Macro-appraisal and Professional Communities

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Abstract: This paper explores the application of social network analysis tools and other quantitative measures for the macro-appraisal of a research community in order to identify individuals from whom to solicit professional papers. While the contributions of individual scholars can be quantified and reviewed in a variety of ways, network analysis provides a useful approach for assessing the contributions of scholars in terms of their connections with other researchers. Using the faculty of a university department as a case study, this study considers how visualizing networks might be used as an additional metric in a professional papers program or subject-based archive to select which faculty members to solicit for donations.

Introduction

The existing literature on appraising faculty papers recommends a range of criteria that might be used in determining which individual faculty members to solicit for donations. Contributors to the Society of American Archivists' reader *College and University Archives* variously suggested everything from "most senior faculty members" to "every professor who is given a tenure position."[1] Over time, however, advice on approaches to solicitation have moved away from categories to focus on the high-level macro-appraisal of individual contributions, or a subsequent appraisal of the content of the collections themselves. In her thesis, Frances Fournier recommended that individuals be assessed in terms of their "excellence in research, teaching, university service, and community service."[2] Tara Z. Laver used these same categories of assessment in her survey of faculty papers program, but noted the difficulty in evaluating these aspects of faculty work and the potential for subjectivity in archival appraisal.[3]

While determining whose papers to solicit is often seen as subject for a qualitative analysis, increasingly the contributions of university faculty members are being quantified and reviewed in a variety of ways. Faculty have increasingly turned to bibliometrics such as h-index values or student ratings to support their bids for tenure.[4] Along with these measures, network analysis provides a useful approach for assessing scholarly contributions and service.

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[1] Maynard Britchford, "Appraisal and Processing," and Laurence R. Veysey, "A Scholar's View of University Archives," in *College and University Archives: Selected Readings* (Chicago: Society of American Archivists, 1979), 12, 148.
[2] Frances M. Fournier, "Faculty Papers: Appraisal for Acquisition and Selection" (Thesis, University of British Columbia, 1990), 136.
[3] Tara Z. Laver, "In a Class by Themselves: Faculty Papers at Research University Archives and Manuscript Repositories," *American Archivist* 66, no. 1 (2003): 189.
[4] See Cameron Barnes, "The h-index Debate: An Introduction for Librarians," *Journal of Academic Librarianship* 43, no. 6 (2017): 487-494, or Angela R. Linse, "Interpreting and Using Student Ratings Data: Guidance for Faculty Serving as Administrators and on Evaluation Committees," *Studies in Educational Evaluation* 54 (September 2017): 94-106.

Published by Society of American Archivists, May 2020.

Problem Statement

This project sought to review and examine available methods for quantitative assessment of the faculty of a university department to identify individuals to solicit for the donation of their professional papers. Due to Brigham Young University's focus on religious education, the college of Religious Education faculty has been well represented in the University Archives. Using the Church History and Doctrine Department within that college, available statistical measures were identified and selected in each of the areas of faculty professional assignment, namely: teaching, professional service, and research/publication. The validity and applicability of these measures were then evaluated.

Methodology

In order to endeavor a quantitative analysis, data sources were identified for each of the areas of assignment, with varying levels of success. In the area of teaching, RateMyProfessors.com (RMP) was used due to the public accessibility of its measures.[5] Information about faculty participation in professional service was compiled based on web-accessible copies of each department member's curriculum vitae. Connections to professional organizations and institutions were recorded in a spreadsheet and normalized, both to produce statistics and for network analysis. Finally, data on research and publication activities were harvested from Google Scholar[6] using the bibliometric application Publish or Perish.[7] Statistical measures for faculty productivity were generated by Publish or Perish, while citation data was exported and normalized to produce a bibliographic citation network graph.

Network analysis was performed in order to look at the representativeness of individual faculty members. In these cases, individual centrality measures and overall graph modularity measures were produced using the open source application Gephi.[8] These measures were then used to determine how connected a faculty member's work was to work done across the department.

Results

[5] Institutionally administered student course rating data is not available publicly at the university. The RateMyProfessors.com website allows students to rate faculty members in terms of overall quality, difficulty, and whether they would take a course with them again. Each of these criteria are given a score of between 1 and 5 by student reviewers, and the faculty member's average scores are available on the site. See "About RateMyProfessors.com," RateMyProfessors.com, https://www.ratemyprofessors.com/About.jsp (viewed Nov. 1, 2019).

