

AN ATOMIC STRUCTURE MODEL (ASM) FOR EVALUATING ENGLISH-LANGUAGE SCIENTIFIC JOURNALS PUBLISHED IN NON-ENGLISH COUNTRIES

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ABSTRACT. *Although it is known that English-language scientific journals published in non-English countries are an important channel for academic exchange, the lack of a suitable evaluation tool for these journals has become an obstacle for their development and may even impact their survival. Taking this into consideration, the Atomic Structure Model (ASM) was designed to evaluate these journals. Global principle, vitality, distinguishing qualities are core values, and faith level of a journal is defined as the core in the ASM; various agents (editors, authors, and readers) are distributed in three shells around the core, and each agent's distance to the core increases as the relationship weakens. The role of an agent can change like an electron, which can jump from one shell to another: for example, a reader of a journal can become an author when he or she submits a manuscript. Using the ASM, 17 indicators were defined, and a sample consisting of 18 journals was tested. This evaluation approach and indicators could be applied to English-language journals published in non-English countries. Furthermore, the ASM is appropriate for evaluating any scientific journals because they all share the common essential elements of core value, editors, authors, and readers.*

Keywords: Atomic Structure Model (ASM), English-language scientific journals, Evaluation

1. Introduction. English-language scientific journals published in non-English countries account for only a small fraction of all scientific journals published in the country, but they play an important role in connecting non-English scientists with their peers around the world and in improving international collaboration. For example, in China, although over 5000 scientific journals are published, ranking it second after the United States in terms of number of journal titles published, its English-language journals amount to only about 4% of the whole [1]. English is the most widely used language in almost all fields of science, technology, and current international economic and social affairs, and there is a tendency to accept English as an official international language. Most scientific journals, especially the most outstanding ones, are published in English [2]. It is obvious that international scientific communications and publications follow the existing trend, so scientific journals published in English have become the major channel for international exchange and cooperation. More than 100,000 papers by Chinese scientists are indexed annually in Science Citation Index Expanded (SCIE), and 14% of these papers appeared in English-language scientific journals published in China [3].

China aims to become a substantive member of the world scientific community, so it has become important to make those few Chinese journals published in English better and more attractive to international scientists as a place for publishing their academic findings. The same challenge is probably faced by other countries where English is not an official language.

In general, evaluating something is a good step toward improving it because the grade or marks accorded as part of a logical evaluation process and related systematic indicators denote the advantages and disadvantages as well as the strengths and weaknesses of the matter under evaluation in a significant, precise, and all-encompassing manner. In other words, evaluation is akin to the role of diagnosis, upon which prescription and amelioration are founded.

English-language journals published in non-English countries have distinct characteristics which result in a lack of an accurate and suitable evaluation model and indicator system. These English-language journals focus on international readers and authors, which is why their sponsors and editors made the decision to operate them in a country where English is not an official language. In China, international journals usually acquire more citations than domestic ones [4], so it is understandable that English-language journals do not attract many domestic authors and readers, who pay more attention to Chinese-language journals and articles for their convenience and availability. Some evaluation models or systems have been established for journals published in China, and English-language journals always obtain lower scores than most Chinese journals [5]. Most English-language journals deal with peripheral fields, according to the Mutual Citation Network, which groups journals by subject areas [6], but it may not reflect the real academic level and impact of these English-language journals.

Most English-language scientific journals published in China are very new and have limited circulation, so they have not got strong impact on the world scientific community. China's first English-language scientific journal, established in 1887, was entitled *China Medical Missionary Journal*. However, before 1980s, during about 100 years, almost no similar English-language journals appeared by a survey of Xu [7]. Figure 1 shows the number of English-language scientific journals published in China per decade, it is evident that the great majority have appeared in the last three decades, and more than a quarter of them emerged after 2000. These journals are so new that it is not appropriate to evaluate them with the same standards that can be applied to other older Chinese-language journals.

