

## Analysis of Problems and Countermeasures for the Ten Principles of Open Access Plan S (Post-print)

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### Abstract

[Purpose/Significance] The implementation of Plan S has promoted open access to academic research achievements, yet deficiencies remain. By extracting problems from various participating entities regarding the implementation of Plan S's ten principles, this study identifies the reasons hindering the promotion of Plan S and proposes corrective recommendations accordingly, with the aim of facilitating the early implementation of Plan S. [Method/Process] Research materials were identified based on the principle of distinguishing between different national contexts and different participating entities within the same country. NVivo11 was employed to systematically analyze foreign interview data line by line, combined with grounded theory procedural coding to deeply explore the problems within Plan S's ten principles. [Results/Conclusion] In response to the existing problems in Plan S's ten principles, corrective countermeasures are proposed from five aspects: recognition by authoritative government departments, supporting hybrid journals as a transitional model, establishing implementation guidelines with transparent costs, appropriately delaying the implementation timeline of Plan S, and refining and expanding Plan S's principles.

### Full Text

## Analysis of Problems and Countermeasures Regarding the 10 Principles of Open Access Plan S

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### Abstract:

[Purpose/Significance] The implementation of Plan S has promoted open access to academic research outputs, yet it still has shortcomings. By identifying

problems in the implementation of Plan S's 10 principles from various stakeholders, this study aims to uncover the obstacles hindering Plan S's advancement and propose corrective measures to facilitate its early implementation. [Method/Process] Following the principle of different countries and different participants within the same country, research materials were selected. Using NVivo 11, foreign interview data were analyzed line by line, and grounded theory with programmatic coding was employed to deeply explore problems within the 10 principles of Plan S. [Result/Conclusion] In response to existing problems in Plan S's 10 principles, corrective suggestions are proposed from five aspects: securing recognition from authoritative government departments, supporting hybrid journals as a transitional model, establishing implementation guidelines for cost transparency, appropriately delaying Plan S's implementation timeline, and refining and expanding Plan S's principles.

**Keywords:** open access; Plan S; academic publishing; grounded theory

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Although open access can more broadly promote the sharing of academic research outputs, statistics show that only about 15% of papers were published as open access in 2017. Over one-third of journals remain behind paywalls, typically allowing free online reading only after at least six months, and fewer than half of journals use hybrid open access models, with authors still required to pay publishers for certain services. Publishers' dual charging standards—collecting article processing fees from authors while simultaneously charging readers subscription fees—impose a heavy financial burden on researchers. To address this economic pressure in research and dismantle the “paywall” limiting access to academic materials, the open access research funding alliance (cOAlition S) proposed Plan S in 2018, an initiative to reform academic publishing, and released a revised version on May 31, 2019. The revised Plan S requires that from 2021 onward, all parties—including alliances, government organizations, academic research institutions, and academic publishers—contribute funding and effort to ensure Plan S's sustained operation. China has also expressed support for Plan S, with the National Natural Science Foundation of China, the National Science Library of the Chinese Academy of Sciences, and the National Science and Technology Library all issuing statements endorsing it. Foreign research on Plan S primarily uses interviews to understand different stakeholders' attitudes and opinions toward the initiative. Domestic academic research on Plan S remains limited, with main contributors including Cui Liyuan, Zheng Ang, Wang Chunsheng, Xu Jie, Fan Hao, and Jia Wuzhi, focusing on background introduction, content elaboration, adjustments in the revised version, challenges and implications, and both positive and negative impacts on information resource construction and academic publishing.

Plan S aims to accelerate the transition of research outputs to open access publishing. All research activities supported by cOAlition S should be made available under the Creative Commons CC-BY license, and upon publication,

results should be immediately made freely available to the public on open access platforms and in repositories. While not the first or only initiative attempting to promote and improve open access to research outputs, Plan S's success would revolutionize academic publishing, necessitating close attention and in-depth research. Currently, the rigid provisions in Plan S's 10 principles have sparked heated debate across academic disciplines and among stakeholders, with controversies persisting. This study uses NVivo 11 to analyze foreign interview materials and grounded theory to deeply explore problems in Plan S, proposing corrective measures based on identified issues to improve Plan S and further promote open access to research outputs.

