Revista de Lingüística y Lenguas Aplicadas
Vol. 11 año 2016, 1-10
EISSN 1886-6298
http://dx.doi.org/10.4995/rlyla.2016.4652

THE IMRD OVERFLOW PHENOMENON: FORM AND FUNCTION OF JAPANESE-LANGUAGE JOURNAL DOCUMENTS

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Abstract: *Despite the growing body of research on the overall organization of documents from academic journals, little is known about the use of IMRD-based structures—the pattern composed of Introduction, Methods, Results, and Discussion sections and its variants—in publication categories other than the research article. The current paper addresses this phenomenon with the focus on Japanese-language journal documents. Both the structure and the basic function of 186 documents in Japanese of five categories different from the research article were analyzed. It was found that IMRD-based structures are consistently used in two and sparsely used in one of the five categories. Additionally, it was found that most documents exhibiting these structures report some kind of investigation. The results point to a close connection between form and function; the overflow of IMRD-based structures seems to be an external sign of the advance in academic journals of publication categories centered on research processes.*

Keywords: *academic writing, scholarly publication, academic Japanese, Japanese for specific purposes, overall structure.*

1. INTRODUCTION

Research on documents from academic journals generally approaches form at two distinct yet interdependent levels: local structure, which relates to the constituents of the sections of a given publication category as well as to their order; and global structure, which has to do with the overall elements of a category of publication in addition to their arrangement. Local structure has been a recurrent research topic since Swales' (1981) seminal work on research article introductions. Examples of subsequent studies focusing on this organizational layer include those by Crookes (1986), Holmes (1997), Anthony (1999), Muraoka (2002), and Kimoto (2006). Global structure, in contrast, has received less attention. After Hill, Soppelsa, and West's (1982) description of the general arrangement of experimental-research articles, investigations concerning this structural level have been few and somewhat isolated (e.g., Posteguillo, 1999; Ruiying & Allison, 2004; Sollaci & Pereira, 2004). It seems that only recently has macrostructure started to be examined on a more regular basis (see Aragão, 2011a, 2011b, 2015; Lin & Evans, 2012).

A primary concern of investigations into the global structure of documents from academic journals is the presence, the incidence, and even the power of structural patterns. Indeed, research studies on macrostructure have demonstrated the great importance of IMRD-based structures: the Introduction, Methods, Results, and Discussion (IMRD) pattern and other formats apparently derived from it (Figure 1). Findings of an examination of instructions to authors, for example, suggest that a considerable portion of journals from several fields recommend IMRD-based structures for research articles (Aragão, 2011a). Furthermore, results derived from analyses of research articles reveal that the amount of documents following either the IMRD pattern or similar structures is in fact high (Sollaci & Pereira, 2004; Aragão, 2011b, 2015; Lin & Evans, 2012).

Received: 2016/02/06 Accepted: 2016/02/21

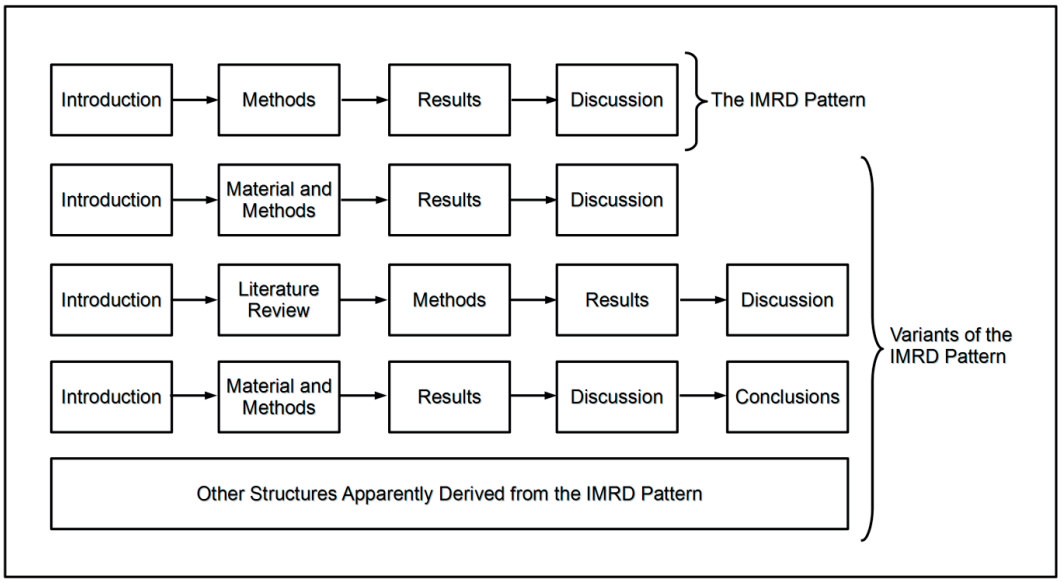

Figure 1. IMRD-based structures.

