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SOME PREDICTORS OF *SMJ* ARTICLE IMPACT

DONALD D. BERGH,[1]* JOHN PERRY[2] and RALPH HANKE[3]
[1] *Krannert School of Management, Purdue University, West Lafayette, Indiana, U.S.A.*
[2] *Barton School of Business, Wichita State University, Wichita, Kansas, U.S.A.*
[3] *College of Business Administration, Bowling Green State University, Bowling Green, Ohio, U.S.A.*

Article impact is becoming an increasingly popular metric for assessing a scholar's influence, yet little is known about its properties or the factors that affect it. This study tests whether author, article, and methodological attributes influence the impact of SMJ articles, defined as summed counts of article citations. Findings reveal that authors having fewer, more-often cited articles tended to have SMJ articles that received the most citations. In addition, whether an article appears in a regular or a special issue is not a stable predictor of its impact. Moreover, empirical articles that test primary data, control for more threats to internal validity, and have higher statistical power tend to receive more citations. Further, an article's long-term impact oftentimes becomes apparent shortly after its publication. Overall, the findings provide new insights into the determinants of impact and its temporal qualities and help explain some of the differences between high and average impact articles. The findings also underscore the need for transparency between author publication strategies (article volume, impact) and the requirements of his/her institution. Implications for authors, reviewers, editors, and administrative evaluation are offered. Copyright © 2005 John Wiley & Sons, Ltd.

Article impact has long been used to evaluate the effects of one scientist's work on another (Clark, 1957; Cole and Cole, 1967; Walberg, Rasher, and Mantel, 1977). Generally defined and measured in terms of summed citation counts (Kacmar and Whitfield, 2000; Newman and Cooper, 1993; Robinson and Adler, 1981), article impact can be used by peers, recruiting committees, and promotional review boards to evaluate a scholar's influence, recognition, and standing (e.g., Garfield, 1972, 1979; Myers, 1970; Oromaner, 1983).[1] Not surprisingly, article impact has even become a factor in promotion and tenure decisions (Storandt, 1985; Tahai and Meyer, 1999). Strategy researchers therefore need to understand what article impact is, what it means, and what factors differentiate high- from low-impact articles. Such knowledge could help strategy scholars understand where to allocate their time among alternatives that have high opportunity costs, assist in the structuring of research programs, and better enable them to evaluate whether their research plans and goals match the reward systems of their institutions. Moreover, article impact is pertinent to the strategic management field in general. From reviewers and editors shaping the development of the field to administrators and promotion committees assessing faculty standing and value, all gain from knowing about impact and the factors that influence it.

Keywords: strategic management research; citation analysis; article impact
*Correspondence to: Donald D. Bergh, Krannert School of Management, Purdue University, 403 W. State Street, West Lafayette, IN 47907-2056, U.S.A. E-mail: Ddbergh@mgmt.purdue.edu

[1] Citation counts capture one dimension only of article impact. An article's role in the development of subsequent knowledge may be direct or indirect, and may not be evidenced by its subsequent citation.

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Current understanding of article impact is still in its developmental stages. Most research aggregates article impact to the journal level (e.g., Franke, Edlund, and Oster, 1990; Johnson and Podsakoff, 1994; Podsakoff *et al*., 2005; Tahai and Meyer, 1999), institution (Stahl, Leap, and Wei, 1988; Trieschmann *et al*., 2000) or author (Allison and Long, 1990; Boyd, Finkelstein, and Gove, 2005; Long *et al*., 1998). Fewer studies consider article impact per se and those that do examine it in limited ways. Specifically, Laband (1986) evaluated the impact of 5880 articles published in 40 economics journals from 1974 to 1976, finding that most articles (84%) were rarely cited (10 times or less). He also reported that citation counts could be predicted using journal reputation and article length. Newman and Cooper (1993) reported that an empirical article's impact was related to whether the article refined, extended, or explored quantitative relationships. In addition, Phelan, Ferreira, and Salvador (2002) found that article impact tended not to vary based on whether an article was empirical or non-empirical. Finally, Ramos-Rodriguez and Ruiz-Navarro (2004) document the articles and books that have had the greatest influence on shaping the development of the strategic management field. Considered collectively, these studies provide insights into article impact, yet they provide a limited framework for understanding the factors that affect the impact of strategic management articles per se. We still have incomplete knowledge of what article impact means and what factors differentiate between high and average impact strategy articles. This is an important deficiency because impact is becoming an increasingly relevant, visible, and central topic.

The present study seeks to address this gap in prior research by testing a more comprehensive set of predictors of article impact. We focus on three general constructs—author, article, and methodological rigor—and examine whether attributes of those constructs are associated with article impact levels. The articles published in the *Strategic Management Journal* during the 1990s were the focus of the study. We find that an article's impact tends to follow a life cycle pattern. The results also suggest that high and average impact articles differ with respect to factors evident at the time of publication. In addition, we compare the top 20 impact articles appearing during the first half of the 1990s with a random sample of articles appearing in the same years. We find that the annual impact levels and growth rates of these groups differ quite quickly after publication, providing a basis for forecasting future impact based on early evidence. Overall, the results provide a basis for planning research streams, review and editorial decision-making, and administrative evaluation.