[6] The Google Scholar service provides a search engine for scholarly publications, including academic journals, books, theses, and other sources. Citation data is identified in each source, allowing researchers to identify other works that are based on a given study. See Google Scholar, "About," Google, https://scholar.google.com/intl/en/scholar/about.html (viewed Nov. 1, 2019).

[7] The Publish or Perish application, developed by Anne-Wil Harzing, allows academics and others to analyze Google Scholar or other databases to produce statistical analyses of scholarly productivity. Available measures include total citation counts, average citations per article, Hirsch's h-index, and other metrics. See Anne-Wil Harzing, "Publish or Perish," Harzing.com, https://harzing.com/resources/publish-or-perish (viewed Nov. 1, 2019).

[8] The Gephi application produces network graphs for data visualization and exploration, as well as producing overall graph statistics and statistics for individual nodes. See "Gephi: The Open Graph Viz Platform," Gephi.org, https://gephi.org/ (viewed Nov. 1, 2019).

Looking first at RMP evaluation data for teaching, the compiled statistics showed that the Church History and Doctrine Department as a whole had relatively high scores on the evaluations. As a group, the department average overall quality rating was 3.99 out of 5, with 71 percent of students reporting that they would take a course with a given professor again. On the other hand, the average difficulty of courses reported in the RMP data was fairly low, at 2.66 out of 5.

Within the faculty, 22 out of 35 individuals (62.9 percent) scored a 4 or higher in overall quality ratings. The highest scored instructors in overall quality (n=11) also tended to receive high ratings on whether a student would take a course with that faculty member again, but had lower than average difficulty ratings (see Table 1).[9] These findings illustrated the biases noted in RMP analyses, which have noted the positive correlation between reported overall quality and the easiness of the course.[10]

Faculty name	Overall quality	Would take again	Difficulty
FM25	4.8	0.9	2
FM23	4.7	--	2.2
FM34	4.7	0.91	2.3
FM31	4.7	0.9	2.6
FM30	4.6	0.77	2
FM29	4.5	0.88	1.3
FM27	4.5	0.93	2.4
FM10	4.4	0.89	2
FM15	4.4	0.92	2.9
FM16	4.4	0.89	2.2
FM4	4.4	--	2.1

Table 1. RateMyProfessors.com statistics for faculty members with highest overall quality ratings

[9] Individual faculty member names have been removed for this report and replaced with an identifier.
[10] Andrew S. Rosen, "Correlations, Trends and Potential Biases Among Publicly Accessible Web-based Student Evaluations of Teaching: A Large-scale Study of RateMyProfessors.com Data," *Assessment & Evaluation in Higher Education* 43, no. 1 (2018), 31-44, https://www.tandfonline.com/doi/full/10.1080/02602938.2016.1276155 (viewed Nov. 1, 2019).

Reviewing the compiled data from department faculty CVs, entries related to professional service appeared to vary depending on the comprehensiveness of the document available on the department website. While some faculty enumerated all their activities across their careers, others appeared to limit this list to just their most prestigious or recent involvement. This lack of consistency reduced the reliability of the statistical counts as a measure of relative involvement in this area of professional assignment.

Graphing the available connections in Gephi reflected the shortcomings of the CVs as a data source. The node with the highest degree value, as shown in Figure 1, is the university itself at the center of the graph. The degree values, as well as centrality measures of individual faculty members were tied directly to the completeness of the CVs (see Table 2). Nevertheless, the graph allowed identification of professional associations with high degree values and their relationship to faculty members, indicating which affiliations were most common amongst the department faculty as a whole.