More than half of the China's English-language journals are not indexed by SCIE that means they do not have the impact factor of Institute for Scientific Information (ISI) or other indicators calculated by ISI – Journal Citation Reports (JCR). Those are the

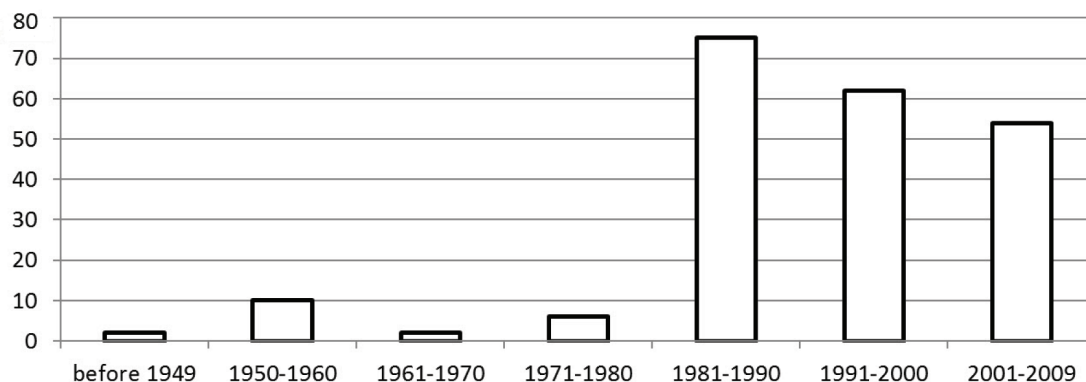


FIGURE 1. The number of English-language journals published in China that appeared per decade

most popular international indices for scientific journals [8]. Hence, neither the existing domestic evaluation system nor the international one is appropriate for China's English-language journals.

It is possible that some of these journals may fall into a vicious cycle in the future if the current evaluation models continue to be adopted, because less influence leads to a lower evaluation score, a lower score leads to fewer submissions, and fewer submissions lead to less academic value and poorer impact of the journal. To solve this problem, a new model that resembles the structure of an atom has been designed as follows to evaluate China's English-language scientific journals.

2. Atomic Structure Model.

2.1. Characteristics of the model. John Dalton, a British chemist and physicist in the 1800s, put forward the atomic theory. In the following years, J. J. Thomson, Jean-Baptiste Perrin, Hantaro Nagaoka, Niels Bohr, Ernest Rutherford et al. conducted extremely fruitful research in developing this theory and producing the universally acknowledged atomic model. As devised by Bohr and Rutherford, the atomic model is a structure that consists of various shells around the nucleus.

2.2. Use of the ASM in communication. Yuan applied the ASM in his study of an online communication model. According to it, the core of the model is human, which actively push information [9]. Information subject distributed the information into three shell layers and each shell has different effects to communication, environment of Web sites and human behavior. At the same time, there are complex interactions among all elements in this model to maintain the balance of the system.

Scientific journals can be regarded as a branch of communication. Therefore, the ASM should be useful in evaluating scientific journals.

2.3. Use of the ASM in evaluating China's English-language scientific journals.

In this study, the Atomic Structure Model (ASM) can be represented by Figure 2. Three shells surround the nucleus, and the relationship (degree of interaction) between the shells and the nucleus gradually recedes with distance. The five characteristics of the ASM are as follows: (a) there is only one nucleus in the system; (b) three shells are located around the nucleus; (c) each shell has a spherical surface; (d) both shell-nucleus and shell-shell interactions occur; (e) the electrons on the three shells orbit around the nucleus.

China's English-language scientific journals have some characteristics that match those of the ASM. The essential element that decides a journal's academic quality is its core value. The core value is signified by the core (C). Around the core value, there are three classes of individuals located in order of decreasing relationship with the journal: they are somewhat similar to the electrons orbiting in three shells around the nucleus. As Figure

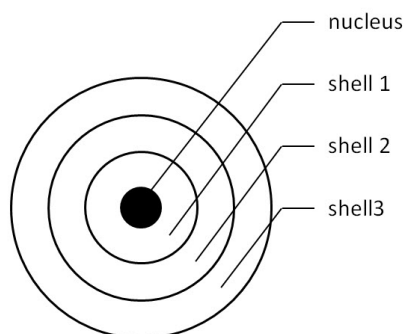


FIGURE 2. The Atomic Structure Model (ASM)

