The IMRaD model: what is it and how can it be applied to articles in the humanities and social sciences?

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El modelo IMRyD de artículos científicos: ¿qué és y cómo se puede aplicar en humanidades y ciencias sociales?

ABSTRACT

The IMRaD acronym stands for the terms: Introduction, Methods, Results and Discussion. It is a proposed structure and also a standard expected by most academic journals when accepting manuscripts reporting research results. It is important for novice researchers to know its components, but above all to interpret its meaning in the human and social sciences as it can help them to be successful in manuscript acceptance. Its components are presented following the APA standards (among other sources) and the possibilities of application to fields other than STEM are discussed, as well as in the case of qualitative methodologies. It is concluded that nothing in the IMR&D model precludes its application to research in the humanities and social sciences. On the other hand, applying IMRaD improves quality transparency of research reports and increases the chances of the manuscript to be accepted by academic journals.

KEYWORDS

IMRaD; Scientific articles; Academic articles; APA; Academic journals; Scientific journals.

RESUMEN

El modelo IMRyD corresponde al acrónimo formado por los términos: Introducción, Métodos, Resultados y Discusión. Es una propuesta de estructura y es un estándar esperado por la mayoría de las revistas académicas a la hora de aceptar manuscritos que reportan resultados de investigación. Es importante para los investigadores noveles conocer sus componentes, pero sobre todo interpretar su significado en las ciencias humanas y sociales ya que puede ayudarles a tener éxito en la aceptación de manuscritos. Se presentan sus componentes siguiendo las normas APA (entre otras fuentes) y se discuten las posibilidades de aplicación a ámbitos distintos de las STEM, así como en el caso de metodologías cualitativas. Se concluye que nada en el modelo IMRyD impide su aplicación a investigaciones en humanidades y ciencias sociales. Por otro lado, aplicar IMRyD favorece la calidad y transparencia de los reportes de investigación e incrementa las posibilidades de aceptación de los manuscritos por parte de las revistas académicas.

PALABRAS CLAVE

IMRyD; Artículos científicos; Artículos académicos; APA; Revistas académicas; Revistas científicas.

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1. Introduction

The IMRaD model is a widely accepted standard in the scholarly communication ecosystem. Its purpose is to establish the structure and preferred components of the manuscripts that report research results. Therefore, it is the structure generally expected for scientific articles. The acronym owes its name to the following sections:

- Introduction
- Methods
- Results and Discussion

This work has two main principles: the first one, is to present the IMRaD model in some detail. The idea is that novice or predoctoral researchers (especially for those who do compendium theses) can produce manuscripts with a better chance of being accepted by academic journals.

I believe that those of us who are involved in committees or editorial bodies of scientific journals should contribute to improving, to the extent of our possibilities, the training in academic communication of new researchers.

The second principle is to answer the question in the title and argue that, although this structure arose from the so-called STEM (Science, Technology, Engineering and Mathematics), it can be applied without any problem to the so-called SHAPE (Social Science, Humanities and the Arts for People and the Economy). The reason is that IMRaD is independent of both the object of study and the applied methodology. Instead, it imposes a very healthy transparency to improve the overall quality of science communication.

2. Origin

According to Sollaci and Pereira (2004), the IMR&D model was imposed by decantation. It was progressively adopted without being a there appearing to be a clear founding moment or an undoubted author to whom its paternity could be attributed. In this sense, Sollaci and Pereira’s research records early uses in the 1940s but points out that it was between the 1970s and 1980s when it was imposed, mainly in physics and medical journals. The powerful influence of the latter is what drove its export to other disciplines.

In contrast, Wu (2011) citing another author (Robert A. Day) attributes the first use of this model to Louis Pasteur, which takes the origin to as early as 1876. However, he also states that IMR&D did not become widespread until the 1970s.

3. An article is a research reporting

Undoubtedly the reason for its success is the transparency it
imposes. Indeed, IMRaD can only be properly applied when an article is the report of an investigation. This is precisely how the APA style defines what a scientific article is. For this reason, before detailing the IMRaD sections, it is worth trying to understand what makes the manuscript that is sent to a journal really be a research report. Before going into the structure (which we will see later), we’ll see the three conditions that must be present in research:

- A process of taking or extracting data from a well-identified object of study.
- A well-defined methodological framework that has guided the entire process.
- Enough elements of transparency that allow the evaluation of the research and eventually its replication by other researchers.

As we will see later, journals publish works other than empirical research (e.g., this forum), and instead they can be conceptual or methodological contributions. But it’s important for novice authors to keep in mind that a journal is more likely to accept research articles than any other type. The reason is that all academic journals accept research papers, but not all of them accept papers of other types. In addition, the proportion of conceptual or theoretical articles is always lower and is usually reserved for authors with extensive experience in their field.