In spite of the advances in knowledge of global structure, there is a phenomenon concerning the overall organization of scholarly journal documents that has been overlooked: the use of IMRD-based structures in publication categories other than the research article. It is known that these arrangements may be employed in dissertations (Swales, 2004:107) and even in reports (Shirasa, 2004:144); however, there is still little understanding of such an overflow in academic journal documents, despite the fact that IMRD-based structures have been recommended for research notes (e.g., Embrapa Informação Tecnológica, ca. 2016) and review articles (e.g., Nihon Sōshō Gekagaku Kai, 2013), to name but a few.

The present paper addresses this issue with the focus on Japanese-language journal documents, which provide an interesting counterpoint to studies involving data written in languages such as English or Spanish. To describe and comprehend the IMRD overflow phenomenon, an analysis on both the macrostructure and the basic function of documents in Japanese of different categories was carried out. Since what a research article, a dissertation, a report, a research note, and a review article seem to have in common is that all of them may report a research study (in the case of the review article, when it consists in a systematic review), it is assumed that IMRD-based structures have been used regardless of publication categories as long as documents describe some sort of investigation. This paper's hypothesis is that the spreading of the IMRD pattern and its variants might be related to the essential function fulfilled by documents.

2. DATA SET AND METHODS OF ANALYSIS

Five publication categories were included in the analysis, namely *kaisetsu* (the Japanese explanation article), *shiryō* (the Japanese research note), *shohyō* (the Japanese book review), *sōsetsu* (the Japanese review article), and *tanpō* (the Japanese short report).[1] These categories have been chosen due to the considerable relevance they seem to have in Japanese academic journals—it can be said that together with the Japanese research article (*kenkyū ronbun* or *gencho ronbun*) all of them are major categories of publication. Documents of the five categories published in recent issues of Japanese periodicals composed the data set. The Japan Science and Technology Information Aggregator, Electronic (J-Stage), an open-access database of leading Japanese scholarly journals (Japan Science and Technology Agency, 2015), was used to gather the texts. Only journals whose submission norms mention at least one of the five publication categories of interest were considered. The criterion to include a given document into a particular category was its official designation, that is, the label assigned to it by the journal of origin in the table of contents (and often in the document itself). For the purposes of this study, an amount between 35 and 40 documents for each of the five categories appeared to be reasonable. Overall, 186 Japanese-language documents from 14 periodicals were examined (Table 1).

[1] For ease of reading, only the English terms will be used throughout this paper (except in tables and in the last figure).

Table 1. Components of the data set per category of publication and journal of origin.

Publication Category (*Japanese Designation*) Journal (English Title)		No. of Documents
Explanation Article (*Kaisetsu*)		
Kōgaku Kyōiku (Journal of JSEE)		10
Nihon Kaisui Gakkaishi (Bulletin of the Society of Sea Water Science, Japan)		10
Nihon Sangoshō Gakkaishi (Journal of the Japanese Coral Reef Society)		6
Seibutsu Butsuri [Journal of Biophysics]		10
	Total	36
Research Note (*Shiryō*)		
Kōdō Keiryōgaku (The Japanese Journal of Behaviormetrics)		10
Nihon Eiseigaku Zasshi (Japanese Journal of Hygiene)		10
Rōdō Anzen Eisei Kenkyū (Journal of Occupational Safety and Health)		10
Zairyō (Journal of the Japan Society for Testing Materials)		10
	Total	40
Book Review (*Shohyō*)		
Haikibutsu Shigen Junkan Gakkaishi (Materials Cycles and Waste Management Research)		10
Kōdō Keiryōgaku (The Japanese Journal of Behaviormetrics)		6
Seibutsu Butsuri [Journal of Biophysics]		10
Sonraku Shakai Kenkyū Jānaru (Journal of Rural Studies)		10
	Total	36
Review Article (*Sōsetsu*)		
Rōdō Anzen Eisei Kenkyū (Journal of Occupational Safety and Health)		7
Seibutsu Butsuri [Journal of Biophysics]		10
Sōgō Byōin Seishin Igaku (Japanese Journal of General Hospital Psychiatry)		10
Zairyō (Journal of the Japan Society for Testing Materials)		10
	Total	37
Short Report (*Tanpō*)		
Dōbutsu Rinshō Igaku (Journal of Animal Clinical Medicine)		10
Nihon Kankyō Kansei Gakkaishi (Japanese Journal of Infection Prevention and Control)		10
Oriento (Bulletin of the Society for Near Eastern Studies in Japan)		10
Rōdō Anzen Eisei Kenkyū (Journal of Occupational Safety and Health)		7
	Total	37
Overall Total		**186**

Titles in round brackets are provided by J-Stage; titles in square brackets are the present author's translation.