STUDY

Sample

We content analyzed the articles (regular articles and research notes) that appeared in the *Strategic Management Journal* during the years 1990 through 1999. The *SMJ* publishes high-quality research on and about strategic management topics and has achieved a premier position in the field of management (Phelan *et al*., 2002; Podsakoff *et al*., 2005; Trieschmann *et al*., 2000). We examined the articles of the 1990s because they are young enough to facilitate data collection, old enough for assessing impact and the period itself is long enough to provide for adequate variability in the study variables. In addition, the *SMJ* publishes all types of articles, including quantitative, qualitative, and non-empirical, thereby providing an excellent context for evaluating factors likely to influence impact. Further, by focusing on the *SMJ*, there was no guesswork in defining the scope of the strategic management literature.

The total number of *SMJ* articles that appeared during the 1990s was 598. All were used for testing the effects of author and article attributes on article impact. The entire set of 598 articles could not be used for testing the influence of methodological rigor characteristics, however, as some were non-empirical (156, 26%) and did not report a methodology. 442 articles reported a methodology, 47 of which reported qualitative data (data as words) and 395 reported quantitative data (data as numbers; see Lee, 1999, for additional differences between quantitative and qualitative articles). We tested the methodological rigor effects using a sample of the 395 articles that reported quantitative data only. The designs and analysis of the 47 articles reporting qualitative studies could not be combined with the quantitative studies (too different in structure) and they were too small in number to meet statistical power requirements for independent tests.

We randomly selected 200 of the 395 articles, as a sample size of 200 is sufficient in statistical power for our study design (using formulae presented in Cohen, 1988, and Ferguson and Ketchen, 1999) and is large enough to adequately reflect the sampling frame of 395 articles. The 200 articles were selected using a random process. Each article was examined to determine whether it reported the full set of methodological variables. Those that did not were removed, and the sampling process was repeated until the sample of 200 articles was identified. The sample of 200 articles did not differ from the other 195 empirical articles that were not included. Note that empirical articles were also similar to the non-empirical articles except for the dependent variable, article impact. Empirical articles tend to have less impact, an effect that is considered below, in the generalizability of the findings.

Dependent variable

Article impact was measured as the total number of citations an *SMJ* article received through December 2004. The variable was called Article citation count. The *Social Science Citation Index* provided the data (accessed through the Web of Science). Measuring article impact by total citation count represents the conventional and most frequently used method (Kacmar and Whitfield, 2000; Newman and Cooper, 1993; Tahai and Meyer, 1999).[2]

Independent variables

Author attributes

Five dimensions of article authorship were tested as predictors of article impact. First, a variable called Citation count of other articles was the summed number of citations for each of the first or sole author's articles published in the top 20 management journals (minus the citations of the focal *SMJ* article). Following recent research (Park and Gordon, 1996; Tahai and Meyer, 1999), the following journals were defined as the top 20: the *Strategic Management Journal, Administrative Science Quarterly, Academy of Management Journal, Management Science, Harvard Business Review, Academy of Management Review, Sloan Management Review, Journal of Management Studies, California Management Review, Organization Studies, Journal of Business Strategy, Organizational Dynamics, Journal of Management, Decision Sciences, Long Range Planning, Journal of General Management, Human Resource Management, Interfaces, Business Horizons*, and *Organization Science*. Although there may be disagreement about particular journals in this list, most overlap with other lists of the most prestigious journals in the field of management (e.g., Boyd, Gove, and Hitt, 2005a; Trieschmann *et al*., 2000).

We then used the *Social Science Citation Index* (2004) to identify the number of times each of the 598 first or sole author's articles appearing in those journals had been cited. We focused on the first or sole author for several reasons: (1) we desired to reduce error and subjectivity assumed with weighting co-author contribution; (2) articles that have influential co-author effects are likely to be offset by articles that do not; and (3) authorship order matters, as first authors tend to contribute the most to their articles (Floyd, Schroeder, and Finn, 1994), making the effects of first authors more comparable to sole authors than attributes of other co-authors.

Second, a variable called Number of Other Articles was the summed number of articles published by the first or sole author in the list of the 20 top management journals (minus the focal *SMJ* article). The author's articles were located by searching the *Social Science Citation Index*. We then counted the number of articles that appeared in the 20 top management journals.

Third, we created a cross-product term to represent the interaction effects of Citation Count of Other Articles and Number of Other Articles. This variable was determined by multiplying the two variables. Fourth, School Research Rank was an ordinal variable that reflected the first or sole author's business school average research productivity ranking during the study period. The sources for this variable came from previous school rankings by Long *et al*. (1998), Trieschmann *et al*. (2000), and the *Financial Times*' annual review (which lists a cumulative research rank for business schools in their annual report). School Research Rank was coded as a 2 for authors whose business schools were listed in the top 25, as 1

[2] Other measures of impact exist, such as the form of the citation and the article's role in the development of subsequent work. Also, articles are cited for different reasons and have dissimilar effects (see Kacmar and Whitfield, 2000, for further explanation).

for those between 26 and 50, and as 0 for all others. Fifth, Author Number was the total number of authors. The five author variables were computed for all 598 studies.

