Discrete & Continuous Models
& Applied Computational Science
ISSN 2658-7149 (Online), 2658-4670 (Print)

2024, 32 (4) 355–361
http://journals.rudn.ru/miph

Editorial

DOI: 10.22363/2658-4670-2024-32-4-355-361 EDN: EKXUGR

IMRAD structure

Dmitry S. Kulyabov[1, 2], Leonid A. Sevastianov[1, 2]

[1] RUDN University, 6 Miklukho-Maklaya St, Moscow, 117198, Russian Federation

[2] Joint Institute for Nuclear Research, 6 Joliot-Curie St, Dubna, 141980, Russian Federation

Abstract. We describe introduced in the journal the rubric system.We describe the general structure of an IMRAD research publication. The IMRAD structure for a research article is described in detail.

Key words and phrases: IMRAD, research article

For citation: Kulyabov, D. S., Sevastianov, L. A. IMRAD structure. *Discrete and Continuous Models and Applied Computational Science* **32** (4), 355–361. doi: 10.22363/2658-4670-2024-32-4-355-361. edn: EKXUGR (2024).

1. General structure of the IMRAD paper

IMRAD is an abbreviation of *introduction, materials and methods, results and discussion*. The structure of IMRAD is described in ANSI Z39.16-1972 (Preparation of Scientific Papers for Written or Oral Presentation). In the 1970s, IMRAD became the de facto standard for the design of scientific articles [1].

The structure of an article according to IMRAD should look as follows.

- *Introduction*.
  - Why the study was done.
  - What was researched.
  - Purpose of the study.
  - What hypotheses were tested.
- *Methods* (aka *Materials and Methods*, *Theoretical Framework*).
  - When, where, and how the research was conducted.
  - What materials were used.
- *Results*.
  - What answer was found.
  - Whether the hypothesis was tested correctly.
- *Discussion*.
  - What the answer implies and why it matters.
  - How it fits in with what other researchers have found.
  - What are the prospects for research.
- Also included in the article structure are *Title*, *Annotation*, *Keywords*.

2. Different IMRAD structure options

The IMRAD structure is not a dogma, but a guide to action. Therefore, for different types of articles and for different scientific fields, some modifications may be made to this structure.

- The *Materials and Methods* section may be replaced by the *Theory* section.
- The *Results* and *Discussion* sections can be combined into one section.
- The *Conclusions* section can be included as the last part of the *Discussion* section.
- Only the main aspects can be given in the article, all additional aspects are listed as *Supplemental Materials* (on the journal's website).
- Review articles do not have a *Results and Discussion* section.
- Grant information may be included in the *Funding* section.

3. Structure of a research paper based on IMRAD

3.1. Title

- The title of the article should describe the content of the article as accurately as possible.
- The title of the article should be understandable for both humans and tools for processing and analyzing scientific information.
- The title of the article—this is what is looked at first.

Guidelines for writing the title of the article:

- the title should contain as few words as possible (7 ± 2 words) [2];
- is assumed that in our journal, the title of the article should not exceed 12 words;
- the title should accurately and specifically describe the content of the article;
- the title should not contain abbreviations, formulas and jargonisms;
- the title should not use abbreviations such as "Some notes on", "Observations on", "Investigations on", "Study of", "Effect of", etc;
- the title should not be flashy, as in newspapers;
- the title should communicate the subject of the study, not the results.

3.2. Authors

- This section is organized according to the rules of the author list.
- These rules may vary from one field of science to another.

3.3. Keywords

- Keywords should not duplicate terms specified in the title of the article.
- Keywords are used to analyze articles by automatic tools of abstract databases.

3.4. Abstract

- The main purpose of this section is to give the reader a comprehensive idea of what the article is about, so that he or she can decide whether or not to read it in its entirety.
- The abstract summarizes the main quantitative results of the study and the conclusions drawn from the work.

3.5. Introduction

- The introduction does not repeat the abstract; its purpose is to introduce the topic of the publication.
- The introduction aims to immerse the reader in the context of the research.
- The introduction provides a brief overview of the literature most relevant to the topic.
- The introduction answers the questions *what we are researching* and *why we are researching*.

In the introduction, the following objectives need to be addressed:

- to justify the relevance of the research (make a historical excursion, highlight the most significant works in the field);
- to reflect the most relevant recent achievements in the chosen field and the current state of the field;
- to introduce the necessary abbreviations and definitions;
- to formulate the prerequisites for the formation of the hypothesis to test which the article is devoted to;
- to define the specific problem, the solution to which the study is devoted;
- to formulate the goals and objectives of the work;
- to put the questions that this paper answers.

It is recommended to place service sections within the introduction: *Structure of the paper* and *Notations and conventions*.

3.5.1. Structure of the paper

In this section, the authors briefly summarize the structure of the article.

3.5.2. Notations and conventions

In this block the authors explain special terms, reveal abbreviations.

3.6. Materials and Methods

The section may also be called *Theoretical Basis*. The main objective of this section is to enable other scientists to reproduce the work done in the paper. It specifies the preparation mechanism, the equipment used, the algorithm for constructing the experimental process in chronological order, the laboratory procedures, the reagents and materials used, the laboratory objects, the methodology for processing the experimental results, and the research software used to write the paper.

Guidelines for preparing the section:

- avoid ambiguity in abbreviations or names;
- write all quantitative characteristics in standard international units of measurement (the choice of measurement system can be justified in the Introduction);
- explain each step of the study;
- explain all methods used;
- avoid irrelevant and unnecessary information that is not relevant to the results of the paper.

3.7. Results

In the section, authors presents the main results of the research findings.