4. What IMRaD does not imply

What the IMRaD model does not require is that the methodology be quantitative, or that the research design be experimental or incorporate field work. Nor that the analysed data is numerical. Although all these mentioned variations rightly enjoy prestige, they are not the only ones that are acceptable in research articles, far from it. Science would suffer a radical and very dangerous impoverishment if it were limited in this way.

Luckily, qualitative methods are considered at least as valid as quantitative methods in most sciences. But especially in the humanities and social sciences and within these in social communication, they may be the best and even the only methods available to address certain realities.

More specifically, instead of experiments, research can be based on cases, and instead of fieldwork, we can use content analysis, or documentary analysis. In each context, these latter techniques are not only appropriate, but they are also possibly exactly the right ones to apply. That is why we say that there is no barrier, a priori, so that SHAPE can apply IMRaD with as much reason as STEM.

4.1. Variations of the IMRaD model

The usual way of presenting the model as we have done here should not lead us to believe that it should be applied with a hammer. Rather, there are several variations. A first variation

<table>
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<tr>
<th>Requirement</th>
<th>Explanation</th>
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<tr>
<td>Process of taking or extracting data</td>
<td>For a work to be considered research, it must incorporate some process of data collection or extraction. These must refer to a well-identified object of study, and with sufficient academic or social interest (or both). This, which is applicable to manuscripts that are sent to a journal for examination, can be extrapolated to other academic works, such as doctoral theses, when the regulations require that they be based on original research.</td>
</tr>
<tr>
<td>Methodological framework</td>
<td>The data, which will form the basis of the evidence for what is established in the results, must have been obtained following a well-defined procedure. Otherwise, it is impossible to decide on its relevance since there could be any kind of bias or absences or unjustified presences in the results. In addition, the data cannot be presented raw, but must be analysed in some way. For this reason, we also need a procedure that guarantees that all data has been analysed equally. All this: the justification of the object of the study, the way of extracting the data and the way of processing it is part of the method or the methodological framework.</td>
</tr>
<tr>
<td>Transparency</td>
<td>The manuscript that responds for all of the above must do the following criteria of traceability and transparency to meet these two objectives: first, that the reviewers of the journals can make judgments about their quality, something that is essential to the scientific method, where every contribution must be evaluated. Second, so that other researchers can replicate the research, either to advance in the same line or to detect gaps or points for improvement and, eventually, strengthen further research.</td>
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</table>

Table 1. Requirements for an academic work to be research.
is the following:

- **Introduction**
- **Materials and methods**
- **Results**
- **Discussion**

Indeed, in many articles the research can be better represented if, in addition to the methods, the materials used are explained. In this case, the expression materials should not lead us to imagine restrictive scenarios. This concept must be understood broadly, because investigations cannot be limited to any type of material; such a thing would simply go against science.

Examples of materials may be interviews, surveys, meeting memorandums, transcripts, press releases, images, films, photographs, web pages, or archival documents. The adequacy of the type of materials for the research is what the authors will have to argue, showing their relationship with the objectives, the research questions, the method and the results. It’s not easy, but it’s not hard.

We can still see another small variation in which a section called Design and Methods appears. In this case, the emphasis is on the way in which the research has been designed. So, IMRaD looks like this:

- **Introduction**
- **Design and Methods**
- **Results and Discussion**

As in the previous case, imagining restrictive scenarios that could exclude the Humanities or the Social Sciences makes no sense, as we are going to try to argue. Note that the expression design does not imply research with an experimental design. This is just one of countless possible designs.

Many investigations, in all or almost all scientific disciplines, are based on different experimental designs. Not even sciences like physics base all their investigations on experimental designs. Nor, far from it, a discipline like medicine, which is the one that sets the standards in academic communication.

The idea of naming the central component of IMRaD in this way implies that authors are expected to be as explicit as possible about the components that inform the design of their research, whatever it may be.

Note that the definitions of what a research article is do not include the notion of fieldwork. The reason is that while some investigations include field work, many others do not.

In communication, content analysis applied to news, for example, is very common. In historiography we work with archive documents; review papers use document banks as the evidence base, etc. As far as we know, in almost all disciplines there is research that does not need field work. Without going any further, in principle, experimental designs lack field work, unless the laboratory itself is understood by this.

Therefore, neither the original IMRaD model nor any of its variations rule out any kind of research as long as -we are going to repeat our mantra- it is based on data collection guided by a methodology.