Article attributes

Five aspects of articles were tested as predictors of article impact. First, Article Age was coded to reflect publication year. Article Age was coded as 1 for articles published in 1999, 2 for those appearing in 1998, and sequentially to 10 for articles in 1990. Second, Article Length was a dummy variable coded as 1 if the focal article was full length and as 0 if it was a research note. Third, Special Issue was a dummy variable coded as 1 if the focal article appeared in an *SMJ* special issue and as 0 if it did not. Fourth, articles were categorized based upon whether they were non-empirical or empirical (includes qualitative and quantitative articles). A dummy variable called Article Type was coded as 0 for those that did not report empirical data and as 1 for those that did. Finally, Research Topic Count was the number of citations of other *SMJ* articles that examined the same topic as the focal *SMJ* article (excluding the citations of the focal *SMJ* article). Research topics were identified using the keywords listed at the bottom of the focal *SMJ* article's first page. We identified the *SMJ* articles whose key words matched the first key word of the focal *SMJ* article. The citations of these articles were then summed. The five article variables were computed for all 598 articles.

Methodological rigor attributes

Four dimensions of methodological rigor were tested as predictors of article impact. First, sample representativeness is the *a priori* determination of whether a study's results could be generalized to other situations or settings. A dummy variable was coded as 1 when the article reported test results of sample generalization, and as 0 when it did not (e.g., Short, Ketchen, and Palmer, 2002). Second, data sources may affect the perception of a study's rigor. A dummy variable called Secondary was coded as 1 if the data sources were secondary in nature and as 0 if otherwise (e.g., all data were collected from surveys or interviews).

Third, design internal validity is the extent to which the results of a study can be more attributed to the predictor variables than to flaws in the research design (Vogt, 1993). Campbell and Stanley (1963) and Cook and Campbell (1979) identified several possible threats to internal validity. Each was operationalized using a dummy variable, 1 for when the threat was controlled for and 0 when it was not. History was coded as 1 when the study design included a feature (a variable or a sampling condition) that accounted for intervening events that might influence the studied relationships. Maturation was coded as 1 when a change occurred in the subjects over time that was independent of the predictor variables. Testing was coded as 1 when the study accounted for the effects of repeated exposure to the same instrument or researchers. Instrumentation was coded as 1 when differences associated with data collection sources were tested. Regression was coded as 1 when subjects were not selected on an extreme score. Selection was coded as 1 when the sample did not use a value or characteristic that was related to the predictor or predicted variables. Mortality was coded as 1 when subjects that dropped out of the study were compared with those that remained. Selection-History was coded as 1 when a historical event was not used for determining the sample. Selection-Testing was coded as 1 when the respondent's responses to an instrument or particular values were not used for determining a sample. Selection-Maturation was coded as 1 when changes in the subjects (age, experience, or life cycle process) were not used for retaining the sample.

Note that these threats are not universally applicable to all studies. Therefore, a variable called Percent Threats Controlled was computed to represent the percentage of relevant threats to internal validity that were controlled for, given each study's specific research design. This variable was determined by identifying the relevant threats to each study's research design as defined by Campbell and Stanley and by Cook and Campbell and then computing the proportion that were controlled for relative to those that were not.

Fourth, statistical conclusional validity, the accuracy of conclusions about covariation made on the basis of statistical evidence (Vogt, 1993), was measured as the ratio of Sample Size to the Number of Variables (control, independent and interaction, if pertinent) (Short *et al*., 2002).

Data for the methodological rigor variables were collected by a content analysis of each of the randomly identified 200 quantitative articles. Two

senior doctoral candidates conducted the content analysis. Each doctoral candidate had extensive training in research methods: both had completed a two-semester seminar sequence on research design and measurement (one semester on qualitative methods and one on quantitative methods) as well as three semesters of analytical methods. Both were at the dissertation stages of their programs.

The content analysis required several stages. First, each study was examined to identify its sample and representativeness, its data sources, design type and number of control, independent, and interactive variables. Second, each study's research design was deconstructed to determine whether its relevant threats to internal validity were controlled. This process required defining each study's design using Campbell and Stanley's notation scheme of Xs to reflect independent variables and Os for dependent variables. Next, the notation schemes of the research designs were compared with those in Cook and Campbell (1979) and Campbell and Stanley (1963) to identify the threats that were applicable. The research designs were then evaluated to determine which of those threats were controlled for and which were not. Finally, reliability was determined by exchanging articles at three different points during the coding process, repeating the data collection process, and then comparing the results. Initial agreements were high, each over 80 percent, and resulting disagreements were discussed and resolved until 100 percent agreement existed.

RESULTS

Table 1 presents the number and types of articles that appeared in the *SMJ* during the 1990s. On an annual basis, the *SMJ* published between 48 (1995) and 66 (1996) total articles (the sum of regular articles and research notes). Of those articles, most (442 of 598, 76%) were empirical. Moreover, empirical articles seem to be gaining in their prevalence; the annual number of empirical articles tended to rise over the period, peaking (57) in 1997 whereas the annual number of non-empirical articles tended to fall from a high in 1992 (22) to a low point (8) in 1997. Overall, these data suggest that the *SMJ* publishes a relatively similar number of articles each year, and empirical articles outnumber non-empirical ones, a difference that is becoming more pronounced.

