Evaluation of Academic Achievements in Philosophy and Social Sciences in the Big Data Era: Problems, Strategies, and Indicator Systems (Postprint)

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Abstract

[Purpose/Significance] Academic achievement evaluation constitutes a critical factor in promoting the healthy development of philosophy and social sciences. For a long time, traditional peer review and scientometric methods have increasingly revealed limitations in evaluating academic achievements in philosophy and social sciences, making it imperative to challenge the hegemony of conventional approaches and develop targeted evaluation strategies. This article attempts to explore the transformation and implementation of evaluation for philosophy and social sciences academic achievements within big data environments, particularly proposing an evaluation indicator system for such achievements from a big data perspective.

[Method/Process] Based on comparative and comprehensive analysis, this study first examines the drawbacks of traditional evaluation methods for philosophy and social sciences, then analyzes the changes that big data brings to such evaluations, and finally proposes evaluation strategies and indicator systems for philosophy and social sciences grounded in big data environments.

[Result/Conclusion] The study proposes strategies for evaluating academic achievements in philosophy and social sciences in the big data era: shifting from citation record analysis to multi-dimensional analysis of citation content and behavior, transitioning from stage-based static evaluation oriented toward achievements to whole-process dynamic evaluation centered on "academic activities" , and moving from academic influence evaluation to assessment of academic value and social benefits. On this basis, an evaluation indicator system for philosophy and social sciences academic achievements in the context of big data is constructed, comprising two first-level indicators, five second-level indicators, and thirty-four third-level indicators.

Full Text

Preamble

Evaluation of Academic Achievements in Philosophy and Social Sciences in the Big Data Era: Issues, Strategies, and Indicator Systems

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Abstract

Academic achievement evaluation is a crucial factor in promoting the healthy development of philosophy and social sciences. For a long time, traditional peer review and scientometric methods have increasingly revealed problems in evaluating academic achievements in philosophy and social sciences. It is imperative to challenge the dominance of conventional methods and develop targeted evaluation strategies. This article explores the transformation and implementation of evaluation for philosophy and social sciences achievements in the big data environment, particularly proposing an evaluation indicator system based on big data thinking.

[**Method/Process**] Through comparative and comprehensive analysis, this paper first examines the drawbacks of traditional evaluation methods for philosophy and social sciences, then analyzes the changes that big data brings to such evaluation, and finally proposes evaluation strategies and indicator systems based on the big data environment.

[**Results/Conclusion**] The paper proposes three strategies for evaluating philosophy and social sciences achievements in the big data era: (1) shifting from citation record analysis to multi-dimensional citation content and behavior analysis; (2) transforming from static, stage-based evaluation focused on outputs to a dynamic, whole-process evaluation centered on "academic activities"; and (3) moving from academic influence evaluation to academic value and social benefit evaluation. Based on these strategies, an evaluation indicator system for philosophy and social sciences achievements in the big data context is constructed, comprising 2 first-level indicators, 5 second-level indicators, and 34 third-level indicators.

Classification Number: G251
Keywords: philosophy and social sciences, academic achievements, achievement evaluation, big data

For a long time, academic evaluation has been divided between quantitative and qualitative assessment. Quantitative evaluation has been widely criticized for its limited objectivity, insufficient fairness, lack of professional expertise, and oversimplified conclusions. Professor Su Xinning of Nanjing University argues

that extreme quantification and purely quantitative academic evaluation should be terminated [1]. Li Chong et al. from Dalian University of Technology also point out that quantitative evaluation has limited universal applicability due to disciplinary differences [2]. Qualitative evaluation, on the other hand, suffers from subjective arbitrariness, inefficiency, opacity in the evaluation process, and difficulties in reproducibility and supervision. Although combined qualitative-quantitative methods have been used as complements, the effect has been less than satisfactory because the two evaluation subjects—academic communities conducting peer review and third-party evaluation institutions—find it difficult to integrate and tend to operate independently.

The current problem is that third-party evaluation institutions, lacking professional expertise, cannot participate in qualitative evaluation. Even when focusing solely on quantitative evaluation, their inability to draw professional conclusions makes their assessments incomplete. However, academic communities are not necessarily incapable of quantitative evaluation. Currently, academia generally recognizes that evaluation of philosophy and social sciences achievements should be conducted through qualitative assessment by academic communities rather than third-party quantitative institutions. But this is a pre-big data consensus.