## 1 Research Data and Methods

### 1.1 Research Data

This study's data were sourced from the introduction to Plan S on the cOAlition S official website and feedback materials on the Plan S implementation draft published on the Zenodo platform. In November 2018, cOAlition S released a draft of Plan S principles and solicited public feedback from November 2018 to February 2019. During January-February 2019, 243 feedback submissions from universities, research institutions, publishers, academic societies, and scholars across more than 40 countries were published on Zenodo. After downloading and organizing these 243 feedback documents, 78 were selected as research materials (as of October 1, 2020). Selection criteria prioritized feedback from different countries and, within the same country, from different participating institutions. The collected feedback on the draft implementation of Plan S's 10 principles was read, translated, and organized into documents recognizable by NVivo 11 software. Eighteen documents were randomly selected for saturation testing, leaving 60 for problem extraction and analysis.

### 1.2 Research Methods

According to feedback on Plan S's 10 principles, this study adopted a qualitative research approach, using NVivo 11 to create a word cloud of Plan S feedback materials to explore respondents' intentions, identify and articulate problems in Plan S, and ultimately propose solutions. Qualitative research involves holistic investigation of social phenomena in natural settings, using multiple data collection methods, with inductive analysis and theory formation at its core, interacting with research subjects to obtain explanatory understanding of their behaviors and intentions.

## 2 Principles and Coding of Open Access Plan S

### 2.1 The 10 Principles of Open Access Plan S

Plan S aims for comprehensive and immediate open access to all peer-reviewed academic publications supported by public and private research funding, requir-

ing that research outputs be published in open access journals, on open access platforms, or made immediately available through open access repositories. To ensure smooth implementation, cOAlition S formulated 10 principles to regulate and define participant behaviors, detailed in Table 1 .

**Principle 1 (Copyright Regulations):** Authors or their institutions retain copyright, and publications must follow open licensing agreements, preferably using CC-BY from Creative Commons, to meet the requirements of the Berlin Declaration.

**Principle 2 (Standard Setting):** Funders must establish reliable service standards and requirements for high-quality open access journals, platforms, and repositories.

**Principle 3 (Funding):** When high-quality open access journals or platforms are lacking, funders should provide coordinated incentives to establish and support open access infrastructure when appropriate.

**Principle 4 (Funding):** Where applicable, open access publication fees should be borne by funders or research institutions, not individual researchers, and all research outputs should be open access.

**Principle 5 (Funding):** Funders support diversified business models for open access journals and platforms. Open access publication fees must match publishing services provided, with transparent fee structures to inform the market and funders of potential standardized fees and payment caps.

**Principle 6 (Coordination):** Funders encourage governments, universities, research institutions, libraries, academic organizations, and societies to align strategies, policies, and practices to promote coordination, particularly regarding funding.

**Principle 7 (Scope):** These principles apply to all types of academic publications, though achieving open access for monographs and book chapters may require more time and a separate, appropriate process.

**Principle 8 (Hybrid Journals):** Hybrid publishing models are not supported.

**Principle 9 (Oversight and Sanctions):** Funders will monitor compliance and sanction non-compliance.

**Principle 10 (Evaluation Criteria):** Funders commit that in evaluating research outputs for funding decisions, they will value the intrinsic merit of research regardless of publication venue, impact factor, or other journal metrics.

## 2.2 Word Cloud of Plan S

The 78 feedback documents were processed and imported into NVivo 11's internal interview files. Using the query function with exact matching, the top 1,000 most frequent words were counted and a word cloud of Plan S feedback was generated, shown in Figure 1 [Figure 1: see original paper]. In the figure, word size

represents frequency. The word “no” (with negative sentiment) appears most frequently, indicating predominantly negative attitudes toward Plan S among respondents. This visualization helps identify why respondents hold negative views and further uncovers problems in Plan S.

### 2.3 Three-Level Coding of Plan S

Programmatic grounded theory methods were used to deeply study existing problems and respondents’ concerns in Plan S. Data analysis and interpretation were critical. Through three-level coding, feedback materials were carefully dissected, annotated, and coded to conceptualize implicit phenomena, using concepts to explain underlying patterns. This process identified problems and concerns, traced their roots, and proposed solutions from the source.

**2.3.1 Open Coding of Plan S** Open coding requires careful examination of feedback materials through initial line-by-line coding, conceptualizing ideas or attitudes expressed. Sixty feedback documents underwent open coding, generating 69 reference points and 36 categories. Through constant comparison and analysis, 11 attributes were ultimately extracted—attributes being common characteristics of all concepts within a category. Detailed coding results are shown in Table 2 (due to space limitations, original excerpts are partial NVivo 11 extracts).

