A Study on Differences in Altmetrics Evaluation Needs of Chinese University Researchers: Post-print

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Abstract

[Purpose/Significance] As Altmetrics research continues to deepen, effectively identifying stakeholder needs in Altmetrics evaluation holds significant importance for the design of evaluation indicators and the construction of data infrastructure.

[Method/Process] Taking university researchers as the subject, this study employs semi-structured interviews to identify the Altmetrics evaluation needs of Chinese university researchers, and utilizes questionnaire surveys to obtain data and test the differences in the identified Altmetrics evaluation needs among university researchers.

[Results/Conclusion] The study reveals that Chinese university researchers have seven primary types of Altmetrics evaluation needs: research evaluation, achievement display, needs discovery, academic recognition, communication and dissemination, achievement operation, and discipline development. University researchers across different age groups exhibit differences in "research evaluation," with the "51-60 years" age group showing significantly lower needs in this dimension compared to other age groups. Except for "communication and dissemination," the intensity of six Altmetrics evaluation function needs in humanities disciplines is lower than that in social sciences and natural sciences, while the evaluation needs between natural sciences and social sciences are completely identical. Except for differences in the "research evaluation" function needs between faculty and students, the six Altmetrics evaluation needs show no differences across all different identity categories of university scientific personnel. The seven types of Altmetrics evaluation needs demonstrate relatively high universal applicability for university researchers.

Full Text

Abstract

[**Purpose/Significance**] As Altmetrics research deepens, effectively identifying stakeholder needs in Altmetrics evaluation is crucial for designing evaluation indicators and constructing data infrastructure. [**Method/Process**] Focusing on university researchers in China, this study employed semi-structured interviews to identify Altmetrics evaluation needs and used questionnaires to examine differences in these needs among Chinese university researchers. [**Results/Conclusion**] The study identified seven primary Altmetrics evaluation needs: research evaluation, achievement display, needs discovery, academic recognition, communication and dissemination, achievement operation, and disciplinary development. Significant differences were found across age groups in "research evaluation," with the 51-60 age group showing notably lower demand than other groups. Except for "communication and dissemination," humanities scholars exhibited lower demand intensity across all six other Altmetrics functions compared to social and natural sciences, while no differences emerged between natural and social sciences. Apart from "research evaluation," no differences were observed across identity categories. These seven Altmetrics evaluation needs demonstrate high universal applicability for university researchers.

Keywords: Chinese universities; researchers; academic achievements; Altmetrics; evaluation needs; need differences

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Introduction

The rapid development of social media technology has led increasing numbers of scientists and the public to use these platforms as important channels for publishing academic achievements [1], making informal communication an increasingly vital component of the academic ecosystem. As informal communication makes a strong comeback, the presentation forms of academic achievements have expanded beyond traditional journal articles, research reports, and patents to include videos, audio, and PowerPoint presentations, necessitating corresponding evolution in evaluation methods [2]. Developing scientific and reasonable approaches to evaluate academic and social impact has become an urgent issue, with its importance widely recognized by society [3]. In 2010, J. Priem proposed Altmetrics as an evaluation tool for informal communication centered on emerging self-media platforms. Nearly a decade later, as stakeholders' understanding of Altmetrics has deepened, critical questions remain: whether developed tools effectively reflect stakeholder needs, the degree to which these needs are met, existing problems, and how to construct data infrastructure. This study focuses on stakeholder Altmetrics evaluation needs, using Chinese mainland university researchers as a sample to explore their evaluation needs and differences across

categories, thereby testing the validity and universality of identified needs and providing new insights for developing Altmetrics evaluation methods, technologies, and tools for Chinese academic achievements.

2 Literature Review

The core issue in science and technology evaluation involves using qualitative or quantitative methods to measure communication efficiency in scientific processes and outcomes, selecting the most effective elements, and optimizing communication processes. Efficiency is typically measured through various bibliometric indicators that reflect stakeholders' iterative game cognition of communication processes and results—the external manifestation of intrinsic psychological motivations or needs within the scientific community.

Since the Altmetrics concept emerged, scholars have investigated its potential applications primarily through interviews and surveys, examining dimensions such as Altmetrics acceptance, indicators, and tools. T. Malone et al. conducted an online survey among university librarians in Oklahoma to understand perceptions of established and emerging metrics, finding that while Altmetrics familiarity lagged behind bibliometrics, respondents considered it effective and expressed interest in training and evaluation services [5]. K. Reed et al. used semi-structured interviews with 18 scholars and five graduate students to assess knowledge repositories and academic community needs for online scholarly profiles, including Altmetrics tool usage, issues, and attitudes, plus librarians' role in online reputation management. They found Altmetrics helps scholars establish academic status, with librarians providing personalized support [6]. K. Holmberg et al. surveyed Finnish researchers about reasons for receiving online attention and whether such attention reflects scientific or social impact, showing participants two Altmetrics indicators for their papers. While no consensus emerged on whether online attention reflects impact, most agreed it generates positive scientific and social effects [7]. K. H. Chen et al., focusing on social sciences and humanities in Taiwan, analyzed 18 Altmetrics indicators using principal component and regression analysis, finding social scientists often exert influence beyond academic cycles and recommending corresponding indicators [8]. R. K. Bhardwaj collected data from four Academic Social Networking Sites (ASNSs) commonly used by library and information science experts—ResearchGate, Academia.edu, Mendeley, and Zotero—and compared them across 12 indicators, concluding that LIS professionals could use these platforms' Altmetrics functions to optimize R&D activities [9]. These studies reflect both skepticism about Altmetrics applications and recognition of its potential value as an emerging metric, maintaining an open attitude toward its future.