To describe the range of the IMRD overflow phenomenon, the headings of the main sections of the body of the documents were recorded. Titles, abstracts, keywords, subheadings, notes, acknowledgements, disclosures of conflicts of interest, references, appendices, and authors' information were left out. Next, the documents were classified into three groups. Those consisting of Introduction, Methods, Results, and Discussion were classified as "IMRD pattern." Documents whose structure displays varying degrees of resemblance to the IMRD pattern were classified as "IMRD-pattern variants" and then subclassified as first, second, third, and fourth level variants (Table 2). The remaining documents, which exhibit no apparent connection with the IMRD pattern, were classified as "other sorts of structure." Unlike Lin and Evans (2012), merging of sections was not considered a distinctive characteristic. Consequently, a document composed of (1) Introduction, (2) Methods, and (3) Results and Discussion was put into the IMRD pattern group. Also, following Aragão (2015), no distinction was made among the Japanese introductory sections *Hajime Ni*, *Joron*, *Jo*, and *Shogen*, whereas *Owari Ni* ("Ending"), *Matome* ("Summary"), *Ketsuron* ("Conclusion"), and *Ketsugen* ("Concluding Words") were dealt with separately (they appear to refer to different sorts of content). Additionally, it was interpreted that both *Kekka* and *Seiseki* correspond to Results sections. In those cases in which the main headings proved to be insufficient to place a given document into a group (or subgroup), it was necessary to study the abstract, the subheadings, and other items —including the main text— to complete the classification.

Table 2. Classes of variants of the IMRD pattern.

Class	Features	Examples
First Level	Differences in headings	Introduction and Objective, Method, Results, and Discussion
Second Level	Added or excluded sections	Introduction, Methods, Results, Discussion, and Conclusions Introduction, Results, and Discussion
Third Level	Differences in headings and added or excluded sections	Introduction, Material and Methods, Results, Discussion, and Conclusion
Fourth Level	Less evident association with the IMRD pattern	Introduction; Research I, Methods, Results, Discussion; Research II, Methods, Results, Discussion; and Overall Discussion

Based on: Aragão, R. M. L. (2011). "Modelos de estruturação do artigo científico: Retrato e discussão a partir de instruções aos autores da SciELO Brasil", *Cadernos de Letras da UFF* 43: 153–163; Aragão, R. M. L. (2015). "A view into *gencho ronbun*: To what extent do Japanese original articles follow the IMRD pattern?", in L. M. Morales & M. Matsuda (general coordinators), *Proceedings of the 1st International Symposium on Japanese as a Global Language*. São Paulo, Brazil: Universidade de São Paulo (CD-ROM publication, without page numbers).

Subsequently, to assess the proposed hypothesis and provide an initial account of the IMRD overflow phenomenon, the basic functions of the documents were determined by an analysis of content. In most cases, examining titles, abstracts, section headings, and sources, as well as skimming the text, was enough to capture the gist of the documents. In some cases, however, it was necessary to take a careful look at the full document and search for clues. Past tense, for example, suggests a narrative. Purpose statements may reveal whether the document reports an investigation or review an issue. Summaries outlining what authors have done or explained can point to essential functions as well. Japanese expressions such as *honjikken* ("the present experiment"), *honkenkyū* ("the present research"), and *honkō* ("the present paper") were particularly useful to identify statements of purpose and summaries. After separate analysis, findings were reviewed and clustered. Following this process, the number of documents whose primary function is to report a research study and whose overall structure relates to the IMRD pattern was recorded.