The big data era should change these issues. Big data brings "cloud computing-based data processing and application models that form intellectual resources and knowledge service capabilities through data integration, sharing, and cross-reuse" [3]. This can not only expand the data types and research scope of quantitative analysis but also enable qualitative analysis and efficient value judgment while supervising subjectivity and verifying credibility. In other words, the big data era makes it possible for quantitative evaluation to integrate into philosophy and social sciences achievement evaluation in a more professional manner, while also ensuring the efficiency and credibility of qualitative evaluation. The seamless integration of qualitative and quantitative evaluation will become a new evaluation approach in the big data era. Based on this, international quantitative evaluation methods have shown new development trends: deep qualitative and semantic orientation, and the rapid rise of altmetrics data [4]. It is evident that big data' s penetration into academic evaluation is gradually gaining momentum.

At the symposium on philosophy and social sciences work, General Secretary Xi Jinping pointed out that China' s philosophy and social sciences suffer from an "unscientific academic evaluation system." Peng Qiugui, a researcher at the Chinese Social Sciences Magazine, believes that academic and ideological attributes are the two most fundamental characteristics of philosophy and social sciences research, and that academic and political standards are the two most basic requirements in philosophy and social sciences evaluation [5]. The uniqueness of philosophy and social sciences (hereinafter referred to as "philosophy and social sciences") academic achievements is the main reason why they are separately discussed in evaluation research. The academic community has also paid at-

tention to evaluation issues in philosophy (humanities) and social sciences. For example, Jiang Chunlin of Dalian University of Technology argues that evaluation of humanities and social sciences research achievements should be based on their intrinsic attributes [6]. Dai Jinping of Chongqing University of Posts and Telecommunications proposes that philosophy and social sciences evaluation should not only focus on academic innovation and influence but also emphasize researchers' basic value orientations and the value orientation of achievements [7].

Traditional peer review and scientometric methods have proven inadequate for evaluating philosophy and social sciences achievements. The big data era provides a new thinking mode for breakthroughs in existing methods (based on correlations among diverse, distributed data), as well as the data environment (providing platforms for publishing academic achievements in different formats and from different academic activities) and technical support (text mining technology, semantic association technology, etc.) to realize this thinking mode. Based on this, this paper proposes evaluation strategies for philosophy and social sciences achievements under the big data thinking mode, focusing on exploring the transformation and implementation of such evaluation in the big data environment, particularly presenting an evaluation indicator system based on big data thinking. This enables philosophy and social sciences achievement evaluation to move from focusing on peripheral indicators such as influence to deeper content indicators like citation content and social value, and to expand from evaluation based on journal articles and monographs to evaluation of various types and forms of academic activities, thereby more profoundly and comprehensively revealing scholars' academic performance.

2. Problems and Reflections on Philosophy and Social Sciences Achievement Evaluation

In addition to their inherent defects affecting the scientificity and objectivity of philosophy and social sciences achievement evaluation, these two methods also fail to take effective measures to address the particularities of philosophy and social sciences achievements due to insurmountable management and technical obstacles, thereby intensifying the risks of cognitive limitations and conclusion bias. Specific manifestations include the following aspects:

2.1 Simple Linear Correlation-Based Citation Record Analysis Ignores the Complexity of Citations

Citation analysis has served as an important method for academic achievement evaluation for over 50 years, with the emergence of Science Citation Index databases providing strong impetus for its application. However, citation analysis based on bibliographic information has been questioned since its inception. In 1986, T. A. Brooks argued that citation analysis began to be used without first understanding citation motivations and behaviors [11]. Citation record

analysis is typically used to describe mutual influence between documents or authors without considering directionality or intensity. The process implicitly assumes that each cited document has equal value to the citing document [12], which is clearly unreasonable. In reality, traditional citation record analysis primarily attempts to answer two questions: whether two articles are correlated, and how many times an article has been cited. This equates academic influence with citation counts, despite H. Small' s observation that no evidence shows highly cited papers have high influence [13].