Finally, we can ask ourselves where the conclusions lie. The truth is that these are not a requirement of the IMRaD model as we can see, and indeed, some journals, especially STEM ones, do not require them. On the other hand, in social sciences and humanities it is a practically mandatory component, whether the instructions for authors include it or not. Therefore, in these areas we must consider that the conclusions are part of the model.

### 5. IMRaD is a part of the article

The best way to understand all the above is to realize that IMRaD is limited to the main components of the manuscript without excluding others, from the most obvious, such as the title, the abstract or the authorship line (byline) to those required by the nature of each investigation, and therefore impossible to foresee.

As in this illustration, the following is the IMRaD version of Elsevier that shows what was pointed out in the previous paragraph about the need to understand this model as part of a broader structure:

![General structure of a research article](image)

*Figure 1. IMRaD structure of a scientific article. Source: Elsevier Researcher Academy.*
5.1. What contents correspond to each of the sections of the IMRaD model?

To present its components, we will follow in the main, although not only, the APA recommendations (7th edition) complemented by other sources, such as those cited in the reference (see Table 2).

The Journal Article Reporting Standards (JARS), on which we have based the previous table, are a very important contribution of the APA standards that in their latest edition (2020) present in detail the composition of the main categories of articles in scientific journals. They are a development of the IMRaD model in which the content of each section is expanded to offer detailed indications. (see Figure 2).

### 6. Estimated extension

In this parameter, the first thing to say is that the estimated length of each section will be conditioned by the standards of each journal. Now, if we want to indicate a typical extension in social sciences and humanities, we can mention the range of 6,000-10,000 words.

Also, as a rule, we can point out that the Methods, Results and Discussion sections will constitute the main part of the

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<th>Section</th>
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<tr>
<td><strong>Introduction (</strong>)**</td>
<td>Presentation of the purpose and objectives of the work, the object of study and the framework of the research problem, including theoretical or practical implications. Justification of the importance and timeliness of the research and possible gaps it covers. Critical review of academic background (previous research). Presentation of the hypotheses or research questions. Terminological clarifications if applicable.</td>
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<tr>
<td><strong>Theoretical framework</strong></td>
<td>Detailed presentation of the theoretical or conceptual framework or the state of the matter, if applicable. Part or all of this section could be part of the Introduction (see previous section) or it can be located in a specific section. It may be necessary if you need to address the mainstream presentation in detail according to the research problem addressed, as well as to point out its possible deficiencies or research gaps. This is a section that may be required by the type of research or by the editorial policies of the journals in the field considered. Review works (with traditional or systematic methodology) will be helpful in these cases.</td>
</tr>
<tr>
<td><strong>Methods (variations: Materials and methods / Design and methods) (</strong>)**</td>
<td>Global explanation of the design of data collection or extraction. Explanation of the methods used both to obtain and analyse the data or information, documents, etc., that constitute the basis of the evidence. Explanation of the sampling procedure when applicable (quantitative or qualitative methods), or of the selection and construction of the case and its significance when appropriate (qualitative methods). Details of the instruments or analysis protocol. Any additional aspect on the materials and methods according to the type of qualitative, quantitative or mixed research that is required to guarantee the generalization or transferability of the results.</td>
</tr>
<tr>
<td><strong>Results (</strong>)**</td>
<td>Presentation of the results obtained using various formats: tabular, statistical, graphic, and narrative, always prioritizing the most effective forms of synthesis. Description of the nature of the different results obtained. The complete data or datasets must be made available to the evaluators, and once the article is published, they must be available in open repositories and linked from the article.</td>
</tr>
<tr>
<td><strong>Discussion (</strong>)**</td>
<td>Reasoning of the central contribution of the work and its significance for the advancement of the discipline. Description of the different contributions achieved by the results. Identification of similarities and differences with other studies, if applicable. Review of the support for the hypotheses, if applicable. Review of the answers to the research questions, if any. Reasoning about its generalization (quantitative methods) or its transferability (qualitative methods). Strategic scope of results. Study limitations. Possible future research.</td>
</tr>
<tr>
<td><strong>Conclusions</strong></td>
<td>This section is not normative, neither in the IMRaD model nor in the APA. However, most journals (and reviewers) already expect it, so it is highly recommended to consider it. In any case, most journals in the social sciences and humanities consider it one of the determining criteria for the quality of a work.</td>
</tr>
</tbody>
</table>

It can consist in checking the objectives and of the research questions with a concrete synthesis of each result (if it was not done in the discussion). It can consist of a list of recommendations according to the type of work. It can also consist of a type of executive summary, with an assertive record where the main significance provided by the research is highlighted. Sometimes, it is requested that it be presented in a structured way, through numbered lists or specific sections of well-differentiated items.