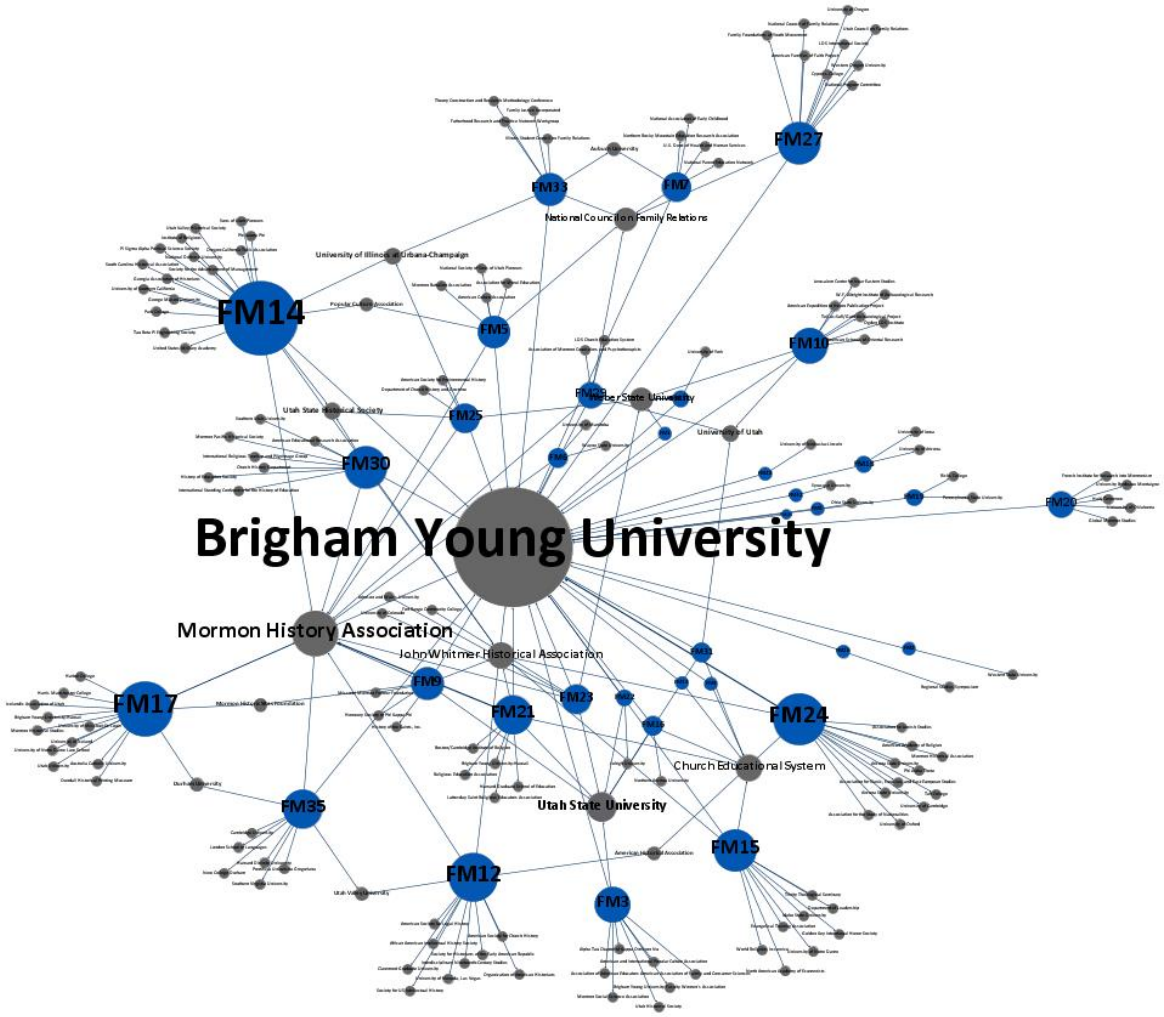

Figure 1. Professional network based on faculty CV references

Faculty name	Degree	Closeness centrality	Eigen-centrality
FM14	21	0.38758	0.413458
FM17	15	0.377871	0.298625
FM12	13	0.374741	0.279846
FM24	13	0.374741	0.239078
FM27	11	0.371663	0.204197

Table 2. Association network statistics from Gephi, by faculty member

Finally, looking at research output, Publish or Perish provided a range of statistics quantifying faculty member productivity. Per the Google Scholar data, faculty published an average of 23.71 papers over the course of their careers, with an average number of 99.91 cumulative citations for all papers. These numbers varied somewhat, depending on the length of an individual's career and the genre in which they wrote. This variation was also evident in h-index values, which measures the number of papers cited a given number of times. On average department faculty had an h-index value of 3.83, which is to say that on average each faculty member had published 3.83 papers that had received 3.83 citations. However, individual h-index values ranged from a high of 17 to a low of 1 (see Table 3).