3. RESULTS[2]

Table 3 summarizes the results of the initial classification of the data, providing a picture of the IMRD overflow phenomenon in Japanese-language journal documents. As can be seen, IMRD-based structures were observed in three of the five publication categories: the Japanese explanation article, the Japanese research note, and the Japanese short report. Whereas only a small portion of the sample of explanation articles exhibits textual organization associated with it, most research notes and short reports have structures related to the IMRD pattern. This suggests that IMRD-based structures play a substantial role in the writing of such categories. Indeed, the percentages of 70.0% and 64.9% show that IMRD-based structures may be almost as vital in the writing of Japanese research notes and Japanese short reports as they are in the composition of research articles for academic periodicals in both Japanese and other languages, since these figures are relatively close to those found in previous studies (Aragão, 2011b, 2015).

Table 3. Distribution of documents of the five publication categories by overall structure group.

	Explanation Article (n = 36)		Research Note (n = 40)		Book Review (n = 36)		Review Article (n = 37)		Short Report (n = 37)	
Overall Structure Group	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
IMRD Pattern	–	–	5	12.5	–	–	–	–	–	–
IMRD-Pattern Variants	2	5.6	23	57.5	–	–	–	–	24	64.9
Other Sorts of Structure	34	94.4	12	30.0	36	100.0	37	100.0	13	35.1

The Japanese terms for the five publication categories are the following: *kaisetsu* (explanation article), *shiryō* (research note), *shohyō* (book review), sōsetsu (review article), and *tanpō* (short report).

[2] The references of the components of the data set are listed before general references.

All classes of variants of the IMRD pattern (Table 2) could be found in the data set. The IMRD-pattern variants group includes documents with *Kyōzai oyobi Hōhō* ("Materials and Methods") instead of the conventional Methods section (e.g., Soma *et al.,* 2012); and documents with either *Mondai to Mokuteki* ("Problem and Aim") or *Mondai* ("Problem") performing the role of introduction (respectively, Okumura, 2008; and Kosugi *et al.,* 2011). It was interpreted that the overall structures of these documents correspond to first level variants. The group also includes one document with an additional section for conclusions (Miki, 2008), whose textual organization was considered an instance of second level variant. Documents exhibiting added sections and differences in headings in relation to the components of the conventional format compose another part of the IMRD-pattern variants group—for example, a research note by Tabuchi and Shiota (2014) that consists of *Shogen* ("Introduction"), *Jikken Gaiyō* ("Experiment Outline"), *Kekka* ("Results"), *Kōsatsu* ("Discussion"), and *Ketsugen* ("Concluding Words"). Structures of such documents were classified as third level variants. Finally, documents that include the basic components of the IMRD pattern but do not exhibit headings in the body, such as those by Nishimura (2012) and Sasahara *et al.* (2014), account for most of the remaining components of the group of variants. Due to its tenuous connection with the pattern, this sort of arrangement was interpreted as a variant of the fourth level.

Turning now to the scope of content, Table 4 displays the results of the description of the basic functions of the documents for each publication category. Generally, the Japanese explanation article introduces and explains a given subject covering current circumstances, knowledge, and perspectives. Shimizu's (2013) work on robot contests can be cited as an example. The author traces the development of robot contests in Japan from their origins and provides an outlook on the future, considering the importance of such contests for Japanese technological education. The Japanese explanation article may include data, examples, and findings. For instance, Takeuchi, Tabata, and Ito's (2013) introduction to a technique of pretreatment of seawater contains results of microscopic observation of sand as well as performance data on a reverse osmose system. Documents of this category whose primary function is to report a research study are likely to be rare. Only two have been found. While Sumino *et al.* (2011) focus on a survey on engineering design education, Nakaema *et al.* (2014) describe an inquiry on educational activities in the field of coral reef.

Table 4. Distribution of documents of the five publication categories per basic function.

	Explanation Article (n = 36)		Research Note (n = 40)		Book Review (n = 36)		Review Article (n = 37)		Short Report (n = 37)	
Basic Function	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Introducing and Explaining a Topic[a]	33	91.7	–	–	–	–	–	–	–	–
Reporting a Research Study	2	5.6	26	65.0	–	–	–	–	25	66.6
Presenting Taxonomy and Ecology	1	2.8	–	–	–	–	–	–	–	–
Proposing Something New[b]	–	–	6	15.0	–	–	1	2.7	–	–
Reporting a Research Study and Proposing Something New[c]	–	–	5	12.5	–	–	–	–	–	–
Reviewing a Topic[d]	–	–	2	5.0	–	–	35	94.6	–	–
Introducing a Research Group and Reporting a Meeting	–	–	1	2.5	–	–	–	–	–	–
Reviewing a Book	–	–	–	–	36	100.0	–	–	–	–
Reporting a Visit to Facilities	–	–	–	–	–	–	1	2.7	–	–
Offering Tribute to a Professor (Obituary)	–	–	–	–	–	–	–	–	5	13.5
Reporting a Case	–	–	–	–	–	–	–	–	4	10.8
Replying to Previously Published Content	–	–	–	–	–	–	–	–	2	5.4
Reporting an Academic Congress	–	–	–	–	–	–	–	–	1	2.7

