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The logic of the research article

A critical guide on reading science more effectively

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HOOFDSTUK 6.4: THE LOGIC OF THE RESEARCH ARTICLE: A CRITICAL GUIDE ON READING SCIENCE MORE EFFECTIVELY

PAUL W CHAN

ABSTRACT

Reading scientific papers is an integral part of any university degree programme. Yet, academic writing is a specific communication genre that can be quite daunting for the uninitiated student and novice researcher. The purpose of this chapter is to explain the typical logic of the scientific article. Notwithstanding a variety of disciplinary conventions, there are specific moves that characterise the different parts of a paper. These moves include making an argument for the research question (what and why), describing the research methods (how), reporting on the research findings (what), and developing the argument for future research and practice (so what). By elaborating on the different moves, this chapter provides a model for the process of reading scientific papers and to situate a scientific article in the broader context of scientific conversations and debates. In so doing, students should be able to read science more effectively.

KEYWORDS

process reading, rhetorical moves, scientific conversations.

INTRODUCTION

How can we design spaces that promote better learning outcomes in schools? What spatial configurations work best for patients with dementia? What colour schemes are most effective in boosting workplace productivity? How can we design indoor environments that contribute to infection control? How can public spaces be designed to enhance social cohesion? What contributions can architecture make to create and preserve cultural heritage value?

The craft of architecture has long been recognised as a creative art form. Architects engage with the local context and the needs and problems of the client or community to produce designs that delight. Often, such engagements are subjective, building on the intuitive and tacit knowledge that is built up through experience over time. Yet, over the past few decades, there has been a growing movement for architecture to engage more with scientific research. Wallén (1986), for example, wrote about the scientification of architecture. He explained how turning the production of the built environment from a craft form to a more industrialised, systems-building process has led to increasing technification where systems planning and scientific rationality became more prominent in architecture. Schrijver (2014) also observed how scientific research not only supports architects in finding answers to broader societal questions (some examples raised above), but also provides the means to capture and articulate the tacit dimensions of the craft of architectural design. In so doing, architectural knowledge can benefit from both “the state of the art and current scientific insights, yet also founded on longstanding historical and cultural particularities” (Schrijver, 2014: 81).

In the era of the digital revolution where data is the central resource that can support and augment the design of the built environment, it would appear that understanding science and its relationship to architectural design is ever more vital. However, science does not simply occupy the realm of objective facts. As Latour and Woolgar (1986) argued, there is a social life in the scientific laboratory. By observing, anthropologically, the daily lives of working scientists they found that, far from being the guardians of objective facts, scientific work is also a result of subjective struggles:

“that a body of practices widely regarded by outsiders as well organised, logical, and coherent [is] in fact consists of a disordered array of observations with

which scientists struggle to produce order. [...] scientists and observers are routinely confronted by a seething mass of alternative interpretations. Despite participants' well-ordered reconstructions and rationalisations, actual practice entails the confrontation and negotiation of utter confusion" (Latour and Woolgar, 1986: 36)

A clear example of this 'negotiation of utter confusion' can be found in the scientific response to the Covid-19 crisis in 2020. The production of scientific knowledge is an evolving process. At the time of writing this chapter, Google Scholar registered nearly 1,3 million research outputs on Covid-19, representing a significant part of the huge scientific effort to understand and deal with the new coronavirus. Far from being the stable ground of objective scientific facts, scientists spend a lot of time arguing with other scientists. Theories, assumptions, data sources, approaches to analysing and coding the data, and conclusions are all debated and questioned, resulting in some scientific knowledge being refuted while others are regarded as credible.

It is this shaky ground of scientific work that forms the basis of this chapter, which seeks to offer a critical guide for reading (and hopefully understanding) scientific articles more effectively. In what follows, the typical logic of the research article will be explained through rhetorical moves that are found across the different parts of the article. It is through these rhetorical moves that researchers situate their studies in the wider context of scientific work in their chosen domain or topic area. Such contextualisation represents the process of scientific researchers engaging in conversation with other scientists. This conversational process signifies the space in which scientific researchers negotiate what ways of thinking, assumptions and approaches are acceptable or not. (See [chapter 2](#) as well.)