Faculty name	h-index value	Papers	Citations
FM33	17	42	895
FM10	8	39	187
FM7	8	13	264
FM14	7	62	158
FM22	7	58	173
FM4	7	38	300
FM6	6	55	114
FM17	5	84	141

FM9	5	56	143
FM34	5	47	47

Table 3. Google Scholar statistics, gathered from Publish or Perish

Examining citation data in terms of a bibliographic network provided additional statistics to suggest how representative faculty contributions were in the context of the department as a whole. In this case, the authors of each work that cited a faculty member were compiled from Google Scholar citation data and graphed using Gephi to create a network map. The resulting graph for the bibliographic citation network was characterized by a low average degree per node (1.107 citation relationships per author), low graph density (0.001, or 0.1 percent of all possible citation relationships), and high modularity (0.788, indicating significant segmentation and low interconnectedness within the network) (see Figure 2).

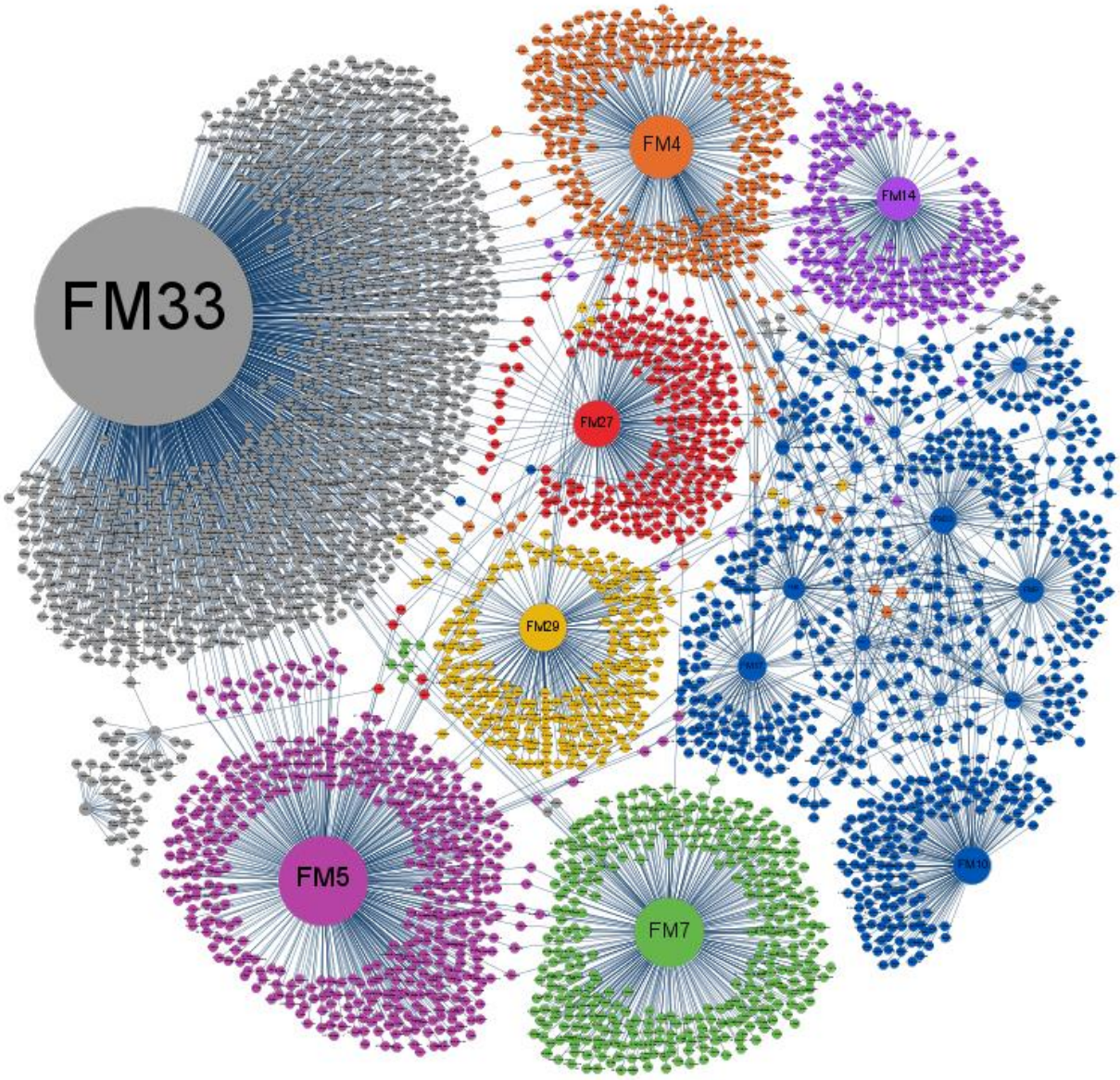

Figure 2. Bibliographic citation network, based on Google Scholar data

Among individual faculty members, degree values reflected the citation statistics produced by Publish or Perish. Some numbers in this analysis were higher, as some citations with multiple authors were split to indicate one-to-one citation relationships. For example, Faculty Member 33 (FM33) had 895 citations in Google Scholar, but 1,293 citation relationships in the network graph (see Table 4). However, these changes did not significantly affect the relative statistical measures across the department.