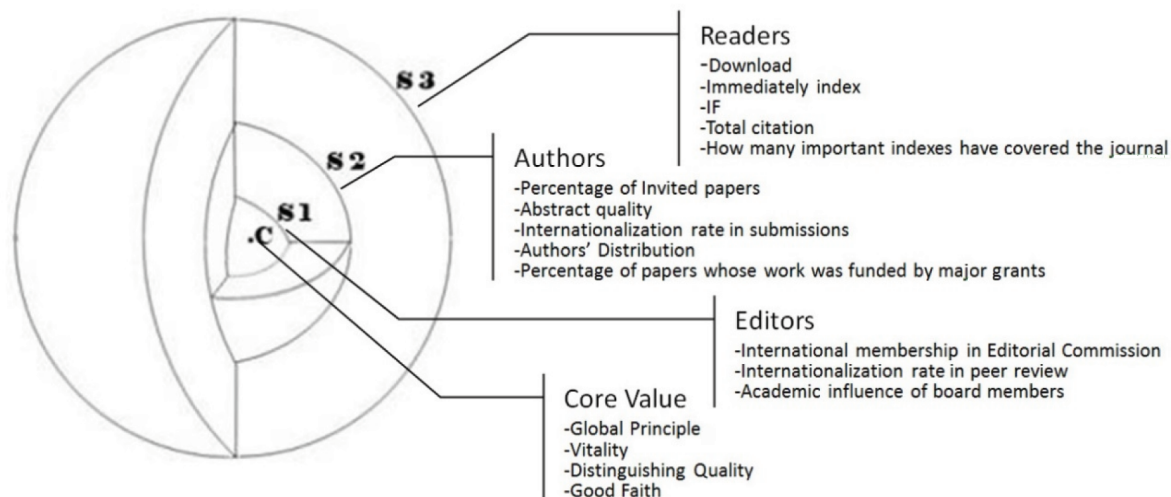


FIGURE 3. The Atomic Structure Model (ASM) and indicators for evaluating China's English-language scientific journals

3 shows, the three groups are the editors, the authors, and the readers; they appear, respectively, as Shell 1 (S1), Shell 2 (S2), and Shell 3 (S3) in that figure.

Editors, including technical editors, associate editors, and the members of editorial board, are the closest ones to the journal's core, so they are located in the S1 shell. The principles that they are following decide whether a journal can be outstanding, such as evaluating the quality of submissions and the paper's English level. China's English-language journals are similar to journals published overseas and are thought different from other domestic journals. Therefore, the editors of English-language journals should have a global view and the capability for international exchange and collaboration that should be examined in the evaluation.

The S2 shell consists of the authors who submit to the journal. Clearly, most parts of a scientific journal are academic articles which come from a large number of authors. There is no close relationship if they submit only one or two times a year to the journal. The ability to attract international authors is a positive attribute for international journals [10]. Therefore, it is necessary that the evaluation indicators reflect the quality of the authors and articles.

The most distant is S3, the readers. Readers normally have a loose relationship with the journal's core, and the direct communication between them is a one-way street. The readers study the journal's quality through identifying and assessing its academic effect that is an indirect method. Consequently, the following questions related to citation analysis have to be answered to evaluate the response from readers to the journal in S3: how many readers download papers of the journal, and what are the journal's citation indicators, such as impact factor and total number of citations?

Interaction between the shells and the nucleus likes that of various shells. A journal with a strong core value usually invests more resources, including human resources and financial support, so the editors can be more effective in soliciting higher-quality submissions and in turn bring in more readers and citations. It is similar to that of an electron's transition between shells in the ASM, so the status of shells related to the journal changes according to the shell: a reader may become an author, and an author may become an editor. There will be a good deal of transition from S3 to S2 and from S2 to S1 during the developing of most quality journals, with more readers submitting and more editors being required.

Conversely, a plain journal will not attract former authors and the number of readers will dwindle too.

Based on the ASM for evaluating English-language scientific journals published in China, a series of tentative indicators was developed after dozens of information scientists and academic journal editors brainstormed the issue. Some of these tentative indicators were discarded owing to limited data availability or overlap with other indicators. Thus, 17 indicators were finally established for this evaluation model (Table 1).