2.1.1 The Complexity of Citation Behavior Enriches the Connotation of Citation Rates Unlike natural sciences (hereinafter referred to as "natural sciences") that focus on exploring truths about the natural world and can adopt universal standards worldwide, philosophy and social sciences research objects are largely human beings and society, which determines the particularity of philosophy and social sciences achievements: (1) Achievement content is primarily characterized by ideological, ideological, and value-oriented attributes. Even without considering experts'social and cultural influences, evaluating these contents itself places high demands on peer reviewers' academic literacy and cognitive abilities, while scientometric indicators are almost powerless; (2) The dissemination and application of achievements feature obvious impact time lags, ambiguous transformation outcomes, experiential value effects, and prominent informal academic exchanges. Theoretical peers mostly from "within academic circles" cannot truly and objectively analyze these issues in achievements based solely on intuition and experience, and superficial quantitative indicators such as citations, publications, or even downloads and reprints in altmetrics are even less capable of making effective judgments; (3) Philosophy and social sciences scholars are significantly influenced by perceptual thinking and social environmental changes, requiring not only analysis of their stage-based achievement stock but also the establishment of long-term evaluation mechanisms oriented toward the entire research process and academic career—something existing peer review and scientometric evaluation methods cannot achieve.

2.1.2 Citation Rate Data Obscures Disciplinary Differences Significant differences exist among disciplines such as science and engineering, humanities and social sciences, and applied and basic disciplines [18]. However, due to the complexity of inter-disciplinary relationships and different research questions within disciplines (e.g., basic research vs. applied research), citation record analysis that focuses solely on data cannot distinguish citation differences among disciplines. Particularly in philosophy and social sciences, excellent papers in many disciplines may still have low citation rates due to the inherent characteristics of the discipline. Meanwhile, the scientific community focuses more on highly cited literature while neglecting low-cited or zero-cited literature [19].

2.1.3 Time Lags in Citation Processes Reduce Citation Analysis Efficiency Research by W. Glanzel et al. shows that over 80% of documents are

first cited within 3 years of publication , and over 90% are first cited within 5 years [20]. Similarly, Dutch scientometrician A. F. J. Van Raan discovered the "Sleeping Beauty" phenomenon [21], both powerfully demonstrating the time lag issue in literature citation. Such lags delay the evaluation of research impact and researchers, preventing true reflection of current research realities and particularly disadvantaging the motivation of young researchers. Meanwhile, the rise of informal communication in scientific research (e.g., academic blogs, preprints, academic communities) has led to extensive dissemination of materials through informal channels before formal publication [22]. Informal communication has become an important means of research achievement dissemination and influence deepening. Current citation analysis limited to literature-based sources suffers from defects in this regard, significantly reducing analysis efficiency.

2.2 Static, Stage-Based Evaluation Focused on Outputs Risks Overgeneralization

Against the backdrop of rapidly developing informal academic communication, philosophy and social sciences achievements are manifested not only in literature-based forms but also extensively in various informal communication contexts. Informal academic communication features significant timeliness and dynamism, requiring real-time tracking and analysis. Static, solidified achievement analysis clearly suffers from one-sidedness. Moreover, dynamic process-oriented work such as academic activities and academic careers, which cannot be expressed through static achievement forms, is crucial for philosophy and social sciences with their "slow-burn" and "sedimentation" characteristics. Comprehensive analysis of these elements is essential for discovering and cultivating talent, thereby generating more outstanding academic achievements. Current evaluation methods limited to specific stages and focused only on concrete outputs obviously cannot achieve this goal.

2.3 Academic Influence Evaluation Cannot Objectively Reveal Academic Value and Social Benefits

In the knowledge economy era and under the innovation-driven development strategy, scientific research is expected to play an important role in social development. Philosophy and social sciences research should not only produce high-impact academic achievements but, more importantly, these achievements should embody academic value and generate social benefits. Academic value is reflected in academic innovation, frontier nature, and promotion of research advancement. Unlike academic influence, which is mostly limited to superficial academic dissemination and inheritance, academic value more deeply reflects guidance in thought, concepts, and content—key to accelerating scientific development. The core of social benefits lies in the guiding role of academic achievements in promoting social practice (such as policy formulation, social management, and development).