**2.3.2 Axial Coding of Plan S** Axial coding, the second level of grounded theory, reorganizes data from initial coding by grouping and merging concepts and categories from open coding to create more coherent analysis. Table 2’s open coding results were reorganized and classified into three frameworks: conditions, actions/interactions, and consequences, as shown in Figure 2 [Figure 2: see original paper].

**(1) Conditions Framework:** Describes the context or setting of research subjects, helping explain why individuals or groups respond in particular ways. For Plan S, external conditions were summarized into four aspects: subjective cognition of Plan S participants, implementation timeline, participation by countries/organizations (international environment), and Plan S as globally published guidelines.

**(2) Actions/Interactions Framework:** Refers to reactions by individuals or groups to situations, problems, events, or major incidents. Through interview analysis, Plan S’s actions/interactions framework was extracted, linking six major problems—platform systems, official policies, funding issues, implementation details, hybrid journals, and coverage—with evaluation and review mechanisms as interactive solutions.

**(3) Consequences Framework:** Results produced under specific conditions through particular actions or interactions. Plan S’s existing problems and potential consequences include: hindering career development, affecting young

scholars' promotion, inhibiting broader collaboration, causing some journals to cease, unproven universality, and other unknown risks.

**2.3.3 Selective Coding of Plan S** Selective coding's key is selecting core categories and establishing connections between them and subsidiary categories based on conditions, context, interactions/actions, strategies, and results, creating a logical chain that concisely explains all phenomena. Analysis of Plan S's 10 principles feedback identified the following problem 脉络: Before implementation, Plan S should focus on releasing and authorizing official policies, constructing platform systems, setting reasonable timelines, fully considering coverage scope, and correcting subjective cognition—these are prerequisites for advancing Plan S. During implementation, Plan S should emphasize implementation details, funding circulation, hybrid journal transition models, and review mechanisms—these are crucial methods for ensuring continuous progress. After implementation, Plan S should conduct proper evaluation through feedback and consider negative impacts—this is key to gradual improvement. Thus, this study's core categories are defined as: preliminary preparation, mid-term implementation, and post-implementation evaluation. Plan S's problem analysis “storyline” revolves around these three dimensions, as shown in Table 3 .

**2.3.4 Theoretical Framework for Plan S Problem Analysis** The grounded theory application to Plan S problems reveals that Plan S's issues center on three core elements: preliminary preparation, mid-term implementation, and post-implementation feedback. Each core category comprises specific sub-categories with finer details, as shown in Figure 3 [Figure 3: see original paper]. By linking these categories, the storyline describing Plan S's existing problems can be detailed, providing comprehensive and objective solutions for subsequent implementation.

### 3 Recommendations and Countermeasures for Plan S Implementation

Based on NVivo 11 and grounded theory analysis, the following recommendations are proposed to address problems in Plan S's 10 principles, aiming to promote its better implementation and dissemination.

#### 3.1 Need for Recognition and Support from Authoritative Government Departments

Plan S was issued by research funders. Although some European national research funding agencies have signed Plan S, the initiative is led by funders rather than authoritative government departments, resulting in a lack of authoritative government guidance. Recognition and support from authoritative government departments are crucial for Plan S's implementation, enhancing its authority, credibility, and popularity, and encouraging more institutions to recognize the

importance of open access and actively participate. Plan S urgently needs official government authorization and support.

Currently, Plan S's main obstacle is the relatively small number of coalition funders. To achieve Plan S's goals, the cOAlition S signatory list must be expanded to seek broader institutional support. Authoritative government departments can issue policies and allocate funds to invite, encourage, and reward various funders to join Plan S. Government support and guidance will inevitably attract more active participation. Additionally, with authoritative government leadership, Plan S stakeholders can better coordinate their strategies, policies, and practices. Government involvement, guidance, coordination, and supervision on key issues such as copyright authorization, quality control, cost transparency, and implementation timeline will further promote Plan S's smooth implementation.

### 3.2 Support Hybrid Journals as a Transitional Model

On July 20, 2020, the European Research Council (ERC) announced its withdrawal of support for Plan S, representing a major blow to the initiative. A key reason for ERC's withdrawal was Plan S's non-support for hybrid journal models. Additionally, Principle 8 explicitly states that hybrid publishing models are not supported, declaring publications in hybrid journals without transformation arrangements "non-compliant." This principle adversely affects three researcher groups: early-career researchers without established outputs, researchers in countries with limited funding opportunities, and researchers in fields where open access policies are difficult to implement. Therefore, Plan S should support hybrid journals as a transitional model.

