The Influence of Academic Social Media on Research Practices and Scholarly Collaboration

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Abstract: *This evaluation examines academic and researcher use of Academic Social Networking (ASN) sites from 2001 to 2020. According to the literature, users from different disciplines utilize different ASN platforms at different frequencies. Discipline-specific social and cultural behaviors may explain the substantial disciplinary influence. The evaluation shows professional prominence as a major incentive for academics and researchers to join ASN sites. Seeking scholarly answers, earning citations, seeking experts, sharing research literature via ASN self-archiving, exploring collaborative research possibilities, and job hunting are further motivators. The evaluation found that alternate metrics for research impact are becoming more popular. Age and gender discrimination, snooping, academic cyber bullying, and flooding ASN sites with substandard literature were also identified as issues that need more research and ASN interface modifications to better meet user needs*

Keywords: Academic Social Networking, Research Collaboration, Information Sharing.

I. INTRODUCTION

J.A. Barnes introduced social networks in 1954. It was difficult to study social network dynamics before Facebook, even though research began in 1967. Quantifying the subjective impression of closeness and intimacy in a one-to-one social network interaction was most important. Tracking information through a social network was difficult because data collection was mostly manual and relied on inaccurate survey responses. According to sociologist Duncan Watts, "a much better approach is to record what it is that people actually do, who they interact with and how they interact.". The transition from static Web 1.0 to dynamic Web 2.0 gave rise to online social networks, which enabled Watts's idea of recording what people do, who they engage with, and how they interact.

Web 2.0 social networking applications have created several web-based platforms powered by online feedback mechanisms like computer-mediated communication technologies that offer common functions like visible profile creation, sharing social connections and messaging, generating and sharing content, accessing others' content, posting comments etc. SixDegrees.com was the first significant social networking site created in 1997, followed by many others. But the most significant milestone in computer-mediated social networking was Facebook's emergence as the most popular site in terms of registered users. In 2018, Facebook reached 2.25 billion users. Several Facebook competitors, including Hi5, MySpace, and Friendster, fell behind and exited the stage. Other social media networks with over one billion subscribers include Youtube and Whatsapp.

Recently, social networking services have become household names with many societal uses. SNS is popular among scholars, who use it for teaching and other scholarly communication. While general social networking sites foster a sense of community among users, their constant stream of information from various sources can lead to information overload, difficulty separating personal and professional life, and security concerns, including cyber-bullying. Academic Social Networking Sites (ASNSs) are gaining popularity among academics and researchers due to their focus on scholarly communities, enabling sharing of papers, datasets, information, and publication analytics. Using Web 2.0 technologies in academia and research has given academics and researchers unprecedented opportunities to connect and communicate with peers, researchers, and experts worldwide.

Several online ASNSs support academic and research activities. Few (Academia.edu, ResearchGate, Penprofile, LinkedIn) originated as pure ASNS. Some systems, like Mendeley and Zotero, were initially social bookmarking and

reference management tools but now include networking functions. This paper examines how academics and researchers have used ASNSs in the first two decades of the 21st century.

Objectives of the study

- Analyze motivations for connecting and using ASNSs at individual and group levels using network structure analysis.
- Explore academic social interactions.
- Analyze academic social networking data as an alternative to traditional impact assessment;
- Promote future research by highlighting understudied issues or areas requiring further study (e.g., interface design and modification).

II. METHODOLOGY

To better understand how academics and researchers are using academic social networking sites in response to the unprecedented invasion of social networking technology into academic and research domains, this study critically reviewed and examined the literature.

A two-stage literature search occurred. The first step was to search LISTA, an abstracting and indexing database hosted by EBSCO, for literature on 'academic social network', 'academic social networking', and 'academic social networking sites' to ensure comprehensiveness.

Based on titles and abstracts, 40 publications were relevant. In the second stage, the content of the 40 articles was carefully examined, and sub-facets like network structure analysis, academic social interaction, peer and expert seeking behavior, quality of exchanged information, and others were used as search entities in Google Scholar search to find more research on those dimensions to enrich the review. The review did not limit itself to literature on undergraduate and postgraduate students' usage of academic social networking sites or pedagogy. Non-English articles were excluded from this investigation.

Network structure analysis

Network structure analysis is a powerful tool for understanding community structure, incentives for connecting, and ASNS usage trends. Academic social networking sites have smaller, more clustered networks than Facebook, Twitter, etc. Jordan (2014) found that discipline shapes ASNS community structure via network structure analysis. Megwalu (2015) examined how physics, linguistics, and sociology scholars use Academia.edu through discipline. He observed that physicists use Academia less than linguists and sociologists. Linguists and sociologists use Academia for different reasons.