Traditional scientometric indicators limited to superficial influence evaluation

"within academic circles" clearly do not meet contemporary development requirements. As M. Taylor points out, current scientometric indicators are very limited in understanding the social impact of academic achievements [23]. Particularly as social development complexity becomes increasingly prominent—with issues like global warming, food safety, ecological service deficiencies, and various contradictions in social development requiring significant contributions from scientific research—academic achievement evaluation that remains at the level of publication and citation indicators can hardly reflect the true contributions of academic achievements to social development. As J. Spaapen et al. propose, academic achievement evaluation should transcend scientific performance indicators [24]. Although peer review and academic community evaluation have somewhat improved the defects of scientometric indicators, their uncontrollable subjectivity and the extensive distribution of resources in the network environment leading to limitations in resource acquisition and cognition also fail to truly, scientifically, objectively, and comprehensively reveal the academic value and social benefits of academic achievements.

3. Philosophy and Social Sciences Achievement Evaluation Based on Big Data Thinking

In the big data era, various dynamic and static academic activity data existing in various carriers and forms can be deeply aggregated and subjected to semantic-level correlation analysis. Applying big data thinking, technology, and methods to philosophy and social sciences achievement evaluation can effectively overcome current evaluation limitations. How, then, should we establish matching evaluation strategies for philosophy and social sciences achievements in the big data era?

3.1 Shifting from Citation Record Analysis to Multi-Dimensional Citation Content and Behavior Analysis

Compared with the certainty and clarity of natural sciences achievement content, the context and semantics of philosophy and social sciences achievements are much more complex. Citation record analysis, as a formal and superficial evaluation method, cannot reflect the ideological, ideological, and value-oriented content of philosophy and social sciences. Moreover, philosophy and social sciences scholars are more likely to engage in intellectual collisions through informal communication channels rather than through documents. Big data makes semantic analysis oriented toward citation content and analysis integrating multiple media of informal communication possible.

3.1.1 Full-Text-Based Citation Content and Behavior Analysis Comprehensively Reveals the Complex Meaning of Citations In defining citation content analysis, H. Small is most influential, using "citation context" to refer to the text surrounding the citation location [25], emphasizing the importance of citation position and context. Research papers typically have clear

logical structures, with different modules having varying levels of importance. The importance levels of sections such as introduction, methods, process, and conclusions determine the importance of cited documents when citations occur in corresponding positions. Citation context reveals citation function through words before and after the citation location, such as "based on," "on the basis of" (strong function), "expand" (important function), "compare" (moderate function), and "historical background" (unimportant function) [26].

Citation content analysis actually reveals citation intentions and the influence of evaluation objects through four aspects: citation function, citation importance, emotional orientation, and citation motivation, thereby more profoundly understanding and mining the value hidden in citation complexity.

Citation content analysis is based on two premises: first, citations are assigned different weights in different contexts, mainly achieved through syntactic and semantic analysis; second, qualitative and quantitative methods integrate [27], with content analysis and bibliometric analysis complementing each other. Weight magnitude reflects the importance level and function of cited content. The complementarity of qualitative and quantitative methods not only describes citation polarity and motivation through semantic features but also examines their importance from a quantitative accumulation perspective.

Therefore, citation content analysis, through discourse analysis (context and semantics), reveals the emotion, cognition, attitude, importance, and function of citation content from a linguistic perspective. This can objectively reveal authors' citation intentions, demonstrate the function of citations for their own research, more comprehensively and profoundly reveal characteristics of scientific and technological development (detecting breakthroughs, transfers, and transformations in research content [28]), and more objectively and truthfully examine the influence of evaluation objects.