SPOTTING THE RHETORICAL MOVES IN THE RESEARCH ARTICLE

For many undergraduate students, reading scientific articles can seem like an uphill struggle as they try to make sense of the dense text often associated with academic writing. For a novice, reading an article that is usually between 5.000 to 8.000 words in length (and at times, even stretching to 12.000 words) for the first time can be very daunting and time-consuming. Many are likely to take copious amounts of notes as they try to read and understand what is being conveyed in the article, and it is likely that these notes add to more confusion than clarity. For

the expedient reader, there is the tendency to gloss over the details in the article and jump straight to the conclusions. After all, for many students, it is not until they embark on the research thesis project that they start to take scientific articles more seriously. For many, up to this point, the purpose of reading articles is very likely to find the answers to questions set by their tutors in the assignments.

In this section, a typical model of the research article will be explained with a view to persuade you that ‘jumping to conclusions’ is not a very wise approach. It is important to understand the functions of the different parts of the article so that you can better appreciate how the article you are reading is connected to a wider conversation or debate about a particular topic area. In this section, we will go through what each of the different parts of the article does so that you not only understand what you are reading but also why you are reading this seemingly dense text. The typical model of the research article is shown in figure 6.4.1.

Preamble: The research article often begins with some preliminary information identified in three blocks of text that appears before the main body of the article. This includes the title of the paper, the authors and their affiliations, and the abstract and keywords. The title should convey succinctly important information about the content, intent (purpose) and scope of the paper. A good title should maximise the use of keywords since this is usually the text that many readers first come across when searching for relevant articles to read. The author(s) line is also an important piece of information. For a scientific research article to be accepted for publication after peer-review, this means that the author(s) of the article has credibility. For a reader who knows the field of study, information about the authors can provide an indication of the kind of argument that is likely to be found in the paper. The abstract is then a short summary that typically highlights the aim, method and key finding of the study.

Main body: As shown in Figure 6.4.1, the logic of the main body of the research article follows the shape of an hourglass. In general, there are three main parts in the article. The first part relates to the top-half of the hourglass (or the front-end) and this usually contains the introduction and review of previous studies. In the middle, the focus is on the study that the authors have done and are reporting. This middle-part usually contains the method and findings. In the third part, i.e. the bottom-half of the hourglass (or the back-end), the paper closes with the discussion and conclusions aimed at exploring the broader implications of the research.

Thus, the research article usually starts more broadly in general terms before moving to a more narrow focus – that is, the specific focus of the study being reported in the paper. The paper then moves from the specific findings of the study to more general implications in the back-end of the article. Therefore, if you wish to find out what the paper is about, jumping to the conclusions will mean that you miss all the details about the study reported in the paper.

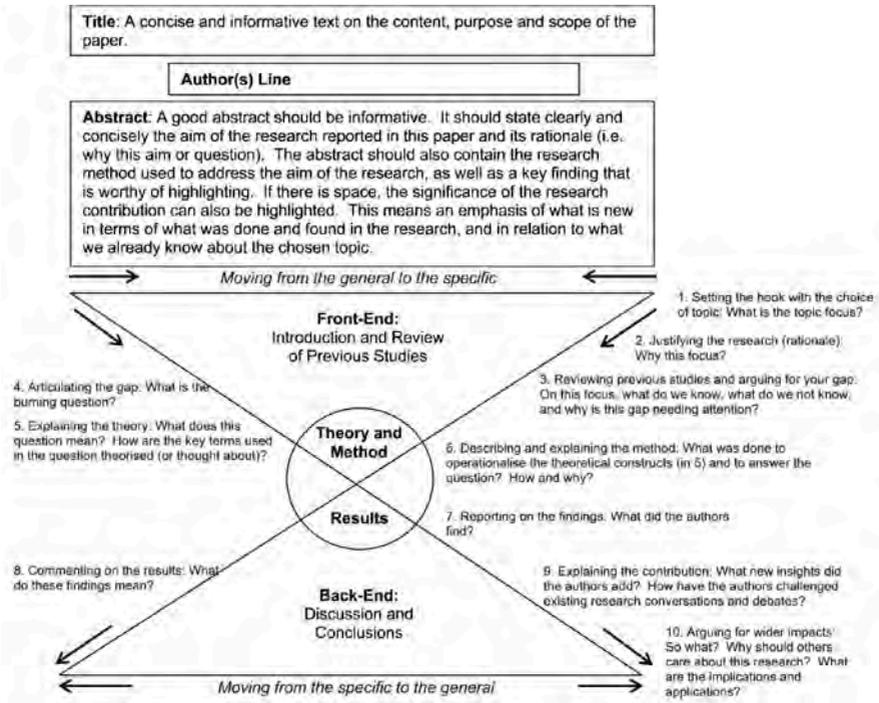


Figure 6.4.1. Typical model of a scientific research article.