More significantly, shading the graph based on modularity (as shown in Figure 2) revealed the connections between faculty research outputs. While faculty members with higher citation counts tended to have large clusters of citations surrounding them, these citing authors were not well connected with other portions of the graph—reflecting the overall low graph density (0.001). On the other hand, the portion of the graph shaded dark blue included a number of faculty members participating in the same

citation community, suggesting that their work is perhaps more representative of the research of the department as a whole.

Faculty name	Degree	Closeness centrality	Eigen-centrality
FM33	**1293**	**0.408359**	**1**
FM5	**499**	**0.36018**	**0.1225**
FM7	**369**	**0.301414**	**0.049946**
FM4	**335**	**0.366192**	**0.054888**
FM29	**237**	**0.317401**	**0.027997**
FM27	**235**	**0.324624**	**0.040686**
FM14	**213**	**0.31311**	**0.022257**
FM10	**179**	**0.272437**	**0.016195**
FM17	**124**	**0.339824**	**0.012993**
FM22	**113**	**0.327571**	**0.015229**
FM9	**109**	**0.318614**	**0.017144**

Table 4. Bibliographic network statistics from Gephi, by faculty member

Findings

Reviewing and comparing the results of the different quantitative measures for each area of faculty service, a few patterns emerged. The network maps provided a means of visualizing the diversity within the department, with faculty members participating in differing professional communities. While each faculty member had different strengths, none of the individual department members ranked highly in all categories of professional service for which statistical measures were compiled. Six (17.1 percent) had high rankings in two out of three categories: FM10, FM34, FM4, FM14, FM17, and FM27. Another 14 (40 percent) ranked highly in one category.

While the best available sources were used to generate quantitative measures for the study, it is important to note that these did have some limitations. As noted previously, university-generated statistics from student reviews are not publicly available, which necessitated the use of RateMyProfessors data. Similarly, the CVs available from the department website were produced with different levels of detail by each faculty member. In examining research productivity, the focus on publications and static metrics such as the h-index may also exclude some forms of scholarship or prejudice the results against early-career faculty members.

While additional work is needed to improve the study's methodology, the exercise proved useful. Quantifying faculty contributions using statistical measures, including the use of network analysis tools to examine representativeness, provided an approach to overcome subjectivity in evaluating faculty contributions. Based on selected quantitative metrics of faculty member prominence and representativeness, six individuals were identified to be solicited for their papers in the future.

Conclusion

Fournier and other authors have suggested that faculty papers should be acquired based on an evaluation of their creators' "excellence in research, teaching, university service, and community service."[11] At Brigham Young University, the current collection development policy that supports collecting the papers of selected members of the Religious Education faculty only includes a subset of these responsibilities with its focus on documenting teaching and research. While previously the decision to solicit a faculty member's papers was largely based on a subjective assessment of their "excellence", the ready availability of quantitative measures produced by this research was found to be helpful in making macro-appraisal decisions. However, statistical measures of publishing such as h-index may not give enough context when selecting individuals as representatives of the department's output.[12] Adjustments in the metrics used in quantifying faculty member contributions should be considered, while repeating these analyses periodically would help capture the contributions of individuals at different stages of their careers.

Resources

--------. "About RateMyProfessors.com," RateMyProfessors.com, https://www.ratemyprofessors.com/About.jsp (viewed Nov. 1, 2019).

--------. "Gephi: The Open Graph Viz Platform," Gephi.org, https://gephi.org/ (viewed Nov. 1, 2019).

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Harzing, Anne-Wil. "Publish or Perish," Harzing.com, https://harzing.com/resources/publish-or-perish (viewed Nov. 1, 2019).

[11] Fournier, "Faculty Papers," 136.
[12] For more information on h-index and alt-metrics, see Barnes, "The h-index Debate."

Laver, Tara Z. "In a Class by Themselves: Faculty Papers at Research University Archives and Manuscript Repositories," *American Archivist* 66, no. 1 (2003), 159-196.

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