3.1.2 Implementation of Citation Content and Behavior Analysis Under Big Data Thinking The rise of big data provides basic technical and platform guarantees for citation content analysis based on full-text information, making semantic analysis and informal communication research impact analysis possible. Especially with the increasing perfection of literature database construction and the deepening development of information and data processing technology, more and more databases available for full-text parsing have been developed, such as arXiv, Citeseer, and domestic CNKI, which has published full-text texts in HTML format. These provide convenient conditions for full-text parsing and text mining of document structure and content, thereby providing important data foundations for in-depth full-text citation content analysis. Meanwhile, advances in social computing capabilities and the development of digital libraries and institutional repositories provide bases for identifying cross-domain specific citation patterns, thus offering feasible solutions for natural language processing-based citation content and behavior analysis. Additionally, in this environment, scalable text mining algorithms can be developed to more

deeply and comprehensively extract hidden semantic associations in large-scale literature collections.

This can be achieved through related technologies such as machine learning, natural language processing, text mining, sentiment analysis, and visual analysis.

3.2 Shifting from Static, Stage-Based Evaluation Focused on Outputs to Dynamic, Whole-Process Evaluation Centered on "Academic Activities"

Compared with natural sciences scholars whose research processes are sequential, rational, and have fixed forms of expression, philosophy and social sciences scholars are significantly influenced by social environments. Their research behaviors often cycle and repeat due to changes in social environments, with perceptual thinking and experience playing important roles, and their achievement forms are diversified. Simply evaluating philosophy and social sciences scholars based on traditional output-oriented achievements is clearly biased. In the big data environment, process evaluation oriented toward "academic activities" becomes possible. Comprehensive correlation analysis of researchers' academic activities and academic career processes can not only objectively evaluate their current research capabilities but also effectively discover their future research development space, help them with self-awareness, and stimulate their research motivation.

3.2.1 Correlation Analysis of Big Data on Academic Activities Academic activities constitute the totality of research, exchange, and dissemination activities conducted by scholars. With the open development of research work, the frequency of academic activities continues to increase, and forms are becoming increasingly diverse. This process generates rich and targeted activity data: first, traditional forms of academic activities, which still play important roles, such as publication, awards, project applications, and conference exchanges. In scholars' academic careers, these forms generate rich activity data in both form and content features. Second, academic-related social network activities. The collaborative and inheritable nature of research leads scholars to generate numerous social network activities, such as cooperation with domestic and foreign scholars and the academic performance of their students, producing substantial activity data. Third, activity data in terms of manifestation. The above two types of data exist not only in traditional carriers but also, thanks to network and communication technology development, in static or streaming forms on various online platforms, with rich content and diverse forms. Deep aggregation of these various content and form data, combined with big data organization, mining, and correlation analysis technologies, can comprehensively, profoundly, and objectively reflect scholars' academic achievement situations.

3.2.2 Academic Career Process Analysis Under Big Data Thinking In 2014, M. McNutt, editor-in-chief of *Science*, noted that better academic achievement evaluation indicators could be developed by tracking scientists' academic

careers, such as ability to participate in interdisciplinary teams, creativity in solving complex problems, and professional ethics [35]. Academic career process analysis can effectively assess scholars' academic accumulation, activity, development potential, literacy, orientation, and prospects—obviously important components for evaluating research capabilities. Through academic career process analysis, cost expenditures and resource support in the research process can also be discovered, providing bases for analyzing influencing factors and essential reasons for scholars' research performance and further offering references for research management.

Academic career process analysis should be designed with targeted "goal orientations" based on scholars' age levels. For senior scholars, the focus should be on academic accumulation and contributions, emphasizing historical-dimension academic activity analysis. For younger scholars, the focus should be on development potential and prospects, de-emphasizing academic accumulation examination to adapt to the particularity of philosophy and social sciences achievement generation, emphasizing forward-looking analysis of predictive academic activities. Additionally, academic career process analysis should conduct integrated analysis of "academic stock" and "academic flow" along a timeline, establishing corresponding tracking mechanisms.

Big data thinking-based academic career process analysis includes not only integrated analysis of large amounts of various static data but also crawling and processing of real-time dynamic data. Its ultimate goal orientation lies not only in clarifying scholars' internal and external basic research conditions but, more importantly, in discovering basic characteristics of different types of scholars' academic careers and, combined with correlation analysis of social development data, predicting their research development space and trends to achieve academic career management oriented toward improving academic capabilities.