- If data is obtained in the paper, the section presents a report on this data.
- It is recommended to use data visualization in the form of figures, tables, and charts.

Guidelines for preparing the section:

- try to present results clearly and concisely;
- not to give large amounts of data;
- reduce the data to statistically analyzable summary forms and present them in tables or graphs along with the necessary statistical information;
- do not repeat in the text the data presented in tables and figures;
- include only tables and figures that are necessary, understandable and should be reproduced;
- do not display the same data in tables and graphs at the same time.

3.8. Discussion

- The section summarizes the relationship between the findings and the answer to the questions posed in the Introduction.
- The section summarizes and shows the relationship between the results and conclusions.
- In the section, the authors justify their hypotheses.
- The section may include a theoretical justification of the findings.
- If there are deviations in the process of experimentation or doubts of the authors of the article, they are indicated here.
- The section indicates the consistency or discrepancy between the results of research published on the subject previously.
- In the section, you can emphasize the merits of your research and what could be improved in further research on the topic.
- This section demonstrates the significance of the work presented and its expected impact on the development of future research trajectories (can be included in the Conclusion section).
- Unfortunately, inconsistency between stated aims and discussion is a common problem in many manuscripts.

Guidelines for preparing the section:

- do not repeat what has already been said in the literature review;
- relate the results to the issues that were outlined in the Introduction;
- show whether the results and interpretations are consistent with current knowledge of the subject, i.e., previously published work;
- explain the theoretical background of the observed results;
- the significance of the results;
- suggest directions for future research;
- discuss only those results that were presented in the study;
- do not make generalizations or assumptions that are not justified by the findings;
- formulate conclusions with evidence for each conclusion.

3.9. Conclusion

- Summary of the analysis of the results of the study and perspectives.
- Should summarize the outcome of the study.
- The answers to each of the questions presented in the introduction should be noted.

3.10. Ethical clauses

The classic structure of this section usually included only an Acknowledgements section. This section thanked individuals and organizations that had supported the research in various ways. In addition, funding information was also provided in this section. Private or corporate investors or grant funds, laboratories that were used to conduct certain blocks of work, collaborators indirectly involved in this block of work and therefore not reflected in the section *Authors*, and technical specialists who assisted in conducting the measurements were mentioned. This section also reflected the genesis of the work, e.g., that the work was done as part of the dissertation.

Influenced by the COPE ethics committee [3], a more complex structure is now used for this section, and it is divided into several thematic subsections. For more information, see the related article [4].

3.11. References

- The formatting of the reference list should be done according to the style (in our journal we are trying to solve this issue with the help of automatic generation of bibliography).
- In the reference list, only those sources are listed that are referenced in the text of the article.
- For a scientific article usually use a minimum of 20 sources.
- If you cite information but do not provide a reference, it can be considered plagiarism.
- You can also link to sites with the date of visit (but do not abuse it).

3.12. Appendices

The section may also be called *Supplementary information*.

- The section provides details of the elements of the study for those who later wish to replicate the work.
- The section may include details of data processing, design of the experiment, and characterization of the equipment, objects, and materials used.
- The section provides any additional information that is relevant to the paper but of secondary importance.
- Appendices usually contain information that is necessary to fully explain and understand the results, but are too bulky and complex to be included in the main body of the paper.

4. Conclusion

The editors expect authors to adhere to the recommended structure of the article.

Author Contributions: The contributions of the authors are equal. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: No new data were created or analysed during this study. Data sharing is not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Wu, J. Improving the writing of research papers: IMRAD and beyond. *Landscape Ecology* **26,** 1345–1349. doi:10.1007/s10980-011-9674-3 (Nov. 2011).

2. Miller, G. A. The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review* **63,** 81–97. doi:10.1037/h0043158. eprint: 13310704 (Mar. 1956).
3. *COPE Council. COPE Discussion Document: Authorship* 2nd ed. doi:10.24318/cope.2019.3.3 (Sept. 2019).
4. Kulyabov, D. S. & Sevastianov, L. A. Author's ethics. *Discrete and Continuous Models and Applied Computational Science* **32,** 135–139. doi:10.22363/2658-4670-2024-32-2-135–139 (2024).

Information about the authors

Dmitry S. Kulyabov—Professor, Doctor of Sciences in Physics and Mathematics, Professor of Department of Probability Theory and Cyber Security of RUDN University; Senior Researcher of Laboratory of Information Technologies, Joint Institute for Nuclear Research (e-mail: kulyabov-ds@rudn.ru, phone: +7 (495) 952-02-50, ORCID: 0000-0002-0877-7063, ResearcherID: I-3183-2013, Scopus Author ID: 35194130800)

Leonid A. Sevastianov—Professor, Doctor of Sciences in Physics and Mathematics, Professor of Department of Computational Mathematics and Artificial Intelligence of RUDN University (e-mail: sevastianov-la@rudn.ru, phone: +7 (495) 955-07-83, ORCID: 0000-0002-1856-4643, ResearcherID: B-8497-2016, Scopus Author ID: 8783969400)

DOI: 10.22363/2658-4670-2024-32-4-355-361 EDN: EKXUGR

Структура IMRAD

Д. С. Кулябов[1, 2], Л. А. Севастьянов[1, 2]

[1] Российский университет дружбы народов, ул. Миклухо-Маклая, д. 6, Москва, 117198, Российская Федерация

[2] Объединённый институт ядерных исследований, ул. Жолио-Кюри, д. 6, Дубна, 141980, Российская Федерация

Аннотация. Описывается общая структура научной публикации IMRAD. Подробно описывается структура IMRAD для исследовательской статьи.

Ключевые слова: IMRAD, исследовательская статья