajaee

(2010)investigations, in which Move 1 was observed as an obligatory rhetorical behavior in the introductions of CS RAs.

Realization of Move 2

Move 2 (*Niche Establishment*)) functions as a joint that fastens Move 1 to Move 3 (Shehzad, 2008). In this move, the researcher adopts a challenging and dubious approach to the previous works (Swales, 2004). It is realized by the Steps of indicating the gap (1A), adding to what is known (1B), and/or justifying the current investigation. Our investigation showed that the Steps of adding to what is known and positive justification were not of interest by Iranian and international CS researchers (Table 4). However, indicating the gap was almost the most common strategy for Move 2 realization (Table 4). This step was mainly identified through adversative sentence connectors such as although, however, despite, etc. and lexical negation such as delay, limit, few, paucity, lack, inconclusive, misleading, among others. (Example 6 & 7).

[**Move 2, Step 1A**] *Although* [emphasis added] some of the aforementioned works improve the robustness of the closed-loop system, they *cannot guarantee* [emphasis added] the stability of… applying a PD or PID controller to a linear system with input delay generally leads to *a time-delay system* [emphasis added] of neutral type. (Example 6, Iranian RA introduction)

[**Move 1, Step 1**] Several models of CA3 axon arbors of varying complexity have been presented [6–12]. The axon geometry in these models ranges from simple… Bernard et al. [9] presented the most realistic model of CA3 axon arbors… Besides, the electrogenic properties of membranes in these models range from… Prior modeling studies indicate that axon orientation…. [**Move 2, Step 1A**] The aforementioned CA3 axon models *are likely limited* [emphasis added] in their ability to predict… To date, a model of CA3 axons with accurate branch structure and electrogenic properties *has not been created* [emphasis added] to study the direct effects of… (Example 7, International RA introduction)

This study showed that Iranian and international CS scholars competed much for research space through gap indication strategy. This rhetorical behavior confirms the proposition that the competitive pressure, which has been established in CS discipline, propels the scholars to highlight their research more than ever (Shehzad, 2008). It is indicated in the relevant literature that this strategy was once infrequent (Posteguillo, 1999), then largely increased (Anthony, 1999), and now it is realized in much higher frequencies in the introductions of CS RAs (Kanoksilapatham, 2012; Shehzad, 2008, 2012; Maswanaa et al., 2015). It should be mentioned that according to these contextualized analyses, the primary step for Move 2 accomplishment was the frequent use of indicating the gap strategy.

In our study, Move 2 was also commonly realized through the maximum use of Step1A (i.e., indicating the gap). The frequent use of this rhetorical interest shows that CS scholars currently consider gap indication as a proper way to explicitly justify their works to the members of their discourse community (Anthony, 1999; Kanoksilapatham, 2012; Shehzad, 2008, 2012; Maswanaa et al., 2015; Yazdanimoghadam & Rajaee, 2010). One possible reason is probably due to the rapid advancement in CS research which makes these scholars contextualize a strong gap in the literature so that they could encourage the members of CS discourse community to persuasively accept and appreciate their research contributions to CS discipline(Shehzad, 2008). This rhetorical interest in the introduction of CS RAs supports the premise that hard science scholars usually show a preference for Step of indicating the gap to justify their research (Swales, 1990, 2004).

Realization of Move 3

Move 3 (*Announcing the Current Research*)provides information on what the present research is about. In this move, the academic researchers find themselves in a position to introduce their contribution, and, more specifically, present information about their scientific work; they inform their audience of the study's purpose(s), hypotheses, research design, advantages/disadvantage, probable findings, paper's structure, etc. (Habibi,

2008). As earlier mentioned, in Swales' (2004) CARS model, Move 3 is realized through seven rhetorical strategies (i.e., steps); one step is obligatory, three are optional, and the rest might have occurred in some disciplines (Table 1).

The qualitative analysis of Move 3 showed that Iranian and international CS scholars presented their study mainly in a descriptive rather than in a purposive manner (i.e., Step 1), and it was usually loaded with a summary of method application (i.e., Step 4). These scholars frequently used deictic expressions such as demonstrative articles of "this" along with the plural pronoun of "we" as the specific textual features to mark the beginning of Move 3. The verbs of "present," and "use," "propose," and "introduce" were also frequent in this rhetorical structure (Examples 8).