We will now examine each rhetorical move in turn, using an example article entitled ‘Trade-offs in the value capture of architectural firms: the significance of professional value’ by Bos-de Vos, Wamelink and Volker (2016) to illustrate each move. The example article can be found on doi.org/10.1080/01446193.2016.1177192.

RHETORICAL MOVES IN THE FRONT-END

1. Setting the hook (what): It is important for authors of research articles to hook the readers’ interest early on in the paper. In part,

this is because we are living in an information-rich but time-poor era, and readers need to figure very quickly whether to invest time in reading further. Therefore, it is typical to find a general problem statement early on in the paper signified by words such as ‘recently’ (to indicate the contemporaneous nature of the problem) or ‘In the Netherlands’ (to indicate a spatial marker to show the specific geographical character of the problem). It is also quite common to find authors begin by saying that this problem is of growing concern, or that there is growing interest in this particular topic area. This move is to create urgency and relevance of the general topic area. For example, Bos-de Vos et al. (2016) began their paper with: “The economic recession and the substantial market changes in the last few years have forced organizations to reassess the ways in which they create and capture value” (p. 21). They then went on to add that “Fuelled by the ongoing changes, both professionalism and the way that professionals are perceived are evolving (Hughes and Hughes, 2013). The architecture profession has even become subjected to potential erosion (Cohen et al., 2005)” (ibid.). Through these statements, the reader can quickly see that the topic focus is on the (architecture) profession and the value it brings. Furthermore, the authors indicate urgency by pointing to the changes ‘in the last few years’, adding further credibility by citing recent authoritative references like Hughes and Hughes (2013).

2. Justifying the research (why): Once the topic focus has been established, authors commonly explain why it is important to pursue research in this area. This reasoning is known as the research rationale. This rationale further persuades the reader that the paper has strong relevance, theoretically and/or practically and/or in terms of policy. In Bos-de Vos et al. (2016), this justification relates to the ‘substantial market changes’ in recent times, which ‘have forced organizations to reassess’ how they create value.
3. Reviewing previous research (what and why): Now that the topic focus and the reason for this focus have been established, a significant part of the research article is the review of previous research. This is a very important part of the article. Academic researchers are always motivated by making significantly original discoveries. Therefore, in order to convince the reader that what they have found is really novel, authors must persuade the readers that they are knowledgeable about what has already been done and

known about a particular topic area. Therefore, this is the part of the article where citations of references are critical. A review is also not just a summary of everything that has been published on a particular topic. Take the example of Covid-19, it is clearly impossible for anyone to read all 1,3 million outputs on Google Scholar. Therefore, it is important that the authors are selective about what they include and exclude from the review, so that they cite the most important sources that is sufficiently adequate to convince the reader that they have engaged with the key writings.

4. Articulating the gap (what and why): To reiterate, the review is not just a summary. It is an argument so that the authors can convince the reader that what they are doing in this study has not been done (adequately) before by other researchers. This is the so-called knowledge gap. Typically, this gap is signified by the clue-word 'However'. Put another way, by using the word 'However', the authors can indicate the start of a counter-point to the points made by previous researchers. Using words like 'However' strategically can really help the authors emphasise what is lacking in previous studies. Nevertheless, this is not the only way to indicate the gap. In Bos-de Vos et al. (2016), for instance, they indicated the gap by pointing out that our current understanding can still be improved: "To better understand why architectural firms experience difficulties making profit, more information is needed about how these firms actually capture value for organizational purposes" (p. 22). Here, the call for a 'better' understanding indicates the gap they are trying to fulfil in their article. Since Bos-de Vos et al. (2016) were interested in better understanding value capture, they then cited a reference to say that other researchers have considered use value and exchange value. They then added: "we propose a third dimension of value, namely professional value" (ibid.). Therefore, the knowledge gap is two-fold. First, Bos-de Vos et al. (2016) argued that we need to know how architectural firms create and capture value. Second, they add to what we already know about value by adding a third dimension, professional value (keywords that are also emphasised in the title).
5. Explaining the theory (what): Theory is often daunting to students. To put simply, theory is basically the way we think about things. So, in Bos-de Vos et al. (2016), the main concept is value. Therefore, on p. 22, they included a section entitled 'The concepts of organizational value, value creation and value capture' to explain

the main concepts that they will be investigating in their study of professional value in architectural firms. Both the review of previous studies and the explanation of theory contain citations of references. However, whereas the purpose of the review of previous studies is to make an argument for the knowledge gap, the purpose of the theory section is to explain the key concepts in the research question.