Table 2 presents means, standard deviations, and, where appropriate, counts of the study variables. The data indicate that the sole and lead authors of the focal *SMJ* articles had a mean citation count of 240.35 for their other articles appearing in the list of the top 20 journals identified above (excepting the citation count of the focal *SMJ* article), and the mean number of articles published in those journals was 8.71. The authors tended to be affiliated with mid-tier business schools, those ranking between 26th and 50th (mean of School Research Rank is 0.95). The mean number of authors on an *SMJ* article (1990–1999) was 1.91. In addition, of the 598 articles in the

Table 1. Count and types of *SMJ* articles by study year

Year	Number of reg. articles	Number of research notes	Number of non-empirical articles	Number of empirical articles	Number of special issue articles	Total number of articles
1990	44	7	16	35	9	51
1991	53	11	21	43	19	64
1992	52	9	22	39	20	61
1993	53	4	15	42	20	57
1994	50	11	15	46	21	61
1995	42	6	13	35	9	48
1996	56	10	18	48	21	66
1997	53	12	8	57	10	65
1998	55	9	16	48	5	64
1999	49	12	12	49	0	61
Total	507	91	156	442	134	598

Non-empirical articles: any article or research note that did not report data; included theoretical development articles, literature reviews, critiques, and articles that introduced new analytic techniques.
Empirical articles: an article or research note that reported data; included qualitative and quantitative studies.
Special issue articles: articles and research notes that appeared in special issues of *SMJ* (included in non-empirical and empirical article totals).

Table 2. Means, standard deviations, and dummy variable frequency counts of study variables

Variable	Mean	S.D.	#0	#1
Author attributes				
Focal article citations	36.6906	49.36460		
Citation count of other articles	240.3512	353.28145		
Number of other articles	8.7124	7.77796		
School research rank	0.9582	0.91145		
Number of authors	1.9181	0.81546		
Article attributes				
Article age	5.3963	2.87106		
Article length	0.8478	0.35949	91	507
Special issue	0.2241	0.41732	464	134
Article type	0.7391	0.43948	156	442
Research topic count	1440.6154	834.46263		
Methodological rigor attributes				
Representativeness	0.2650	0.44244	147	53
History	0.3065	0.46478	43	19
Maturation	0.2581	0.44114	46	16
Testing	0.3710	0.48701	39	23
Instrumentation	0.6129	0.49106	24	38
Regression	0.2419	0.43175	47	15
Mortality	0.6774	0.47128	20	42
Selection	0.2900	0.45490	142	58
Selection-history	0.2850	0.45255	143	57
Selection-testing	0.1950	0.39719	161	39
Selection-maturation	0.1950	0.39719	161	39
Percent threats controlled	0.2705	0.34259		
Secondary data	0.7700	0.42189	46	154
Sample size/number of variables	173.9787	886.97918		

Note: # 0 is the number of studies that were coded as O for this variable. Same applies for 1. Rows may not add to 200, as not all variables apply to all studies. For example, the threat of history applied to the designs of 62 studies, with 43 not having controls (0) while 19 reported controls for it (1). Some variables apply to all studies (598), others apply to only empirical studies (200), while others pertain to particular types of empirical studies.

study, we found that 193 had one author, 284 had two authors, 104 had three, 13 had four, 3 had five and 1 had seven authors. The mean citation count for the 598 articles was 36.69. The table also reports that, on average, 27 percent of threats to internal validity were controlled. Further, most studies use secondary data that were not based on random sampling.

Tables 3(a), 3(b), and 3(c) report correlations among the study variables. Table 3(a) presents the correlations among the author and article variables for all 598 *SMJ* articles, while Tables 3(b) and 3(c) report the correlations among author, article, and methodological variables for the random sample of 200 empirical articles and the 157 non-empirical articles, respectively. First, Table 3(a) indicates that the variable for citation count of the 598 focal *SMJ* articles was correlated positively to all the study variables excepting Number of Authors and Article Type, both of which were correlated negatively. Second, Tables 3(b) and 3(c) show that the correlations were not as consistent among the 200 empirical studies. Overall, the results suggest that citation counts are correlated to some author, article, and methodological attributes. The results also imply that some variables are correlated the same way to article impact irrespective of whether the studies are empirical, non-empirical, or mixed with non-empirical ones (e.g., Citation Count of Other Articles, Number of Other Articles). However, some differences in correlations exist across the empirical and non-empirical groups (e.g., School Research Rank, Number of Authors, Article Length, Special Issue, Topic Count). The potential drivers of article impact for a set of empirical articles may be different from the non-empirical and fuller sample of articles.