3.3 Shifting from Academic Influence Evaluation to Academic Value and Social Benefit Evaluation

Compared with the concreteness and describability of academic value and social benefits in natural sciences, philosophy and social sciences academic value focuses more on ideological and value-level inheritance and guidance, while its social benefits are more experiential and personalized, with certain ambiguity and uncertainty. For this reason, philosophy and social sciences achievement evaluation places greater emphasis on the role of academic communities. As is well known, due to complex factors such as academic bias, cognitive limitations, and social culture, academic communities' achievement evaluation exhibits significant subjectivity. In the big data environment, through aggregation and correlation analysis of massive theoretical and applied data, the academic value and social benefits of philosophy and social sciences achievements can be objectively and deeply discovered. This not only helps complete substantial basic screening work before academic communities participate in evaluation but also verifies and supervises the subjective tendencies of academic communities, mak-

ing qualitative evaluation more efficient and precise.

3.3.1 Realizing Academic Value Evaluation of Achievements in the Big Data Environment Through cloud computing, cloud fusion, and other technologies, various types and structures of research information across different storage carriers can be integrated and correlated with previous related achievements and current social hotspots and priorities reported in media for comparative analysis, evaluating the innovation and content value of academic achievements. Simultaneously, the application of philosophy and social sciences in interdisciplinary research, cross-disciplinary research methods, and cooperation with applied research can be evaluated and analyzed. Additionally, analysis can be conducted on the types of citers or promoters of academic achievements and the types of cited literature. Through these big data technologies and methods to mine the academic value of philosophy and social sciences achievements, the currently popular ranking list presentation can be transformed into deep judgment of academic value, which can either be weighted by classification according to its level or evaluated individually for its unique characteristics.

3.3.2 Realizing Social Benefit Evaluation of Achievements in the Big Data Environment In the 1950s, economists began studying the impact of scientific research and experimental development (R&D) on economic growth and productivity [36], which can be regarded as the prototype of social benefit evaluation for academic achievements. In the 1990s, social application value was incorporated into academic achievement evaluation in multiple fields and gradually attracted scholars' attention [37]. In recent years, social benefit assessment has become a focus of academic achievement evaluation, particularly prevalent in health and medical fields [38], but it has not been widely applied, mainly because the required data are difficult to obtain. Current popular methods such as interviews, case studies, and literature analysis have limited practical application value due to high time costs and data acquisition difficulties [39]. Some altmetrics indicators reflect publications' social impact to a certain extent [40], but they cannot yet profoundly and comprehensively explain the real social role of academic achievements. In practical application scenarios, metrics such as attention, clicks, and downloads cannot be fully equated with the practical value of achievements. Furthermore, the social benefits of high-quality research achievements may not necessarily be built on a solid academic value foundation.

Big data provides a solid data foundation for social benefit evaluation of academic achievements. Applying big data thinking, technology, and methods to social benefit evaluation significantly enhances its operability and scientificity. In the big data era, through cloud search, data integration, and consolidation technologies, not only can comprehensive research activity data stored in various media be widely obtained, but they can also be correlated with social development and management-related data, such as government policy data, economic development data, political development data, and public feedback data. By examining correlations, analyzing their citation in various strategies, action guide-

lines, and policy documents, and understanding their role in resolving social contradictions and predicting social development trends, the social value of corresponding academic achievements can be effectively discovered. Meanwhile, big data thinking also effectively promotes the development of new indicators for academic achievement evaluation, such as readers' dwell time on documents, document retrieval frequency, search indices, and secondary or multiple dissemination of documents. These new indicators are equally important for further discovering the social benefits of academic achievements.

4. Evaluation Indicator System for Philosophy and Social Sciences Achievements Based on Big Data Thinking

The evaluation indicator system is an important basis and foothold for academic achievement evaluation strategies. Based on the above analysis, we believe that academic value and social benefits are the lifeline of philosophy and social sciences achievement evaluation. The two are both independent and inherently connected. Academic value evaluation focuses on "academia" itself, providing supportive and guiding roles for discipline system construction or interpretation of specific research objects, offering bases for related research, or outputting ideas, theories, and methods to guide academic inheritance and development. Social benefit evaluation focuses on "people and society," emphasizing the role of academic achievements in social development, which may be reflected in internalized human spirit or ideological culture, or provide specific guidance for social development. Academic value is the foundation of social benefits—only academic achievements with good academic value can potentially have high social benefits. Serving to enhance social benefits is an important orientation of academic value. Social benefits are important manifestations of academic value transformation into practice, and academic achievements with significant social benefits are usually built on solid academic value foundations.