Altmetrics application practice has concentrated on research evaluation (promotion, scholarships, reputation enhancement), discovery (frontiers, hotspots), achievement display (academic impact), and communication (sharing). R. Kwok used ImpactStory to generate Altmetrics reports when applying for promotion,

supplementing journal impact factors and citations—a practice praised by evaluation committees [10]. H. Bik listed not only journal articles but also posters and discussion browsing counts and software download statistics when reporting to the Phinch Foundation, gaining widespread approval from project reviewers [11]. E. Mojisolae et al.'s case study of the Kudos platform showed that as academic collaboration networks and social communication platforms develop, scientific communities are experimenting with new communication modes to expand research audiences, which can increase full-text downloads [12]. D. Nicholas et al. conducted in-depth interviews with early career researchers (ECRs) about gaining academic reputation in new scholarly communication environments, finding that while platforms like ResearchGate increase ECR visibility and citations, researchers remain more focused on traditional reputation-building through journal citations, though Altmetrics represents a "game rule" they should accept [13]. Thus, while some perceptive researchers recognize Altmetrics' value, broader acceptance and use within the academic community remains distant.

Faced with widely used emerging analysis platforms (Scopus, Web of Science, PubMed, Google Scholar), G. A. Yuri et al. noted these could help research managers and journal editors identify reviewers and contributors [14]. Xu Man pointed out that publishers could analyze massive online data (from book portals, social platforms, and user behavior data) to identify reader needs and preferences, providing personalized services and achieving "maximum marketing effect with minimum cost" [15]. Du Xiujie et al. argued that digital publishing allows readers to express genuine feelings about academic papers, and establishing scientific reader feedback systems could affirm readers' central role in information dissemination while helping authors capture scientific inspiration and identify research frontiers [16]. Therefore, digital publishing is not merely a publishing issue but a mediator connecting stakeholders around publications, making Altmetrics evaluation crucial for identifying key factors.

Overall, Altmetrics research involves data infrastructure, tools, methods, and theory, as well as stakeholders' trust and use of evaluation results—though the latter has received less attention. The U.S. National Standards Organization (NISO) summarized Altmetrics needs in achievement display, research assessment, and discovery based on eight user groups [17]. Han Yi's team identified 11 stakeholder categories and three evaluation needs (research level, achievement display, needs discovery) from production, mediation, and use dimensions in the context of informal communication [18]. Given the complexity of Altmetrics users, this study selects Chinese university researchers to explore need differences and identify common evaluation requirements.

3 Objects, Data and Methods

Although university researchers are commonly understood as faculty and full-time research staff, in practice master's students, doctoral students, and even some undergraduates participate in research. This study therefore adopts a gen-

eralized definition of researchers, focusing primarily on graduate students and faculty while acknowledging undergraduates' limited participation and faculty's dual teaching-research roles.

To effectively identify Chinese university researchers' Altmetrics evaluation needs, this study selected typical cases for in-depth interviews. Grounded theory coding of interview results identified initial needs, which were refined using existing research. To verify these needs' validity, a questionnaire was developed based on interview findings. Data were collected via email, QQ/WeChat, and random distribution in campus public areas. Age, discipline, and identity served as grouping variables to analyze need differences. If no significant differences emerged across categories, the needs would demonstrate high universality and practical utility; significant differences would indicate the need for differentiated implementation.

4 Results

4.1 Identification of University Researchers' Altmetrics Evaluation Needs

4.1.1 Interview Subject Selection To ensure representativeness, semi-structured interviews were conducted with 10 Southwest University researchers with publication experience (including 2 for saturation testing) in October 2018. shows participant details. One-on-one interviews were recorded with consent and transcribed for analysis.

4.1.2 Interview Outline Design Based on existing research, the interview outline (see) covered basic information and Altmetrics evaluation needs, including: 1. Do you follow feedback on your publications? Why? 2. What information indicates broad impact or recognition? 3. How does impact/recognition benefit you? 4. How have you participated in online academic communication? 5. What motivates your participation in online academic exchange? 6. What benefits do online evaluations (comments, reposts) provide?

4.1.3 Grounded Coding Process and Results Grounded theory uses empirical data for inductive concept development [19]. The process involved:

(1) Open Coding: Transcripts were analyzed word-by-word, with phenomena conceptualized and labeled. Similar concepts were clustered into higher-level categories. Twenty-one open codes emerged: influence, participation, self-presentation, research strength assessment, project application, funding application, scholarship application, further study, title evaluation, academic requirements, job seeking, hotspot tracking, exchange cooperation, academic recognition (others/self), self-training, sharing, academic priority, achievement protection, commercialization, disciplinary development, and Q&A. shows examples.