Ortega (2015) included humanities, social sciences, and biological scientists and examined usage behavior on Academia and ResearchGate to observe these disciplinary differences across ASN platforms. Humanists and social scientists dominated academia, whereas biologists chose Researchgate. Users of different disciplines utilize different academic social networking platforms and at different frequencies. Ortega observed that humanities, social sciences, and natural resources scientists communicated more than biologists. Another reciprocity study by Goldstein (2020) found that arts and humanities were more reciprocal than other disciplines.

User motives and behaviors vary per discipline due to social and cultural practices. This premise applies to engineering too. Marahmani (2018) observed that engineering researchers at the University of Teheran had the most LinkedIn members after ResearchGate. LinkedIn has been the most successful tool for promoting employer and employee portfolios. Engineering researchers are naturally more active LinkedIn users due to the discipline's social and cultural traditions of industry absorption and advancement.

When researchers and academics from many disciplines generate a lot of interdisciplinary data, the discipline-centric structure may blur. Studying this network structure may assist find interdisciplinary partners and peer reviewers by mapping academic social media friend discipline distribution31. However, academic social networks of corporation users had limited multidisciplinary interactions.

This network structure shows that users from higher research activity universities and institutions perform better in ResearchGate metrics (publications, profile views, citations, number of followers, etc). The follower-followed

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relationship, the foundation of academic social networks, can be used to analyze institutional and corporate network trends by comparing information source, friend, and information seeker users.

Yan et al. (2018) found that while information seeker users remained consistent, friend users increased with a university's intellectual reputation. Corporations on academic social networking sites build their social networks on follower–followed relationships, but they connect with institutional users in regions with high research impact and interact most with universities. In this respect, academic social networking sites are superior catalysts for industry-university–research collaboration.

Networks have the following general tendencies, regardless of ASNSs or institutions: Many academics have few connections to others in the network, while a few have many; faculty with more profiles are more visible in search engine results, and faculty with authority records are ranked higher in search results; network centrality of nodes is linked with academic seniority, and junior academics, although more active site users, are more peripherally placed.

Academic socialization

ASNSs members are motivated by the potential benefits to the academic community, such as networking with peers, expert advice, self-expression, research updates, creating and joining events and discussions, exploring collaborative projects, finding jobs, and sharing published and unpublished scholarly works like articles, conference presentations, and other media files.

Salahshour Rad et al. (2019) used the Unified Theory of Acceptance and Use of Technology to validate academic researchers' ASNS adoption intentions. The model includes constructs of perceived security, privacy, trust, and attitude toward technology and communication benefits. They observed a positive link but found that age, gender, and experience as moderators have little or no effect on scholars adopting ASNSs. One reason scholars join ASNSs is to boost their professional visibility.

If a scholar joins an ASNS or a group, profile presentation is the initial step that contains potential and danger for future scholarly endeavors. ASNS users come from a variety of scientific backgrounds and academic degrees, hence their self-presentation and communication styles vary. Thus, studying how academics and researchers show themselves to colleagues and how they are seen professionally and attractively is worthwhile.

Tsou et al. (2016) found that older male researchers in profile images were perceived as more professional than females and young people. As such, ASNSs reflect professional ties rather than social interaction. Ostermaier-Grabow and Linek (2019) observed that on ResearchGate, young male academics without prior ties typically engaged in intellectual exchange. This exchange may be limited to young academics. Older and more experienced academics and researchers may limit scholarly exchanges of sensitive data with new entrants for security reasons, such as a lack of knowledge about them and suspicion about their motives. Experienced academics and scholars look comfortable with renowned scholars and researchers.

The communication is objective, professional, and unemotional, with no polite greeting or farewell. Colloquial and emotional language are less popular in ASN communication than in general social networking, save among researchers with long-term associations.

The global reach of ASNSs makes scholarly communication and research dissemination possible. This opportunity encourages scholars to post on ASNSs. Reads and citations increase with wider circulation. This may explain why users prefer publishing articles over projects48. This may explain why Shrivastava and Mahajan (2017) reported the strongest association between ResearchGate score and physics researchers' publications.

However, access to expensive journal papers stored and controlled by profit-making publishers is limited, forcing users to utilize academic social network search and communicate with other scholars. Third-world countries have restricted access to expensive journal publications through institutional subscription due to budgetary constraints.