The Japanese terms for the five publication categories are the following: *kaisetsu* (explanation article), *shiryō* (research note), *shohyō* (book review), *s*ōsetsu (review article), and *tanpō* (short report). [a]Includes introducing and explaining the current state of affairs, perspectives, and suggestions concerning a given topic. May include the presentation of data, examples, or results. [b]Models, application programs, methods, tools, manuals, or protocols. [c]Scales, approaches, tests, methods, or measures. [d]Includes reviewing the current state of affairs, critical issues, perspectives, trends, and research results (generally obtained by the authors) related to a given subject. May include examples and data.

In contrast, of all the functions fulfilled by the Japanese research note the most common seems to be to report a research study. One example with this function is the document by Sato *et al.* (2014), which describes a survey on diet and technology habits with 89 students followed by an experiment involving a cable television food balance

guide with 27 participants. Another primary function of Japanese research notes is to propose something new, such as a model (Yonehara, 2013) or an application program (Aizaki, 2009). Also, there are documents of this category that first report a research study and then propose something new, or vice versa. Nakayama and Tsurumi's (2008) work, which proposes a method to improve result interpretation and reports an analysis on purchase behaviors using the proposed method, can be mentioned as an example.

It can be said that the Japanese book review has the higher degree of consistency among the five publication categories. This is because every book review in the sample fulfills the same function: to review a book. Yet, there are a number of ways to do so. On the one hand, there are short and straightforward reviews, such as those by Wada (2009) and Murakami (2011), of about half a page. Generally, they are limited to an outline and a brief evaluation of the book. On the other hand, there are lengthy, detailed reviews, for example the one by Yoshino (2005), which contains four two-column pages. Yoshino (2005) introduces the author, reviews the research domain of the book, and presents and discusses its content bringing to the text several events and pieces of information. These longer documents include lists of cited works and resemble to some extent Literature Review and Discussion sections of typical research articles.

The Japanese review article is almost as consistent as the Japanese book review. Except for two documents that exhibit a fairly distinct focus —the one by Suzuki (2010), which reports a visit to facilities in the U.S.; and the one by Murata *et al.* (2014), which introduces a protocol— all review articles in the sample are likely to have as their basic function to review a given topic. A common strategy to do this is to present the current state of affairs and critical issues concerning the topic. Therefore, the Japanese review article and the Japanese explanation article share a common range in terms of content. The distinguishing feature between them seems to be orientation. As noticed by Suwa (2005:119-120), the latter aims at a wide audience, thus exhibiting a lower degree of complexity, whereas the former appears to aim at a narrow audience of specialists, being more intricate. Nagai's (2014) *review* of information disclosure in Japan and Europe, for example, is likely to address accounting specialists, a very different focus from that of Shimizu's (2013) *explanation* on robot contests, whose target is apparently less specific. It is important to note that many documents of the Japanese review article category place emphasis upon data and findings from the authors' own investigations, one example being Yano and colleagues' (2011) work—of the 40 references listed at the end of the article, more than half are authored by at least three of them. It seems clear that the Japanese review article may cover items found in reviews written in English, such as those listed by Noguchi (2001:42 as cited in Swales, 2004:209), but the presence of examples and data in many of the components of the corpus indicates that its approach can be more heterogeneous.

Documents of the Japanese short report category perform several functions, as Table 4 shows. Not only can they report different sorts of cases (e.g., Nagai, 2010; Yamagata, 2013) and academic events (Misawa, 2008), but they may also reply to previously published content (e.g., Sugimoto, 2009) and even present obituaries (e.g., Akahori, 2009; Ishida, 2010). The most common function of Japanese short reports, however, seems to be to report a research study, just like Japanese research notes. To illustrate, Onuma *et al.*'s (2009) work can be given as an example. The document reports a comparative analysis between blood data from 12 ferrets with lymphoma (a tumor of lymphoid tissue) and blood data from 10 healthy ferrets, displaying findings as well as a conclusion—the one that anemia and thrombopenia often occur in ferrets with lymphoma. Overall, Japanese short reports may resemble research articles not only with respect to structure (Table 3) but also with respect to content, with the peculiarity that they are more concise than conventional research articles.