Table 3(a). Correlations between study variables for all *SMJ* articles published during 1990–99 ($n = 598$)

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Focal article citations	1								
2. Citation count of other articles	0.374**	1							
3. Number of other articles	0.211**	0.767**	1						
4. School research rank	0.151**	0.293**	0.237**	1					
5. Number of authors	−0.098*	0.032	0.052	−0.054	1				
6. Article age	0.185**	0.183**	0.183**	0.107**	−0.128**	1			
7. Article length	0.170**	0.069	0.013	0.170**	−0.060	0.033	1		
8. Special issue	0.208**	0.203**	0.098*	0.271**	−0.123**	0.186**	0.183**	1	
9. Article type	−0.184**	−0.150**	−0.036	−0.094*	0.225**	−0.110**	−0.008	−0.338**	1
10. Research topic count	0.108**	0.006	−0.004	−0.030	−0.041	−0.126**	0.014	0.071	−0.162**

** Correlation is significant at the $p < 0.01$ level (2-tailed).
* Correlation is significant at the $p < 0.05$ level (2-tailed).
Note: Pearson product–moment correlations are reported.

Table 3(b). Correlations between study variables for a sample of *SMJ* articles published 1990–99 ($n = 200$)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Focal article citations	1												
2. Citation count of other articles	0.362**	1											
3. Number of other articles	0.237**	0.784**	1										
4. School research rank	0.012	0.066	0.092	1									
5. Number of authors	−0.135	−0.032	0.022	0.139*	1								
6. Article age	0.244**	0.164*	0.159*	−0.030	−0.192**	1							
7. Article length	−0.009	0.043	−0.026	0.035	0.072	−0.037	1						
8. Special issue	0.026	−0.034	0.070	0.122	0.001	−0.014	0.081	1					
9. Research topic count	−0.046	0.070	0.021	−0.178*	0.057	0.166*	0.180*	−0.147*	1				
10. Percent controlled	0.138	0.159*	0.151*	0.018	0.119	−0.130	0.000	0.154*	−0.066	1			
11. Secondary data	−0.079	0.064	0.040	0.058	−0.083	0.048	−0.078	−0.038	−0.085	0.142*	1		
12. Representativeness	0.196**	0.078	0.050	−0.075	−0.031	0.127	0.066	0.122	0.037	0.118	−0.129	1	
13. Sample size/number of variables	0.129	−0.026	−0.028	0.135	0.033	−0.087	0.053	−0.009	−0.066	−0.017	0.087	0.165*	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Point–biserial correlations for dichotomous measured variables are reported; all others are Pearson product–moment.

Table 3(c). Correlations between study variables for the non-empirical *SMJ* articles published during 1990–99 ($n = 156$)

	1.	2.	3.	4.	5.	6.	7.	8.
1. Focal article citations	1							
2. Citation count of other articles	0.344**	1						
3. Number of other articles	0.217**	0.753**	1					
4. School research rank	0.112	0.285**	0.199*	1				
5. Number of authors	0.021	0.081	0.051	0.107	1			
6. Article age	0.089	0.142	0.235**	0.186*	−0.137	1		
7. Article length	0.186*	0.100	0.081	0.200*	0.023	0.200*	1	
8. Special issue	0.079	0.193*	0.108	0.311**	−0.007	0.254**	0.276**	1
9. Research topic count	0.144	−0.096	−0.085	−0.167*	−0.148	−0.062	−0.058	0.019

** Correlation is significant at the $p < 0.01$ level (2-tailed).
* Correlation is significant at the $p < 0.05$ level (2-tailed).
Pearson product–moment correlations are reported.

Table 4. *SMJ* article impact regressed onto author and article variables

	Model 1	Model 2	Model 3	Model 4
Variable	Beta	Beta	Beta	Beta
Author attributes				
Citation count of other articles	0.501***	1.155***		1.063***
Number of other articles	−0.178**	−0.061		−0.050
School research rank	0.041	−0.023		−0.052
Number of authors	−0.103**	−0.076*		−0.035
Number of other articles × Citation count of other articles		−0.781***		−0.733***
Article attributes				
Article age			0.161***	0.109**
Article length			0.143***	0.115**
Special issue			0.106*	0.041
Article type			−0.113**	−0.065†
Research topic count			0.100*	0.075*
N	598	598	598	598
$p <$	0.000	0.000	0.000	0.000
R^2	0.166	0.239	0.108	0.278
Adjusted R^2	0.160	0.233	0.100	0.266
Change in adjusted R^2		0.073		
F	29.533	37.214	14.290	22.622
Change in F		7.681***		

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; dependent variable is focal article citations.
Change in adjusted R^2 and change in F are reported relative to Model 1.

In particular, the correlations involving School research rank, Number of Citations of Other Articles, and Number of Other Articles differ across the tables. The correlations in Tables 3(a) and 3(c) indicate that higher ranked schools have scholars that are writing more articles that are, in turn, receiving higher numbers of citations. These correlations do not exist for the empirical articles (Table 3b). It would seem that the top-ranked schools have scholars that are writing more non-empirical articles that are also receiving higher number of citations. However, as will be discussed next, School Research Rank is not one of the significant predictors of *SMJ* article impact and indeed, the Number of Other Articles is related negatively to impact. The pattern apparent in the correlations, especially that for the non-empirical articles in Table 3(c), has little if any consequence for the impact of *SMJ* articles.