Academic value includes three key elements: academic innovation, academic influence, and academic quality. Academic innovation completely focuses on the content of academic achievements, including novelty (topic, viewpoint, and method), frontier nature, and forward-looking nature of achievements. Novelty is an indicator based on comparative analysis, which requires categorical analysis as its basis—that is, comparison within the same discipline category. For example, within the same discipline, whether the research content has breakthrough nature (such as h-index), follow-up nature (such as g-index, e-index, etc.), or takes a new path (such as zero-citation literature research). As an innovation indicator, the frontier nature of academic achievements also has leading characteristics, meaning the achievement can guide research in a certain field in terms of thematic content, research methods, and academic viewpoints, enabling further deepening of that field (such as intelligence service research in the overall national security concept). The forward-looking nature of academic achievements examines whether they are predictive explorations of the future or excavation and grasp of the essence (potentiality) and development potential

of research objects. Novelty of academic achievements mainly examines contributions to current research in a field, while frontier nature and forward-looking nature focus on contributions to the future. Academic influence, on the one hand, represents the dissemination of academic achievements, and on the other hand, reflects the ability to influence other academic achievements or others' research behaviors. Therefore, this indicator includes not only metrics expressing achievement dissemination such as academic trace, conference citations and presentations, and academic diffusion but also metrics demonstrating influence on other research such as academic competitiveness, academic discourse, and academic debates. Academic quality includes content quality and formal quality. The former mainly examines problem awareness and professionalism of achievements, while the latter refers to research standardization and completeness of argumentation.

Academic innovation is the core of academic achievements and the key element driving continuous improvement of achievement influence and academic quality. Academic influence is the prerequisite for transforming academic achievements into society and an important goal of academic innovation. Academic quality is the foundation of academic innovation and influence. Social benefits include two key elements: social influence and social contribution. Social influence emphasizes academic achievements' recognition in society, changes made to society, or economic benefits created for society [41], serving as the precursor to social contribution. Social contribution reflects the level and ability of academic achievements to function in society.

In the big data environment, all achievements generated by scholars' academic activities should be correlated and integrated as data sources for indicator quantitative evaluation, with different indicators focusing on different data sources and methods. For example, in academic innovation evaluation, the content of academic achievements should be the evaluation object, including topics (subject selection), viewpoints, and methods. Whether these contents are innovative is determined through horizontal comparison—comparison of research topics (subject selection) within the same discipline, comparison of viewpoints and methods proposed for the same topic—and vertical comparison—whether these achievements have frontier nature (at the international research forefront) and forward-looking nature (insight and vision into potential issues). Academic influence focuses on evaluating the breadth and depth of achievement dissemination. Breadth includes dissemination speed and spatial scope, obtainable through citation and time-series analysis. Depth mainly refers to the impact of achievements on others' related research, obtainable through analysis of citers' academic behaviors.

Based on the above ideas and principles such as indicator exclusivity, operability, scientificity, and correlation, this paper designs an evaluation indicator system for philosophy and social sciences achievements comprising 2 first-level indicators, 5 second-level indicators, and 34 third-level indicators (see Table 1). This indicator system fully embodies the application of big data as an information

source (such as integrated information from full-text achievements, research policy texts, altmetrics, and multi-type information from important conferences) and big data as evaluation technology (such as correlation analysis and semantic mining). Moreover, this indicator system not only emphasizes full-text content analysis (such as various indicators in academic innovation) but also pays attention to various academic activity-related indicators (such as published papers, academic conferences, media publications, and altmetrics-related content).