Practice has proven that the open access hybrid journal publishing model indeed improves article availability, and researchers pin their hopes on hybrid journals because directly transitioning top-tier journals to open access seems unrealistic and requires a buffer period. Moreover, in disciplines where open access progress is slow or acceptance is low, hybrid open access journals serve as an effective transitional model. Hybrid journals also play important roles in implementing open access transitions in underfunded disciplines. Therefore, diversity should be maintained in the academic publishing ecosystem, retaining hybrid journals as a transitional pathway.

### 3.3 Establish Implementation Guidelines for Cost Transparency

Open access publishing cost calculation and pricing must be transparent, with corresponding implementation guidelines formulated. Plan S has always emphasized cost transparency, with Principle 5 stating that publication fees must match services provided and fee structures must be transparent. Plan S announced that from July 2022, publishers seeking Plan S funding must meet cOAlition S's price and service transparency framework, covering all open access publishing models including non-APC journal fees, platform infrastructure,

article processing charges, and transformative agreements. Plan S also established a “Cost Transparency Award” to encourage cost disclosure. However, detailed implementation guidelines for cost transparency are still lacking.

Cost transparency guidelines should require publishers to disclose all information about publishing costs and factors affecting fees (e.g., cross-subsidies) on websites or platforms, including direct, indirect, and potential costs. Additionally, funding sources, review processes (peer review, editorial work, proofreading services), and fee standards should be published to ensure researchers are not troubled by APC payment details. Different disciplines have different open access publishing service standards and generate different costs, so a “one-size-fits-all” approach to cost fees should be avoided. Finally, to maintain cost transparency and clearly understand open access publishing costs and prices, a supervision mechanism should be established—either a dedicated regulatory department within cOAlition S or a specialized third-party agency commissioned for continuous oversight.

### **3.4 Appropriately Extend Plan S Implementation Timeline**

The cOAlition S alliance originally planned to implement Plan S starting January 2020 but, after widely soliciting and fully listening to global stakeholders’ opinions and suggestions, decided to revise the timeline and delay implementation until 2021. Given current researcher skepticism toward Plan S, implementation at the new timeline also appears difficult.

Regarding timing, Plan S implementation should not be rushed. Whether constructing platforms and infrastructure, proposing policy terms, adapting to different countries, controlling article quality, or planning APC fees, Plan S implementation requires time. Therefore, open access through Plan S should be achieved through evolution rather than overly aggressive immediate reform. This study recommends extending Plan S’s implementation timeline, providing researchers and publishers more time to adapt to Plan S and its changes by establishing a five-year open access thematic project to supplement and improve Plan S, with dynamic and flexible timeline adjustments based on different countries’ policies and actual conditions.

### **3.5 Refine and Expand Plan S Principles**

Plan S’s promotion should follow the 10 principles, but current principles lack detailed elaboration and extension. Expanding and refining principle details, and investing substantial financial and human resources to improve Plan S, are critical links for advancing the initiative.

Principle 2 only states that funders need to provide reliable service standards for high-quality open access journals, platforms, and repositories but should supplement the process of establishing corresponding service standards, funding sources, and agreed standards. Principle 5 mentions diversified business models

and cost transparency for open access journals and platforms but should elaborate on service tiers corresponding to each price level. Open access publication fees must correspond to publishing services, with transparent fee details enabling researchers, libraries, and funders to better understand open publishing service elements. Principle 6's statement on cost transparency should further clarify the scope of transparency and dynamically adjust strategies based on participants' actual conditions. Principle 9 addresses oversight and sanctions but should provide more comprehensive guidance and explanations. Additionally, Plan S needs to expand its research scope to include data and research outputs from non-traditional disciplines.

Plan S is a project benefiting numerous researchers, aiming to dismantle “paywalls” and make research outputs publicly available. While widely recognized by many countries, Plan S has also sparked intense international debate, with researchers expressing many concerns about its open access pathways. This study conducted programmatic coding of foreign feedback materials on Plan S's 10 principles, identified current researcher concerns, and proposed targeted corrective suggestions from five aspects: hoping future Plan S will be led by government departments with official authorization; recognizing hybrid journals as a transitional model conducive to successful open access transformation; establishing a supervision and review mechanism for cost transparency; appropriately extending Plan S's implementation timeline to allow adequate preparation; and refining existing terms while dynamically adjusting and supplementing new terms to continuously improve Plan S and promote its early implementation.

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**Author Contributions:**

Niu Xiaohong: Conceptualized the topic, refined paper arguments, revised and finalized the manuscript;

Zhu Hongtao: Collected data, analyzed data, wrote and revised the manuscript.

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