TABLE 1. ASM indicators for evaluating English-language scientific journals published in China

<i>ASM</i>	<i>Core Value</i>	<i>Editors Shell 1</i>	<i>Authors Shell 2</i>	<i>Readers Shell 3</i>
Indicators	<ul style="list-style-type: none"> • Global Principle • Vitality • Distinguishing Quality • Good Faith 	<ul style="list-style-type: none"> • International membership in Editorial Commission* • Internationalization rate in peer review* • Academic influence of board members* 	<ul style="list-style-type: none"> • Percentage of Invited papers* • Abstract quality • Internationalization rate in submissions* • Authors' Distribution* • Percentage of papers whose work was funded by major grants* 	<ul style="list-style-type: none"> • Download times according to databases on line* • Impact Factor* • Immediately index* • Total citations* • How many important international indexes have covered the journal*

Note: * means quantitative indicator.

3. Results. To test the practicability of the ASM for evaluating China's English-language scientific journals, we selected 18 such journals as our sample, as listed in Table 2. First, we calculated the quantitative indicators for these journals (indicated by asterisks in Table 1), and print journals' copy for evaluation. Then, we invited a group of 3-5 reviewers, including scientists in the field of the journal and senior editors to make a conclusion according to the ASM indicator system. Each journal's core and three shells were rated as A (excellent), B (good), C (fair), or D (poor) by quantitative and qualitative analysis. For example, Journal of Computational Mathematics was rated as A in the S1 shell, which means that editorially this journal is strong according to the indicators listed in Table 1. Although the journal can boast an excellent performance, it scored only C in S2 and S3 shells, which means the editors are unable to attract top authors and expand the readership. The operators or editor-in-chief of this journal should perhaps consider this situation and take steps accordingly. Another example is the journal titled Chinese Physics C, which scored D in S1 and S2 shells. It means that the combined power of its editors and contributing authors is very weak. Therefore, from this result, the journal needs to make great efforts to bolster the capacity of its editors so as to attract better authors and improve the quality of submissions.

4. Conclusion. The primary innovation in this study was the applying of the ASM to evaluate China's English-language scientific journals. Not only indicators but also the layers of indicators in addition to the relationship and transitions between indicators and layers were considered by means of the ASM, which is a concept that has been adapted from the field of communications.

Another original feature of this study was to consider the interactions among the shells in the ASM: these signify the individuals working for or related to a scientific journal. The changes in a journal's editors, authors, and readers could reflect its stage of development

TABLE 2. Evaluation of 18 English-language scientific journals published in China

<i>Title</i>	<i>Core</i>	<i>S1 Shell</i>	<i>S2 Shell</i>	<i>S3 Shell</i>
Advances in Atmospheric Sciences	B	B	C	C
Biomedical and Environmental Sciences	B	C	D	D
Chinese Medical Journal	B	D	D	B
Chinese Physics C	B	D	D	C
Journal of Computational Mathematics	B	A	C	C
Journal of Environmental Sciences-China	B	C	C	C
Journal of Genetics and Genomics	B	C	C	C
Journal of Integrative Plant Biology	B	C	B	D
Journal of Iron and Steel Research Int.	C	D	C	D
Journal of Univ. of Sci. and Tech. Beijing	C	C	D	B
Science in China: Mathematics	C	D	B	C
Science in China: Chemistry	C	C	C	C
Science in China: Life Sciences	C	C	D	C
Science in China: Earth Sciences	C	D	C	C
Science in China: Technological Sciences	C	D	B	C
Science in China: Information Sciences	C	D	D	C
Science in China: Physics Mech. & Astronomy	B	C	D	C
World Journal of Gastroenterology	B	C	C	B

and possible future trends. However, the lack of data from the journals themselves meant that there was no possibility of evaluating such details in this study.

Unlike the situation in some countries around the world, all Chinese journals are managed by public academic organizations, such as universities, research institutes, and academic societies. As the sponsor – more often than not the only sponsor – of scientific journals, those organizations have the competency and absolute responsibility to formulate a vision for a journal's development and carry it out. This aspect of the sponsor, or the owner perhaps, is an important element with regard to the quality of a journal published in China, but it has not been taken into account in the present study.

With necessary adaptations, the indicators designed for China's English-language scientific journals could also be used to evaluate English-language journals published in other countries where English is not an official language. For example, Japan's English-language scientific journals face many similar problems to those of such journals published in China [11].

The ASM evaluation idea could also be applicable to evaluating all scientific journals irrespective of language or country of publication because all journals share the same essential elements of core value, editors, authors, and readers. Further study is required to optimize the indicator system used with the ASM and verify it in a large sample.

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