Table 1. Evaluation Indicator System for Philosophy and Social Sciences Achievements

First-Level Indicator	Second-Level Indicator	Third-Level Indicators	Data Sources/Methods
Academic Value	**Academic Innovation**	Topic Novelty	Semantic Mining [24], Content-Based Citation Analysis [42-43], Categorical Evaluation [44]
		Viewpoint Novelty	Discipline, Topic, Reference Co-citation Analysis, Clustering Analysis, Co-occurrence Analysis [45]
		Method Novelty	
		Frontier Alignment Achievement	
		Forward-looking Nature Achievement	
		Integration Degree	
	Academic Influence	Ye' s Academic Trace Calculation Model [46]	
		Conference Citation and Presentation	Important Conference Texts, Audio/Video

First-Level Indicator	Second-Level Indicator	Third-Level Indicators	Data Sources/Methods
		Academic Diffusion (Spatiotemporal) Diffusion Speed and Scope	Text Mining, Semantic Mining
		Academic Competitiveness	Basic Resources, Funding Input [47]
		Academic Viewpoint Dissemination and Citation	
		Academic Content Discussion	
		Traditional Influence (Overall Citations)	Citations, h-index, etc.
		International Publication and Citation	Survey Analysis, Questionnaire Analysis
		Multi-Carrier Big Data Analysis	Citation Analysis [48]
		Important Secondary Literature Database Reprints	Bibliometric Analysis
		Full-text Reprints, Abstract Reprints	*Xinhua Digest*, *Renmin University Reprints*, etc.
		Connection with Social Development Issues	Text Mining, Comparative Analysis, Peer Review
		Achievement Localization	Adaptation to National Economic and Social Development
	Academic Quality	Important Database Inclusion	

First-Level Indicator	Second-Level Indicator	Third-Level Indicators	Data Sources/Methods
		Academic Standardization	
		Argumentation Completeness	Text Structure Analysis [49], Relevant Standard Comparison, Peer Review
		Continuous Follow-up Professionalism [50]	
Social Benefits	**Social Influence**	Altmetrics Score	Altmetrics.com
		Important Media Publication/Reprint	Diffusion Speed and Scope
		Relevance to Social Hotspots	Media Visibility
		SCI, SSCI Database Inclusion	
		Important Awards Analysis	
	Social Contribution	Policy Association/Mention/Citation	Policy Texts, Major Conference Data
		Achievement Adoption	Adoption by Relevant Institutions
		Support for Natural Sciences Achievements	Multi-Media and Form Big Data Mining Related to Institutions
		Natural Sciences Achievement References	Content-Based Citation Analysis

In this indicator system, we take the characteristics of philosophy and social sciences achievements as the basic starting point, emphasizing the diversity of achievement presentation carriers in the big data environment, and using quantitative objective analysis methods supplemented by peer review as implementation means. However, to truly implement the indicator system in practice,

weight settings for each indicator' s importance are needed, along with standardization and normalization processing based on weight values, requiring support from expert survey methods and mathematical and statistical methods—work we will undertake subsequently. Additionally, given the time-lagged presentation of academic value and social benefits of philosophy and social sciences achievements, phased, periodic, and academic-age-comparable strategies should be adopted when using the above indicators for evaluation, and the principle of categorical evaluation [53] should be strictly followed to maximize and more objectively describe achievement conditions. Meanwhile, in the big data environment, complete research behaviors and processes are also important factors in academic performance, but currently, such data cannot be completely obtained, requiring support from subsequent integrated big data platforms or databases—an issue that academia should focus on exploring.

In the future, there is still a long way to go for the practical application of big data in philosophy and social sciences achievement evaluation. Research management departments and academia should devote more effort to building relevant big data platforms and databases, such as establishing integrated and collection platforms for research activity big data to comprehensively include various data from scholars' academic activities, achieving centralized management and distributed services of data resources through cloud storage and cloud services; breaking through boundaries between current research data management systems and literature databases to achieve interoperability and efficiently realize sharing and intelligent search of various academic information resources; strengthening full-text database construction, changing the original literature unit processing limited to PDF formats, and organizing knowledge units in documents as standardized and structured as possible in automatically parseable formats. Through this, big data can extend the scope of quantitative analysis, supervise qualitative analysis results, integrate and supplement the defects and deficiencies of both, making evaluation methods more precise and evaluation mechanisms more perfect.

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Note: Figure translations are in progress. See original paper for figures.