Finally, Table 5 provides the results of the last stage of the study, showing the amount of explanation articles, research notes, and short reports in the sample whose basic function is to report a research study and whose textual organization is connected with the IMRD pattern. Regardless of the category, the majority of documents exhibit variants of the pattern. There is therefore support for the claim that IMRD-based structures have been employed in academic journal documents irrespective of the category of publication, provided that the function is to report some kind of investigation.

Table 5. Distribution of documents whose basic function is to report a research study by overall structure group.

	Explanation Article (n_{RRS} = 2)		Research Note (n_{RRS} = 26)		Short Report (n_{RRS} = 25)	
Overall Structure Group	N	(%)	N	(%)	N	(%)
IMRD Pattern	–	–	5	19.2	–	–
IMRD-Pattern Variants	2	100.0	18	69.2	24	96.0
Other Sorts of Structure	–	–	3	11.5	1	4.0

n_{RRS} = number of documents with the function of reporting a research study. The Japanese terms for the three publication categories are *kaisetsu* (explanation article), *shiryō* (research note), and *tanpō* (short report).

4. CONCLUSION AND FURTHER RESEARCH

The key results of this paper are summarized in Figure 2. IMRD-based structures are likely to be consistently employed in both Japanese research notes and Japanese short reports; in addition, they appear to be sparsely used in Japanese explanation articles. Irrespective of the category, Japanese-language documents exhibiting IMRD-based structures typically perform the function of reporting some kind of investigation, which points to a close connection between form and function. The findings provide support for the hypothesis that the spreading of the IMRD pattern and its variants may be related to documents' essential functions. It seems that the overflow of IMRD-based structures in academic journals is an outward sign of the advance of research-centered publication categories.

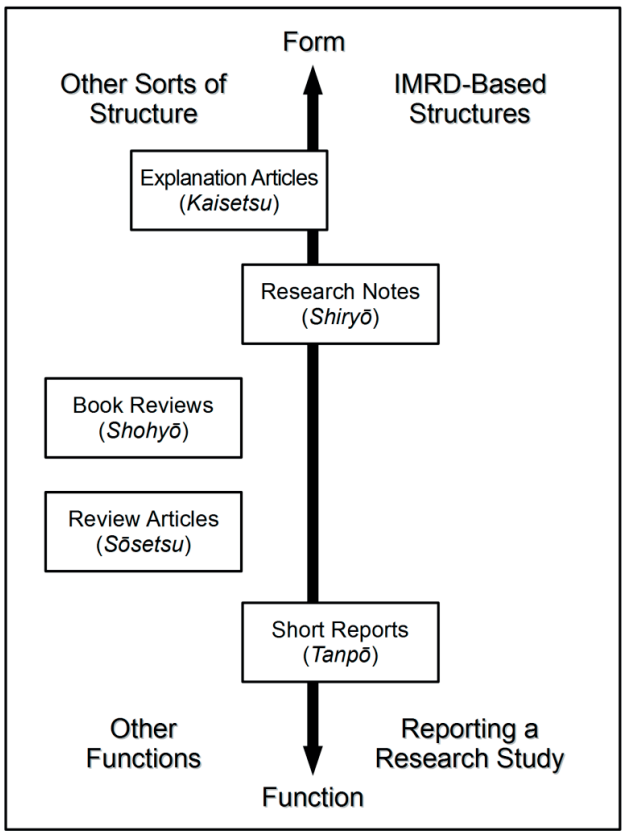

Figure 2. A preliminary representation of the IMRD overflow phenomenon in Japanese-language journal documents.

Further investigations could explore the IMRD overflow phenomenon in languages different from Japanese, considering form and function of publication categories other than the research article, to enhance the knowledge of its range. It may be the case that such an overflow might be limited to Japanese-language journal documents. The predilection for publication categories derived from or grounded on research processes, however, seems to be a wider trend. Therefore, it is expected that IMRD-based structures be found in research-centered documents belonging to categories different from the research article in other languages as well. If confirmed, this could point to an alternative approach to either develop or teach publication-oriented academic writing, centering more on the key function of reporting a research study and on IMRD-based structures than on a particular category of publication.

ACKNOWLEDGEMENTS

The author would like to thank the two anonymous reviewers of the *Revista de Lingüística y Lenguas Aplicadas* for their sensible suggestions, which contributed to substantially improve this paper. Special thanks are also due to Tomomi Aragão for her valuable assistance in revising the Romanized transcriptions of Japanese titles. All remaining mistakes are the author's own.

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