6. Describing and explaining the method (how and why): Once the research question is explained, the authors then describe what was done to answer the question and explain why they did what they did. So, in Bos-de Vos et al. (2016), the readers are informed that “Twenty semi-structured interviews from nine cases of collaborating architects and clients were used to analyse what values architectural firms aimed to capture” (p. 24). They then elaborated on what questions were asked during the interviews, more detailed characteristics of the interviewees, and how they went about analysing the data.
7. Reporting on the findings (what): This is the part of the article that often does not contain citations of references. This is because the findings section is simply a reporting of what was found by the authors. In the case of Bos-de Vos et al. (2016), they categorised the findings into the ‘Content’ (p. 25) and ‘Process’ (p. 27) of value creation and capture.
8. Commenting on the results (what and why): While the findings section simply reports on what was found – in Bos-de Vos’ et al. (2016) case, interviews with 20 participants – the back-end of the article now broadens the discussion of these results. Typically, authors start by commenting on what is significant about the results. In the example of Bos-de Vos et al. (2016), they identified trade-offs as a significant point in their study of professional values.
9. Explaining the contribution (what and why): It is important for academic researchers to emphasise how they have added to what we already know about the topic area. Therefore, it is typical to find citations of references in the discussion of results so that the authors can explain how the findings agree and more crucially, disagree with previous research. In Bos-de Vos et al. (2016), this can be seen in the citations of other researchers on p. 31. Citations of references are also an indication of engaging with the academic

conversation and debate.

10. Arguing for wider impacts (so what): Arguably, every research article will conclude with the need for further work. In Bos-de Vos et al. (2016), this is also the case when they wrote in the conclusions that: “future business models for architectural firms need to facilitate non-conflicting strategies for the creation and capture of different value dimensions” (p. 32). This conclusion is therefore not a statement of fact per se, but an argument for what needs to be done after the study. Thus, it is more of a recommendation than a conclusive answer. This is why the typical model is in the shape of an hourglass, because the front-end and back-end of the paper are really arguments rather than summaries. It is also why it is not wise to jump to conclusions if you really want to know more about the study reported in the article.

KEY TAKEAWAYS

To conclude, here are some key points for reflection:

- The profession of architecture is increasingly required to engage with scientific research, particularly given the movement of evidence-based design.
- Scientific knowledge is uncertain and always evolving.
- Research articles form part of a chain of academic conversation and debate.
- The article is typically split into three parts: the front-end, method and findings of the study, and the back-end.
- The academic conversations can be found in the front-end and back-end, where the authors argue for the need for this study (front-end), and for the contribution made and future research (back-end).
- There are a number of rhetorical moves:
 - The introduction and review of previous research is to make an argument for the study (i.e. what is the knowledge gap) and why this is so important (i.e. the research rationale).
 - The method describes how the authors answered the question and explains why they did what they did.

- The findings reports on what discoveries were made.
- The discussion and conclusions then makes an argument for what contributions were made, and the implications for future work (i.e. so what).

BRONNEN

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HOOFDSTUK 7: RAPPORTEREN/COMMUNICEREN

DE REDACTIE

Na de uitvoering van het onderzoek, het werkelijke “veld” werk soms, wil je de resultaten van je onderzoek delen. Je zult moeten rapporteren. In aanvulling op het [hoofdstuk 6.4](#) over het lezen van een wetenschappelijke tekst, gaat [hoofdstuk 7.1](#) in op het schrijven van een wetenschappelijke tekst. In bouwkunde gaan tekst en beeld vaak hand in hand, die relatie staat centraal in [hoofdstuk 7.2](#). De tekeningen en modellen zelf, zijn daarna het onderwerp: [hoofdstuk 7.3](#) behandelt wat de beelden laten zien en welke rol ze hebben in een ontwerp/onderzoeksproces. Ten laatste, je zult ook in gelegenheden komen dat je je werk mondeling moet presenteren. Enkele elementen, als de beelden, retorische bewegingen, komen weer aan de orde in [hoofdstuk 7.4](#), maar nu in de context van een presentatie.