FROM THE EDITORS

KNOWLEDGE COMBINATION: A COCITATION ANALYSIS

Knowledge creation is perhaps the most important goal for any research community. But how is new knowledge created? Many scholars have suggested that combining existing knowledge is the key process for new knowledge creation (e.g., Kogut & Zander, 1992; Nerkar, 2003; Schumpeter, 1934; Tsai, 2001). New knowledge emerges when individuals/organizations make incremental adjustments to improve existing knowledge, discover new applications of existing knowledge, or invent new combinations of existing knowledge.

In our profession, the link between knowledge combination and knowledge creation manifests in the way we draw on various previous studies to serve as the foundation for new academic articles. To create new knowledge that advances the understanding of important organizational phenomena, scholars may integrate different areas of research to develop new theoretical or empirical models. Scholars may also combine two perspectives that seem irrelevant to each other by uncovering the hidden similarity or resolving the discrepancies of contradictory findings. By examining how different previous studies are cocited (appear together in the reference list of a later article), we can gain a picture of knowledge combinations and better understand our field’s development and progress.

When evaluating the progress of a research field, scholars have expressed different views on how much consensus researchers should have (e.g., Kilduff, Tsai, & Hanke, 2006; Kuhn, 1962; Lakatos, 1970). Although some scholars associate a high degree of consensus with the steady scientific progress of a field or a paradigm, other scholars value the laissez-faire, let-a-thousand-flowers-bloom spirit—in seeking diversity rather than overall consensus (see, for example, a series of dialogues starting with Pfeffer [1993] and Van Maanen [1995] for a debate on this issue). We probably cannot solve this ongoing philosophy of science debate. But we can analyze the way we combine knowledge in our publications and provide some insights into the degree of consensus we currently have. Are we developing a single, interconnected knowledge base among dispersed management scholars? Or do we have multiple distinct bodies of knowledge that are largely unconnected with one another?

Cocitation analysis is a tool that allows studying the development of our field. It also can motivate us to think about our publication strategies. For example, it is not uncommon to see senior scholars advise doctoral students to position papers differently for different journals. People spend a tremendous amount of time contemplating how to cite different literatures strategically to position their papers for certain journals. This becomes an important publication strategy if our field does not have an interconnected knowledge base but rather is fragmented into knowledge silos centered around different journals. What does our field look like? If cocitation analysis shows that different patterns of knowledge combination exist in different management journals, then that means we tend to write different kinds of papers for different management journals (or different journals tend to accept different kinds of papers). One implication is clear: we as authors should want to know more about each journal’s distinctive character to increase the chances of our papers getting accepted in each journal.

In this editorial, we analyze how major articles in our field are cocited by publications in the Academy of Management Journal (AMJ) and in a few other management journals to understand their patterns of knowledge combination. We want to know if there is a consensus among different management journals on the way they combine existing knowledge. Specifically, from AMJ’s perspective, we want to explore the following questions: Is AMJ’s pattern of knowledge combination similar to those of other management journals? If not, what can AMJ learn from other journals’ knowledge combination?

COCITATION ANALYSIS

Cocitation analysis is a bibliometric technique that uses reference data to identify the connections among a group of articles. Cocitation occurs when two earlier articles are cited together by a later article. This event suggests that the later article has combined knowledge from the two earlier articles. Thus, cocitation reflects how prior works relate to each other as they both influence the same later article.

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TABLE 1
Cocitation Statistics\(^a\)

<table>
<thead>
<tr>
<th>Cocitation Statistics</th>
<th>AMJ</th>
<th>ASQ</th>
<th>JM</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of publications, 1981–2008</td>
<td>1,210</td>
<td>533</td>
<td>739</td>
<td>609</td>
</tr>
<tr>
<td>Number of cocitation pairs</td>
<td>1,366</td>
<td>879</td>
<td>1,068</td>
<td>1,199</td>
</tr>
<tr>
<td>Total count of cocitations</td>
<td>5,202</td>
<td>2,806</td>
<td>3,902</td>
<td>4,824</td>
</tr>
</tbody>
</table>

\(^a\) The numbers are obtained from the SSCI online database and may be slightly different from the actual numbers. For example, SSCI started to record JM articles in 1982, but the first issue of JM was published in 1976.

ANALYSES AND RESULTS

Overview of Cocitation Pairs in Each Journal

The 100 target articles contain 4,950 possible pairs \(C_{100}^{2} = 4,950\) that later scholars could cite together; we call these cocitation pairs. However, not every pair actually gets cited. Also, some

\[\text{67\% of AMJ's cocitation pairs are not cocited by any ASQ articles.}\]

\[\text{49\% of ASQ's cocitation pairs are not cocited by any AMJ articles.}\]

\[\text{56\% of AMJ's cocitation pairs are not cocited by any JM articles.}\]

\[\text{44\% of JM's cocitation pairs are not cocited by any AMJ articles.}\]

\[\text{56\% of AMJ's cocitation pairs are not cocited by any OS articles.}\]

\[\text{50\% of OS's cocitation pairs are not cocited by any AMJ articles.}\]
pairs may get cocited in one journal but not in others. As shown in Table 1, AMJ produced 1,366 cocitation pairs from 1981 to 2008, and the number is more than that yielded by any of the other three journals. For example, ASQ produced only 879 cocitation pairs during the same period. In general, more cocitation pairs are generated when a journal publishes more articles. However, it is interesting to note that OS produced more cocitation pairs than JM, even though OS had fewer publications during this period of time.