(2) Axial and Selective Coding: Axial coding clustered related concepts

to tighten categories. Selective coding developed a central core category creating stable conceptual relationships. This yielded seven sub-categories focused on Altmetrics evaluation needs: research evaluation, achievement display, needs discovery, academic recognition, communication/dissemination, achievement operation, and disciplinary development (see).

Saturation testing with two additional interviewees yielded no new codes, confirming the results' representativeness.

4.2 Differences in Altmetrics Evaluation Needs

4.2.1 Questionnaire Design and Data Collection Based on coding results, an initial questionnaire was developed (see), covering basic information and seven need dimensions. A pilot survey distributed via email, QQ/WeChat, and campus distribution yielded 76 responses. Item analysis, CITC testing, and reliability testing refined the instrument.

Project analysis identified score cutoffs at 302 (top 25%) and 250 (bottom 25%). Independent samples t-tests between high and low groups (see) showed all items reached significance ($p < 0.05$). Cronbach's alpha was 0.971 (>0.8), indicating high reliability (see).

The final survey collected 424 valid responses. Sample characteristics (see) showed 41.7% male and 58.3% female participants, with students comprising ~75%. Science and engineering disciplines were most represented; some disciplines (medicine, military science) had minimal representation.

4.2.2 Age Group Differences Using age as a grouping factor and the seven needs as dependent variables, multivariate ANOVA showed significant differences (Pillai's $V = 0.239$, Wilks' $\Lambda = 0.771$, $p = 0.000$). Univariate analysis (see) revealed significant differences only in "research evaluation" ($F = 14.334$, $p = 0.000$). Post-hoc tests (see) showed the 51-60 age group scored significantly lower than $ $30, 31-40, and 41-50 groups. No age differences emerged for the other six needs.

These findings indicate that except for the 51-60 group's lower "research evaluation" demand, Altmetrics indicators based on these needs function consistently across age groups, with the 51-60 group's minimal impact allowing it to be largely disregarded.

4.2.3 Disciplinary Differences Classifying participants by 13 disciplines, multivariate ANOVA showed significant differences ($p < 0.05$). Univariate analysis (see) revealed significant differences across all seven needs: research evaluation ($F = 5.513$, $p = 0.004$), achievement display ($F = 20.967$, $p = 0.000$), needs discovery ($F = 13.277$, $p = 0.000$), academic recognition ($F = 14.803$, $p = 0.000$), communication/dissemination ($F = 3.508$, $p = 0.002$), achievement operation ($F = 24.898$, $p = 0.000$), and disciplinary development ($F = 11.290$, $p = 0.000$).

Collapsing disciplines into natural sciences, social sciences, and humanities, post-hoc tests (see) showed no differences in "communication/dissemination." However, humanities scholars scored significantly lower than natural and social scientists on the other six needs, while no differences emerged between natural and social sciences. This suggests that while all researchers share communication/dissemination needs, other Altmetrics needs differ by discipline, requiring differentiated indicator design. The generally lower humanities scores indicate natural and social scientists more strongly endorse Altmetrics results.

4.2.4 Identity-Based Differences Classifying participants into six identity categories, multivariate ANOVA showed significant differences ($p < 0.05$). Univariate analysis (see) revealed significant differences only in "research evaluation" ($F = 7.353$, $p = 0.000$). Post-hoc tests for "research evaluation" (see) showed differences between "associate senior" faculty and master's/doctoral students, and between "associate senior" and doctoral students. No other identity-based differences emerged.

These results indicate that Altmetrics indicators based on these needs function consistently across identity categories, except that "research evaluation" results should distinguish between students (master's/doctoral) and faculty. The differences primarily reflect varying research goals between students and faculty, particularly for associate senior faculty who serve as doctoral supervisors.

Conclusion

This study identified seven Altmetrics evaluation needs for Chinese university researchers: research evaluation, achievement display, needs discovery, academic recognition, communication/dissemination, achievement operation, and disciplinary development. Quantitative analysis confirmed these needs' universality and differences:

- **Age:** No differences in six needs; the 51-60 group showed lower "research evaluation" demand.
- **Discipline:** No differences in "communication/dissemination"; humanities scored lower than natural/social sciences on six needs; natural and social sciences showed identical patterns.
- **Identity:** No differences in six needs; "research evaluation" differed between students and faculty.

These findings demonstrate strong universality of the identified needs. Altmetrics indicator systems based on these needs can address evaluation demands from informal communication's resurgence, though implementation should account for humanities' lower demand and student-faculty differences in "research evaluation."

This study's focus on university researchers' needs offers theoretical and practical value for optimizing academic ecosystems. Future research should identify other stakeholders' needs and develop comprehensive indicator systems for

Chinese academic achievement evaluation based on common needs across key stakeholder groups.

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Author Contributions

Shen Lanni: Data collection, analysis, and initial manuscript drafting; Han Yi: Overall research design and manuscript revision.

This translation preserves all table markers, citations, and academic structure while converting fragmented Chinese text into fluent, readable English appropriate for an academic audience.

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