Seeking peers and experts

Strong ASNS networks allow users to search for, choose, and connect with peers and experts in a certain field. In a curious study by Wu et al. (2021), they chronologically linked ResearchGate users' navigation pathways to understand expert seeking behavior and found that seekers targeted profile, search, and publication pages to assess a person's expertise in a particular domain. Users focused on research result pages on profile pages.

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Quest for the quality of scholarly information

ASNSs are becoming popular as "Facebook for nerds" among academic and research professionals, hence they are being evaluated for sharing and accessing discipline-specific information. With so many questions being posted, discussed, and answered on ASN platforms, it's interesting to examine how information searchers and experts evaluate answers.

Li et al. (2018) found a common thread in library and information services, history of art, and astrophysics: high-quality answers are longer, contain objective information and fewer subjective opinions, and are given by scholars with a good academic reputation and a large following. Users also perceive good information quality based on peer cues since scholars have comparable research goals. Collective input on an answer (Facebook 'like' concept) may influence a recommending researcher. Demographics, discipline, and ASNS credibility may impact a scholar's answer. Other quality criteria including relevance, completeness, verifiability, comprehensiveness, scholarship, and value-added may apply to generic answers. Objectivity varies by discipline. The answer sometimes depends on the questioner's aim to learn or discuss.

What makes an ASNS query or answer popular among scholars? The statement in a question and/or its answer may motivate a scholar to read, follow, or promote it.

Deng et al.'s (2019) study found two interesting facts: first, the threshold effect, where scholars quickly lose interest if the question description exceeds 150 words and do not read it; second, questions with positive action-oriented statements are likely to be read by other scholars. Scholars also advise answering with positive procedural or negative action-oriented remarks. A smart design and incremental enhancements of academic social networking interfaces could reduce misunderstanding, clarify questions, and promote scholarly content management.

Looking beyond an institutional repository

Traditional profit-making publication strategies limit access facilities by imposing conditions on the worldwide audience, limiting the visibility of individual academics' research output globally. Since academic social networking began, it has allowed scholars/researchers to advocate for easy access to their publications by using ASN platforms' archiving services.

Uploading academic work, material, or research data to personal websites or institutional or subject repositories to make them publicly available online is called "self-archiving". This contains refereed/non-referred journal articles, conference articles, raw data, full-texts, bibliographic information, and research materials. Institutional repositories may have covered the for-profit publication sector policy gap. However, institutional repositories have not been the preferred venues for self-archiving, with ASNSs like Research Gate outperforming institutional deposits.

What motivates scholars to self-archive on ASNSs? Lee et al. (2019) developed a motivational model for self-archiving on ASNSs, incorporating factors from personal, social, professional, and external contexts. This model was based on previously studied motivations for self-archiving in academia and information sharing in social media. Accessibility was the top rated factor due to the perceived benefits of open access, followed by altruism, reciprocity, trust, self-efficacy, reputation, and publicity. Thus, ASNS benefits increased research scholars' misunderstanding of institutional repositories. As indicated earlier, motivational factors depend largely on a discipline's self-archiving culture and hence vary in priority when comparing disciplines.

Copyright concerns, extra time and effort, technological ability, and age hinder self-archiving. Academics and scholars may avoid self-archiving to avoid legal concerns as copyright transfer to publishers is not optimal. Academics and researchers may be deterred from utilizing ASN platforms because to the time required to learn and use them. Additionally, the digital divide, particularly the lack of technology knowledge, may deter authors from self-archiving. As they near retirement, older academics may not be motivated to stay up with ASNS technologies.

Due to their professional compulsion, higher education librarians are aware of copyright issues related to self-archiving on institutional repositories, personal websites/servers, and ASNSs. They also understand that increased visibility of self-archived papers may lead to citations and international collaboration for research projects, which may prompt them to rein

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The underlying concern is that ASNSs are being used to self-archive preliminary research, works in progress, and conference presentations that are no longer publishable owing to quality issues. This would vastly increase garbage in scholarly search results, creating an undesired excess.

Exploring possibilities of alternative metrics

As ASNS traffic grows, academics and research researchers generate a lot of data from their use of academic social media sites. Relational aspects of scientific effect have challenged standard impact measurements for ignoring the significance of academic-research researcher interactions81. The narrow view of judging a scientist's research production based on citations or JIF values is inadequate to portray the greater canvas of research and academic evaluation.