Table 1 also reports the total counts of cocitations that occurred (the number of times a journal cocited any 2 of the 100 articles). The total counts of cocitations are greater than the number of cocitation papers because each pair of articles can get cocited multiple times.

Nonoverlapping Cocitation Pairs

It is possible for some cocitation pairs to appear in two journals that are being compared (overlapping pairs), whereas other cocitation pairs only appear in one journal but not the other (nonoverlapping pairs). If two journals have a similar underlying knowledge combination pattern, we would expect to see many overlapping pairs and few nonoverlapping pairs. In contrast, if two journals have very different knowledge combination profiles, they will have many nonoverlapping pairs.

Figure 1 compares AMJ and other three journals on the percentage of nonoverlapping pairs relative to total cocitation pairs in articles published between 1981 and 2008. When comparing two journals, we used a circle to represent each one. The

Each node in the figure represents an article. Each article is assigned a unique code, which includes the journal name abbreviation, volume number, and the article’s initial page. For example, Barney’s (1991) article about the resource-based view published in volume 17 of the Journal of Management is coded “JM-17-99.”

FIGURE 2A
Cocitation Network of AMJ

a Each node in the figure represents an article. Each article is assigned a unique code, which includes the journal name abbreviation, volume number, and the article’s initial page. For example, Barney’s (1991) article about the resource-based view published in volume 17 of the Journal of Management is coded “JM-17-99.”
nonoverlapping areas between two circles represent knowledge combination opportunities captured by one of the journals but not the other. The existence of large nonoverlapping areas between two journals thus indicates that each has a distinctive knowledge combination profile. As the figure shows, many distinctive cocitation pairs have appeared in *AMJ*. For example, 67 percent of *AMJ*’s cocitation pairs do not appear in any *ASQ* article. There are also distinctive cocitation pairs appearing in other journals that are not in any *AMJ* article.¹

Do the overlapping/nonoverlapping areas in Figure 1 suggest that we have high consensus in our field? Some people may think that the overlapping areas are large enough to indicate such consensus. But other people may want to see even larger overlapping areas in the figure, given that these journals are similar in their readership and topic areas (all these journals intend comprehensive coverage of both micro and macro management research topics). Instead of debating how much consensus we should have in our field, we take a closer look at the structure of cocitation in different journals in the following analysis.

¹ Given that the number of publications varies among journals, we performed an additional analysis, standardizing the number of publications (by randomly selecting 500 articles from each journal) and recalculating the overlap/nonoverlap percentages. This additional analysis showed larger nonoverlapping areas than the results in Figure 1. In other words, the consensus among the journals would be lower than what is reported here if we controlled for number of publications.
Cocitation Networks

Clearly, we did not expect that any two articles in our sample would be cocited. In any comparison between two journals, however, if a group of articles that were systematically cocited in one but not in the other surfaces, this pattern deserves attention. Thus, we needed to examine not only cocitation pairs, but also the overall structure of how such pairs were connected to one another to learn more about each journal’s distinctive knowledge combination profile. In other words, we needed go beyond dyadic relationships to look at entire networks. To do so, we constructed a cocitation network for each journal. This network describes the structure of cocitation relationships among all possible pairs of articles. In our research, a node in a network represents 1 of the 100 articles, and a relationship between 2 articles is present if they have ever been cocited. For each journal, we created a $100 \times 100$ matrix in which a cell recorded the number of times a pair (2 articles) was cocited in it. Figures 2A–2D depict each journal’s cocitation network. Table 2 summarizes each network with some descriptive network-level statistics (density, network centralization, clustering coefficient, and number of isolated nodes). As shown in Table 2, AMJ has the highest cocitation network density of the journals examined. This is consistent with the finding, shown in Table 1, that AMJ created more connections (cocitation pairs) among the 100 articles than the other journals did. AMJ also has the highest cocitation network centralization, suggesting that its cocitation network is dominated by relatively few articles that tend to be cocited frequently with many other articles.

Learning from Distinctive Cliques in Cocitation Networks

Given that each journal has a distinctive knowledge combination profile, each may learn from the others by examining how they combine certain
knowledge. Put differently, a journal’s distinctive areas of knowledge combination may represent learning opportunities for other journals. To illustrate such learning opportunities, we compared two journals, *AMJ* and *ASQ*, and conducted a clique analysis for each of their cocitation networks to identify distinctive areas of knowledge combination. Specifically, we wanted to see if a distinctive clique of cocitations appeared in one journal but not in the other.