Table 4 reports the results of regressing article impact onto the author and article constructs. Ordinary least squares regression was used. Models 1 and 2 report tests of the author variables solely. Results under Model 1 indicate that Citation Count of Other Articles was related positively (0.50, $p < 0.001$) to the citation counts of the focal *SMJ* article, while the Number of Other Articles was a negative predictor (−0.178, $p < 0.01$). School Research Rank was not a significant predictor, while the Number of Authors was related negatively (−0.103, $p < 0.01$). The smaller and non-significant effect of school research ranking relative to the correlation table result is probably due to shared variance with other variables. The overall adjusted R^2 (0.160) and F (29.53) of the model are significant ($p < 0.000$).

Model 2 adds the multiplicative term of Citation Counts of Other Articles and the Number of Other Articles. This interaction term is negative and significant (−0.781, $p < 0.001$) and the Number of Authors remains a negative and significant predictor (−0.076, $p < 0.05$). In addition, both the adjusted R^2 (0.23) and F (37.21) statistic in Model 2 ($p < 0.000$) and the change from Model 1 to Model 2 are significant. These results suggest that author characteristics have predictive effects on *SMJ* article impact. In particular, authors with fewer numbers of articles that have higher number of citations are more likely to have *SMJ* articles that in turn receive higher numbers of citations. Fewer numbers of authors also appear important.

Model 3 reports the results of testing article effects as independent predictors of article impact. The coefficients for the Article Age (0.161, $p <$

0.001), Length (0.143, $p < 0.001$), Special Issue (0.106, $p < 0.05$) and Research Topic Citation Count (0.100, $p < 0.05$) variables are each positive and significant. Article Type is related negatively (−0.113, $p < 0.01$), indicating that non-empirical articles are associated with higher citation counts. This model of article variables, while significant (adjusted R^2 is 0.100, $p < 0.001$), is lower in its explanatory power than either of the two author variable models (Models 1 and 2).

Model 4 combines the author and article attributes to concurrently predict article impact. The results indicate that the interaction term of Citation Count of Other Articles and the Number of Other Articles remains negative and significant (−0.733, $p < 0.001$). Article Age (0.109, $p < 0.01$), Length (0.115, $p < 0.01$), and Research Topic Count are positive predictors. The adjusted R^2 of 0.266 is much higher than the values of the other models (Models 1, 2, and 3). Overall, the regression results suggest that authors with a lower number of higher-cited articles tended to have *SMJ* articles that received more citations. Note that the variables for School Research Rank, Number of Authors, special or regular issue and article type (empirical or non-empirical) had no significant relation when considered in the same model.

The tests of methodological attributes were applied to the sample of 200 randomly selected empirical articles. Table 5 presents the results. Model 1 is the author and article variables only and Model 2 adds the four methodological variables. As before, the results are based on ordinary least squares regression analysis. The findings indicate that Citation Counts of Other Articles and Article Age remain significant predictors. The use of secondary data sources is related negatively (−0.155, $p < 0.05$), while Percent Threats controlled (0.139, $p < 0.05$) and Sample Size/Number of Variables (0.156, $p < 0.05$) are both related positively to article citation counts. These results suggest that methodological rigor variables are associated with article impact such that more rigorous studies—those that use primary data, control for more threats to internal validity, and have larger samples relative to the number of variables, are cited more frequently than studies that use secondary data, control for fewer threats, and have smaller relative samples. Note that the Number of Other Articles and its interaction with Citation Counts of Other Articles are both non-significant as predictors of the Citation Counts of Empirical Articles, result quite different than found in the tests of the full sample.

Table 5. *SMJ* empirical article impact regressed onto author, article and methodological rigor variables

	Model 1	Model 2
Variable	Beta	Beta
Citation count of other articles	0.578**	0.583**
Number of other articles	−0.121	−0.118
School research rank	−0.019	−0.018
Number of authors	−0.069	−0.095
Number of other articles × Citation count of other articles	−0.159	−0.191
Article age	0.201**	0.228**
Article length	−0.005	−0.025
Special issue	0.041	0.006
Research topic count	−0.094	−0.093
Representativeness		0.085
Secondary data		−0.155*
Percent threats controlled		0.139*
Sample size/number of variables		0.156*
n	200	200
P <	0.000	0.000
R^2	0.195	0.266
Adjusted R^2	0.157	0.214
F	5.120	5.176

Note: † $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; dependent variable is focal article citations
$n = 200$ empirical articles

DISCUSSION

Article impact has evolved into a performance measure of a researcher's publications. To date, most knowledge about article impact in strategic management pertains to journals and authors. Although that research has provided important insights, we still have an incomplete understanding of the drivers and characteristics of article impact within the field of strategic management. In particular, strategic management researchers (as well as editors, reviewers and administrators) do not have a well-developed basis for evaluating the relative performance of individual articles in the marketplace of ideas or what attributes tend to lead to high or average impact articles. The current study was designed to address these gaps in knowledge.

The dynamic characteristics of impact

The findings indicate that article impact appears to have a life cycle of three phases (see Appendix).