[**Move 3, Step 1**] *In this paper, we present* [emphasis added] a new hybrid algorithm based on particle swarm optimization and stochastic local search for identification of motifs in given DNA sequences... *In this paper, we use* [emphasis added] the stochastic local search to mitigate premature convergence problem. [Move 3, Step 4] To cope with stagnation, *a new method called repulsion/attraction mechanism is introduced* [emphasis added]. Also, *a new non-linear adaptive inertia weight is introduced* [emphasis added] to further improve the performance of the proposed method. (Example 8, Iranian RA introduction)

Similar to the previous studies, our study also showed that Iranian and international CS provided detailed information concerning the designs of their investigations, instruments, or procedures applied in their studies. This rhetorical structure is usually overlapped by Step 1. This finding is in line with Posteguillo (1990), Anthony (1999), Shehzad (2011), Kanoksilapatham (2012), in which it was revealed that CS scholars talked briefly about nature (i.e., method) of the research rather than the purpose of the research. These rhetorical behaviors show that the primary purpose of Move 3 is probably to descriptively introduce the newly developed method, technique, or algorithm rather than to merely present the purpose of the study (Shehzad, 2010).

It needs to be mentioned that, Iranian scholars were not frequently explicit in the summarization of the proposed method/technique/algorithm (Example 9 and 11). Instead of using the personal pronoun of "we," Iranian CS researchers presented their studies passively (Example 9 and 11). This Iranian rhetorical behavior indicates that the personal stance of the investigator is not appreciated in the Iranian CS community. They might have felt it as a face-threatening act to present their newly developed technique/contribution explicitly. This rhetorical interest is probably an instantiation of Iranian cultural schema, which needs further research.

[**Move 3, Step 1**] *In this paper, a novel method is proposed* [emphasis added] for delineating the lung field ROI by automatically segmenting the lung lobe, correcting the border to avoid excluding nodules close to the lung boundary while minimizing possible over-segmentation…. [**Move 3, Step 4**] A bidirectional chain encoding method *is used to* [emphasis added] detect both vertical and horizontal critical point pairs. A support vector machine *is then employed* [emphasis added] to predict whether the concave region formed by a point pair should be corrected based on positional information, concavity rate, and distance information. To test the proposed method, 233 CT scans from the Lung Imaging Database Consortium (LIDC) dataset *were used* [emphasis added]. (Example 9, International RA introduction)

The current study also found that a majority of Iranian and international CS scholars explicitly justify the values of their research as well (Table 4). This rhetorical strategy is usually loaded with affirmative words (such as appropriate, suitable) (Example 10 and 11). Shehzad (2011) reported that this rhetorical structure occurred immediately after the CS researchers presented the main findings. However, in our study, it was usually followed or overlapped by method description (Example 10). Of course, in some RAs, it occurred before method summarization as well (Example 11).

[**Move 3, Step 6**] The primary spectral response of this filter is the main lobe sinc characteristic which has a DC gain normalized to unity with

appropriate scaling [emphasis added] and the quadratic main lobe droop in the desired passband that is a function of the equivalent boxcar length *M* and the number of cascade sections *K*. *We choose higher-order CIC filters* [emphasis added] to obtain repeated stop band zeros with their associated reduced amplitude stop band side lobes. *Higher-order filters are characterized by increased* [emphasis added] main lobe passband droop. *We compensate for this droop [emphasis added]* to make the filter *suitable* [emphasis added] for SDR applications. (Example 10, International RA introduction)

[**Move 3, Step 6**] This condition [newly proposed method] utilizes the *task re-execution mechanism [23] to realize the guarantee* [Emphasis added]. The *basic idea* [emphasis added] underlining the proposed condition is to manage the *slack times of tasks* [emphasis added] to re-execute a task when it fails. This condition *selects a proper* [emphasis added] schedulable task-set according to an expected failure rate and a desired performability level (Example 11, Iranian RA introduction)

It should be mentioned that the Step of research evaluation was usually credited by reference to previous works (Example 11). It seems that the primary function of reference to previous work is not to establish the territory of research but to justify or support the choice of their research method. Research justification was also evident in some contextualized studies too (Anthony, 1999; Kanoksilapatham, 2012; Shehzad, 2011; Maswanaa et al., 2015). This finding confirms the hypothesis that in engineering sub-disciplines (such as CS), research evaluation is realized in Move 3 rather than Move 2 (Samarj, 2002).

Our investigation illustrated that there was a statistically meaningful variation between the Iranian and international CS scholars concerning the use of outlining the structure of the research strategy. Put simply, Iranian CS used this strategy more frequently than their international counterparts (Table 4). The frequent use of this step in Iranian RA introductions supports previous studies confirming the close-to-obligatory status of this step at the

end of the introduction in CS RAs (Anthony, 1999; Kanoksilapatham, 2012; Maswanaa et al., 2015; Shehzad, 2006, 2011; Posteguilio, 1999).