We chose clique analysis instead of trait-based clustering methods (such as factor analysis and multidimensional scaling) because we wanted to identify densely connected subgroups rather than similar-trait subgroups. A clique in a network is a cohesive subgroup within which each node connects to all other nodes. A clique with four nodes, for example, contains six connections ($C_4^2$), since all nodes connect to each other. A clique in a cocitation network represents an article set within which every article is connected to every other article through cocitation relationships. Like other hierarchical clustering algorithms, clique analysis uses a bottom-up approach to iteratively arrange closest items into a higher-level entity. The algorithm of clique analysis starts from any pair of connected nodes and then iteratively adds nodes that connect to all the existing members of the group until no other nodes can be added to the group to meet the fully connected criteria.
A distinctive clique in AMJ but not in ASQ. In comparing AMJ’s and ASQ’s cocitation networks, we found a distinctive AMJ clique that contains six articles: Barney (1991), Dess and Davis (1984), Salancik and Pfeffer (1980), Snow and Hrebiniak (1980), Becker and Gerhart (1996), and Huselid (1995). As shown in Figures 3A and 3B, these six articles were fully connected to form a clique in AMJ’s cocitation network, but they were not connected at all in ASQ’s cocitation network—no pair of two of these articles has ever been cocited by any article published in ASQ.

A close look at this distinctive AMJ clique suggests that most cocitations in the clique are related to the topic of strategic human resource management (SHRM). The lack of cocitations among this set of articles in ASQ suggests that ASQ does not publish the kind of SHRM work that AMJ publishes—or that ASQ does not combine knowledge in the same way that AMJ does in publishing papers related to strategic human resource management.

A distinctive clique in ASQ but not in AMJ. We also found a distinctive clique in ASQ that contains five articles: Kimberly and Evanisko (1981), Barley (1986), Dougherty (1992), Hackman and Wageman (1995), and Edmondson (1999). As shown in Figures 4A and 4B, these five articles were fully connected to form a clique in ASQ’s cocitation network, but they were not connected at all in AMJ’s cocitation network: no two of these articles has ever been cocited in an article published in AMJ.

A close look at this distinctive ASQ clique suggests that most cocitations in it are related to a topic that combines sensemaking and innovation. Specifically, ASQ work that cocited these five articles represented a routine-disruption view of innovation and suggested that adopting new technology requires collective sensemaking to adjust organizational structure and behavior (e.g., Edmondson, Bohmer, & Pisano, 2001; Feldman & Pentland, 2003; Miner, 2001). AMJ’s lack of cocitations among articles in this clique suggests that AMJ does not combine knowledge as ASQ does in publishing papers in this domain.

DISCUSSION AND CONCLUSION

Our analysis shows how AMJ overlaps with three other management journals (ASQ, JM, and OS) in
terms of cocitation pairs generated. The results suggest that although each journal has some overlap with the other journals, each also maintains a somewhat distinctive knowledge combination profile. The results also indicate that learning opportunities exist between journals when one journal’s decision makers see how knowledge is combined differently in other journals. We provided examples of such learning opportunities by analyzing distinctive cliques in *AMJ*’s and *ASQ*’s cocitation networks.

A clique in a cocitation network can be viewed as a research area with a set of foundational works that are intensively linked and combined by scholars via their publishing activities. A distinctive clique in a journal’s cocitation network thus represents a distinctive area of research that the journal has developed. Analyzing such distinctive cliques in other journals may help a journal to identify some special issue opportunities for capturing research areas that it is currently not covering.

Our analysis only shows the existence of some distinctive areas of research. Many interesting questions remain: How is a distinctive area developed over time? What drives the development? Why does a given journal not recognize or accept those distinctive areas published in other journals? What are the roles of editors and reviewers in facilitating new knowledge combination and new areas of research? Investigating these questions may provide new insights regarding how knowledge is socially constructed in our field (Berger & Luckman, 1966) and contribute to the sociology of knowledge (e.g., Merton, 1973). We leave these interesting questions for future research, as they demand detailed data on scholars’ publishing and reviewing activities that are beyond the scope of our current citation data.

Our analysis certainly has some limitations. First, we focused on only four management journals. If we expanded to other management journals and even to discipline-based journals, we would be likely to see more complicated patterns of knowledge combination than are discussed here. Second, we focused on only the top 100 most-cited papers as the foundation for building cocitation networks. As a robustness check, we expanded our sample to include the top 200 most-cited papers and performed the same analyses. The overall pattern of results remained the same for this expanded sample. However, still other important contributions, particularly books and book chapters that have been well cited, should also be considered as the foundational work for cocitation analysis.

Despite the limitations, our analysis provides an initial means for thinking about how we combine existing knowledge in our research. For scholars
seeking to publish in academic journals, cocitation analysis may help them see different ways that they can draw from prior research when they develop and position their new papers. For editors and reviewers, cocitation analysis may help them benchmark their journals against others to see if they have developed a distinctive research area or if bias exists in their review process. We hope our exercise of cocitation analysis can stimulate learning that eventually leads to productive new knowledge creation.

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REFERENCES