Articles published between the years 1990 and 1994, seemed to have reached a stage of maturity, as they had little variance in the citation count levels at the 25th, 50th, and 75th percentile levels. Considering all articles as an aggregate, the 25th level of citation counts were 19, 18, 19, 12 and 13 (rounding up) for the years 1990 through 1994, respectively. The citation counts at the 50th percentile levels had even less variation; articles published between 1990 and 1994 had a median (50th level) count of approximately 30. The citation counts at the 75th level demonstrate a slight downward trend; the citation counts at the 75th level peak for articles published in 1991 and then fell slightly, where they remained consistent for several years. Overall, the ranges of citation levels for these periods seem relatively small.

Articles published in 1995 and 1996 (9 and 8 years of age) appear to have reached a mid-point stage of development. These articles have 25th (15, 12), 50th (28, 24), and 75th (46, 47) percentile levels that are consistent with each other, yet different from articles published in the earlier years. Inferring from those articles published between 1990 and 1994, it would appear that the 9- and 10-year-old articles would have had most of their impact, but that a small growth effect is likely, as the 25th, 50th, and 75th levels are somewhat lower than articles aged 10 years and older. Articles published between 1997 and 1999 (ages 7, 6, and 5 years) are still growing in their impact. The potential of these articles does not seem to have been realized; consider that the median for articles aged 5 (published in 1999) is 13, a number that jumps to 24 for articles aged 8 (published in 1996), and finally stabilizing at age 10 (articles published in 1994). The same trends apply to the 25th and 75th levels.

Article impact is a more complex concept than just citation counts or other measures of influence. It also involves cohort comparisons and growth rates. First, the quartile values of each publication year cohort seem to be relatively stable from year to year. These values therefore provide an objective basis for ranking articles. Impact can be objective and becomes especially salient when evaluated relative to cohorts. Second, impact tends to vary over time. On average, article impact appears to have a life cycle that is upward trending over time. Therefore, when considering impact, it is important to recognize the temporal dimensions that underlie the concept and that an article's impact may not be fully realized until it is 10 years or older.

Differentiating high- from low-impact articles

The study also sought to differentiate high from average impact articles. First, an author's article citation performance tends to influence the recognition of his/her other work. Consistent with other studies of author impact (Boyd, Finkelstein, and Gove, 2005; Cole and Cole, 1967), we find that authors who write fewer other articles tend to have *SMJ* articles that receive more citations. In addition, our study considers the interaction between an author's number of other articles and the citation counts of those other articles as a predictor of *SMJ* article impact. We find that the combined effect of the number of other articles and the citation counts of those articles is a significant predictor of *SMJ* article impact. We also find that an author's number of other articles (a key variable in prior research) is no longer a salient factor once the interactive effect with the corresponding citation counts is brought into the equation.

This finding indicates that an author's number of other articles is not a stable predictor of the impact of an *SMJ* article. Rather, it is the relative impact of those other articles that appears to matter the most. Authors who write fewer articles, but those who also receive higher citation counts, are likely subsequently to have *SMJ* articles that receive higher citations. The opposite also holds; the most prolific authors, those who write the most articles, and have fewer citations for those articles, tend to have *SMJ* articles that realize lower impact.

Second, article characteristics are also related to article impact. Other than article age, an article's topical area is associated with its impact; articles that address topics that have higher numbers of citation counts tend to receive more citations. Contrary to what some may believe, writing in an area receiving less attention is a risky bet in terms of article impact.

Methodological rigor also matters; studies that use primary data, control for more threats to the internal validity of their research designs, and have larger samples relative to study variable counts tend to have higher impact. This result suggests that articles having higher levels of methodological rigor receive more recognition in the marketplace of ideas. However, not all aspects of rigor have equal effects or are used to differentiate articles. A recent study by Boyd, Gove, and Hitt (2005a) reports that there was no correlation between cumulative citations for articles and measurement

qualities in journals such as the *SMJ*. Considered jointly, some aspects of research methodology (data source, design, and sample size) appear to matter more than others (measurement) when it comes to influencing an article's impact. That difference is unsatisfactory; methodological deficiencies not only lower methodological rigor, but they can also impede theory development (Bergh, 1995; Bergh and Holbein, 1997; Boyd, Gove, and Hitt, 2005b; Greve and Goldeng, 2004). We hope that our results along with those of Boyd and colleagues raise more awareness of the value of research methodology and of improving its universal application (we offer suggestions for doing so below).

Fourth, the findings provide a broader lens for viewing the utility of special issues. Some have found that articles appearing in special issues tend to receive higher numbers of citations relative to articles appearing in regular issues for journals such as the *SMJ* (Olk and Griffith, 2004). Our results are partly consistent with those findings; whether an article appeared in a special issue or not was correlated with its citation count (Table 3a) and those articles had higher numbers of citations than articles appearing in regular issues (see the Appendix). In addition, when considered relative to article variables only, the special issue variable was a significant predictor of article citation counts (Table 4). However, this effect disappeared when the variables for author and method were also included in the equation. These results indicate that publishing an article in a special issue is not a stable predictor of whether the article will have a high impact.