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Table 2. Guidance on the contents of the different sections of the IMRaD model. Own elaboration based on APA (2020) and other sources (see References). * Mandatory parts.
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1. Use of tables and diagrams

The tables and diagrams are not part of the canonical model, not because I forbid it, but because IMRaD does not go into this kind of detail. We have already warned that the IMRaD model is not the complete description of a scientific article.

Tables and diagrams must always be present, because they are privileged forms of synthesis of results (Miles et al., 2014). However, due to a poor understanding of the nature of information visualization, some journals in the field of Humanities and Social Sciences are reluctant about its use. It’s absurd, but then again, it is what it is.

Instead, the most rational recommendation is to use both tables and diagrams in a reasonable way. Another thing is that magazines have a harder time editing manuscripts with images. But this should not lead to turning a practical, low-level problem into the ontological recommendation that some journals make against the use of diagrams and tables.

The use of tables and diagrams are the best demonstration of quality work. The reason is that they are an advanced way of demonstrating consistency and even intellectual honesty in an intellectual type of work. Note that in the Elsevier model, a typical article is expected to have between 6 and 8 figures and between 1 and 3 tables.

What doesn’t make sense are the decorative images. Information visualization experts often invoke the famous principle, due to Tufte, that in a visualization, the ink:data ratio should be equal to or as close to 1 as possible.

8. Do all academic articles have to follow the IMRaD structure?

The short answer is no. First, academic journals publish articles that respond to more than one academic genre, and research articles are only one of them. Some journals only accept research articles, but many accept other kinds as well. For example, the APA standards (which reflect the habits of...
psychology journals and with them those of social sciences) consider that in addition to scientific articles, there are at least theoretical or conceptual and methodological ones. But there are still others, no matter how little we consult the editorial policy section of each magazine.

On the other hand, it would be unreasonable to deny the possibility that a research article may have a different structure. We can’t make sure if in certain occasions the best presentation of an investigation needs another structure. Now, although it should not be mandatory under all circumstances, it can be said that, since its use is as effective as it is practical, to stop applying it, it is worth having some explicit reason against it.

In this section, we cannot fail to mention the golden rule that says that authors have the obligation to review and follow the instructions of the journal to which they plan to send their article. Any deficiency in the adoption of these indications may be cause for a more than justified editorial rejection.

The author is not likely to find journals that, for example, reject the use of IMRaD (rather the opposite), so all or most of what we have seen here will work for him in any journal. But nothing exempts us from carefully reviewing the recommendations of the magazine to which we want to apply. First, because there may be some change, e.g., some section that we have not considered here, and second and more important, because some magazines detail the contents of each section and in this case, they are the ones that we have to follow.

9. Conclusions

We have reviewed the characteristics of the IMRaD model, its components, and the main contents of each of them, as well as we have considered some specific examples. We have considered the types of articles published by academic-scientific journals, in order to place research articles in their broader context.

Additionally, we have presented the idea of research > report scheme that can be useful to develop manuscripts destined for scientific journals with many more guarantees of success. The point is that the research > report scheme, together with the IMRaD model, provide elements of success for researchers in any field of knowledge, if they are willing to carry out the tasks that these two models imply.

Likewise, and thanks to the JARS, from APA, among other sources, we have also been able to present guidelines on the possible components of each of the elements of the IMRaD model.

One of the motivations of this article is to argue that IMRaD does not impose any kind of research, neither quantitative nor experimental. The only thing it imposes is that the research must be traceable and evaluable and must have some data extraction and analysis procedure at its core. But it says nothing about how these data should be. They can be images, interviews, press releases, photographic reports, sound recordings or videos, results of participant observation, field or ethnographic studies, etc.

In addition, we have argued in favour of the systematic and reasonable use of information visualization elements, such as tables and diagrams, to complete the quality of the presentation of results in a scientific article.

Carrying out original research with academic or social value (or both) and then publishing the result in indexed journals is something that is within the reach of any author, or team of authors, in all academic fields: no field or humanities neither of the social sciences is left out of this. What nobody says is that such a thing can be carried out effortlessly. There is no need to. On the opposite, the only thing that the presented models guarantee is that they do work. It’s not like when someone wants to be a rock star, which requires talent, but above all luck. Here, it’s all about working hard and honestly. Nothing else, but nothing less.

Note

A preliminary version of this article was published in Spanish on the author’s website (https://www.lluiscodina.com/IMRaD-model/). For this Tribune, each one of the sections has been reviewed, several of them have been eliminated and new ones have been added. The bibliography has also been revised and completed.

References


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CV

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