It is now being seriously debated and researched whether alternative metrics (altmetrics), generated from academic social interactions on different ASN platforms, are mature enough to be considered an alternative and reliable to traditional scientific impact measures or at least a supplement. Could an institution's national/international rating and alternate metrics score be correlated? While researching on ResearchGate, Ali et al. (2017) found no association between an institution's national/international ranking and its RG Score, while lower-ranked institutions had lower RG Scores.

Apart from an institutional perspective, exploring the relationship between altmetrics and bibliometric indicators at other levels (author, article, and journal) may help determine how well ASNS altmetric indicators can be used as a proxy for research impact.

Ortega (2015) found little correlation between altmetrics and bibliometric variables at the author level. The site dependency of altmetric indicators made them unstable across platforms because one author may manage only one profile on one ASN platform or have different profiles for different platforms, and different ASN platforms manage usage and social indicators differently.

Although bibliometric indicators are time-tested and more stable across websites, citations take time to collect, making them unsuitable for study evaluation or effect assessment. Due to citation distribution skewness, Journal Impact Factor may not accurately reflect an article's potential citation value (article-level indicator) within a journal to compensate for the loss of initial years (when an article may have insufficient citations.

Recent scholarly forms including databases, software, and research blogs are not recognized as citable research objects. Outside of the 'citing-cited' relationship and its offshoots, many scholarly publications are read but not cited. Thus, altmetric indicators with novel methodologies may address the aforesaid difficulties, but typical citation practices may not.

Alhoori and Furuta (2014) examined altmetrics on article and journal levels to determine if research papers' online interest was related to academic impact or other criteria. They observed that online attention to scientific papers is connected to journal rankings and favors long-standing journals. They found substantial relationships between journal-level altmetrics but modest correlations among article-level altmetrics. Academic social network reading correlated most with citation-based measures of all altmetrics analyzed. Similarly, Ergüta and Camkıran (2021) found a substantial association between citation numbers and Mendeley reading counts.

Researchers have used RGScore, a ResearchGate indicator that measures how peers view a researcher, to quantify and understand correlations between altmetric indicators and compare it to other traditional bibliometric indicators in research impact assessment at the individual researcher level.

Shrivastava and Mahajan (2017) discovered a high positive link between RGScore and reads, profile views, Full Texts, and follows of physics academics in their altmetric examination of ResearchGate profiles. A substantial association was found between RGScore and ResearchGate citations. ResearchGate correlated positively with Scopus metrics but RGScore did not correlate with citations (Scopus). RGScore and other altmetric metrics had minimal connection with article-level citation count. Altmetric indicators, while subject to platform-specific dynamics, may enrich and differentiate scientific impact evaluation, but time may not be ripe to replace standard bibliometric indicators.

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II. CONCLUSION

The Budapest, Berlin, and Bethesda Declarations95 of the Open Access Movement made scientific research papers accessible to researchers, citizens, and taxpayers worldwide in 2002 and 2003. The 2012 San Francisco Declaration on Research Assessment (DORA) recommended altmetrics above JIF for scientific and research communities worldwide. These two seemingly unconnected events of the first two decades of the 21st century revolutionized research publication, reading, and assessment, generating ASNS' multidimensional metrics data centers for published literature. Research funding institutions in developed countries evaluate articles and projects based on downloads, reads, expert opinion, citations, connections, bookmarks, conversations, etc. Higher education, research, and finance institutions that employ conventional metrics to quantify research effect may examine altmetric data for a thorough evaluation.

After open access's popularity, academics and researchers need learn about creative commons to publish and self-archive without copyright issues. Active ASNS has several benefits. Library and information science professionals of higher academic and research institutions can stimulate academics and researchers by organizing workshops and lecture series on ASNS features and use, highlighting ethical issues, to increase individual and institutional participation with widespread benefits.

Despite its benefits, ASNSs may cause gender discrimination, academic cyberbullying, plagiarism, espionage, and intellectual junkyards for undesired articles. Most ASNSs are for-profit enterprises marketing the network, therefore expectations may not be met. With increased ASN platform features, such as unique interface design, ANS service providers may overcome bias and improve user experience and security. AI research is growing, therefore ASNSs may leverage cutting-edge AI algorithms to better understand academics' information search behavior and needs and provide more targeted recommendations. Understanding sociocultural elements like individualism-collectivism may help academics accept ASNS and build more responsive ASN platforms.

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