Swales (2004) argues that outlining the structure of research is optional in RAs, however, the realization of this nearly-always-final element in some introductions is probably related to whether the disciplinary field has an established Introduction-Method-Result-Discussion (IMRD)-like sectional arrangement. Our analysis confirms Swales' assertion in this regard since some international papers (around 30% of the corpus) were retrieved from the journal of Computer in Biology and Medicine, in which RAs were featured with IMRD format. The introductions of these RAs were not enclosed with the Step of outlining the structure of the research at all. However, the rest of the RAs featured with this rhetorical structure due to a lack of IMRD format. Therefore, it seems that this step functions as the roadmap of the research in CS RAs, and it informs "the audience about the rhetorical organization of the subsequent text (Shehzad, 2006, p. 230).

By and large, the similarity about the occurrences of schematic organizations in the introductions of Iranian and international CS RAs is probably due to reason that the Iranian and international journals, from which these papers have been retrieved, might have considered Swales' (1990, 2004) three-part model as a prototypical criterion in evaluating the content and style of the received manuscripts. The feedback and comments of the anonymous reviewers could be another reason for similar rhetorical developments in the introductions of these prestigious papers in CS discipline. That is, these groups of CS researchers might have arranged the content and style of their introductions based on the professional readers' perspectives. Paper revision procedure usually takes a long time leading the CS researchers to improve the rhetorical organization of introductions as much as similar to that one standard and conventional to CS discourse community. Still, the massive exposure of researchers to the introductions of other high-quality papers could be considered as another reason for the similarity available in the use of these rhetorical preferences.

CONCLUSION AND IMPLICATIONS

This investigation examined move-step differences/similarities in the introductions of RAs authored by Iranian and international scholars in CS discipline. The study benefited Swales' (2004) CARS framework to code rhetorical preferences. The findings revealed no statistically meaningful variation in the application of Move 1, 2, and 3 by these two groups of scientists. Both groups of scholars enjoyed the use of all steps except outlining the research structure strategy. The similarity in organizational structures was ascribed to the use of Swales' (2004) framework as a prototypical base for introduction development in CS published in the prestigious journals. It was also argued that these similar rhetorical preferences could be further due to their massive exposure to the introductions of other high-quality papers or to constructive comments the researchers receive from the anonymous reviewers during the paper revision procedure.

Similar to previous rhetorical investigation on the introduction sections, this rhetorical analysis also calls for a genre-based approach in the instruction of scientific composition in the ESP context (Hyland, 2003), particularly the introduction section of CS RAs. That is, this pedagogy could help the Iranian CS graduate students be sensitive to the functions of various rhetorical organizations applied in the introductions of research papers in CS discipline. It might also help Iranian expert/non-expert CS researchers to carefully evaluate the introduction of their manuscripts concerning information arrangement before publication consideration in international high-indexed journals.

The results of this study could be further contributed to the improvement of ESP textbooks in CS, in which the rhetorical structures of introductions can be taught to Iranian novice researchers in CS discipline. More specifically, ESP teachers could explicitly teach students the rhetorical devices common in the introduction of CS RAs equipping them with the ability to assert their communicative functions successfully in the

introduction of their manuscripts.

This investigation analyzed move-step structures in the introductions of research reports in the CS discipline. Further research is warranted to probe these invisible structures in Method, Results, and Discussion sections of CS RAs. This study compared the frequencies of move/step in the introductions of Iranian and international RAs in CS discipline. The subsequent investigations may describe the cyclicity and combination of these structures in the introductions of these RAs. It should be noted that the results of this investigation could not be generalized to other CS contexts due to the reason that the findings were not supported and credited by computer specialists. The information of informants could help the genre analysts to have a comprehensive picture of the rhetorical preferences researchers show in generating different sections of their RAs (Swales, 1990). To improve this limitation, future analyses could consult and validate their results with the CS insiders.

This study scrutinized the schematic organizations of RAs published in prestigious journals. The future genre analyses would investigate the similarities/differences of these rhetorical options existing in the introductions of Iranian CS RAs published in low prestigious journals. Shehzad (2011) argued that CS scientists are usually explicit in telling their audience what their research is going to probe. A line of inquiry may contrastively explore this specific rhetorical option in the introduction of CS RAs developed in Persian and English languages. Still, a line of inquiry may contrastively compare the rhetorical devices observed in the introduction of CS to those realized in other disciplines. Future studies could also investigate the Iranian CS researchers' strategies crediting and supporting their claims and positions in the discussions of their papers. The conclusion section also warrants further investigation; the researchers might examine the techniques that Iranian CS researchers use in contextualizing the theoretical and practical implications of their research.

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