Overall, the findings suggest that an article's impact is related to several factors that exist at the time the article was published. The author's characteristics appear to have the most explanatory power (R^2 is 0.239), followed by article (R^2 is 0.100; both in Table 4) and methodological attributes (R^2 is 0.071, Table 5, Model 2—Model 1). The age of the article also matters, as does its length. Thus, of the attributes in our study, when citing an *SMJ* article authors appear to pay most attention to the author and whether he/she has written other influential articles, whether the article has had time to make an impact, if it is a regular article or a research note (less important to an empirical article), if the topical area is growing in impact, and how the study was done. Thus, it appears possible to differentiate high- from low-impact articles on the basis of factors that exist at the time an article is published. These findings provide several new insights for authors, reviewers, editors, and administrators.

Authors

One of the most striking results is the strong, negative relationship between the interaction of number of other articles and the citation counts of those articles and the citation counts of the focal *SMJ* articles. This result suggests that authors desiring or required to write high-impact articles should strive for fewer articles but ones more likely to gain attention and foster influence. The findings also suggest that such authors should write on topical areas that are growing and avoid writing short papers and research notes. If the author is writing an empirical study, he/she is advised to recognize that primary data, larger sample sizes, and stronger research designs may help differentiate his/her articles in the marketplace of other empirical articles. Overall, the study findings imply that there are reasons that article impact varies and authors can apply the findings to improving the likelihood that their articles will receive more attention and influence. They underscore particular care to one's initial publications. If a scholar's initial work has had little impact, then the impact of their later work seems likely to suffer from the same fate.

Further, authors can use the results as a dimension for critically assessing institutional requirements. Some institutions may press their faculty for a high and seemingly ever-increasing number of articles in premier journals. The Deans and other administrators can easily monitor such outcomes and develop reward systems accordingly. The study findings do not cast a shadow on such requirements, but indicate that they have implications with respect to impact. If an author is interested in or required to write high-impact articles, then he/she may not find a high-count publication environment compatible with his/her aspirations. Likewise, if an author is interested in writing a high number of articles, then he/she may not succeed in an environment that requires high impact. Scholars need to recognize these trade-off relationships before joining an institution. Further, changing or alternating between impact and article count could be especially difficult for established authors,

particularly those who have established their own approaches.

More generally, if article impact is a performance metric for evaluation, then authors and administrators need to understand its determinants. This means that strategies (and evaluative systems) that encourage and require fewer but more influential articles are more likely to produce other higher-impact articles than strategies and systems that demand higher numbers of articles. By contrast, authors that follow strategies to elevate their publication counts are likely to have lower impact than authors that have strategies of fewer, but more significant works. This inverse relationship between quantity and impact may exist for many reasons, including the marginal uniqueness of each additional article declines due to increasing overlap with prior articles and competition for distinct contributions is high, requiring specialist niche-oriented strategies for differentiation. Scholars can use these findings to make informed decisions about their career strategies and understand better what they can do to be successful at their respective institutions.

Reviewers and editors

Journals benefit from publishing articles that have high citation counts, so reviewers and editors would benefit from understanding the factors associated with impact. Our study shows that author, article, and methodological factors influence article citation counts. Reviewers should presumably know nothing of the author and his/her characteristics. Article characteristics may matter even less in the reviewer and editor evaluation. However, with respect to methodology, reviewers and editors can learn from the study findings that methodological rigor is a predictor of article impact.

More specifically, reviewers and editors can gain from recognizing the growing stream of articles that provide critiques of research methodologies in strategic management research (see Boyd, Gove, and Hitt, 2005a; Hitt, Boyd and Li, 2004; for recent reviews). These assessments report that common methodological practices often do not meet generally accepted methodological standards and that empirical results and theory development may have been harmed as a result (see Bergh and Fairbank, 2002; Bowen and Wiersema, 1999; Ketchen and Shook, 1996; as recent examples). Indeed, our general finding that so few flaws in designs are controlled for (27% of relevant flaws, on average) is consistent with evaluation of other methodological topics (e.g., sampling, measurement, analysis). Our study goes another step by showing that such variance in methodological practices makes a difference for article impact. In addition, some have demonstrated how such methodological inquiry can lead to an improved understanding of theories in strategic management (Barr, 2004; Greve and Goldeng, 2004; Priem, Ndofor, and Voges, 2004; Slater and Atuahene-Gima, 2004; Venkatraman and Tanriverdi, 2004; Williams, Gavin, and Hartman, 2004). Considered jointly, more reviewer and editor attention to methodological rigor is required.

Some efforts are underway to raise the visibility of methodological rigor, as a new annual book series devoted to improving methodological practices in strategic management has recently been launched (Ketchen and Bergh, 2004). Yet, the success (diffusion and adoption) of this discussion will depend heavily on reviewer and editor vigilance. Reviewers are therefore encouraged to evaluate methodological nuance and to incorporate finer-grained assessments of rigor into their assessments. We suggest that reviewers probe into sample types, sampling decisions, generalizability, representativeness, design validity, the inclusion of relevant control variables, power, construct validity and reliability, and the recognition of basic analytical assumptions, at a minimum, for empirical studies that report tests of data (and to apply relevant dimensions of rigor to qualitative studies; see Lee, 1999). In addition, reviewers are also urged to challenge authors to justify and verify the veracity of their methodological decisions. If reviewers do not hold authors accountable for rigorous methodological practices, then problematic research will continue to find its way into the field and adversely impact knowledge development.

Editors help shape the environment for improving the assessment of methodological rigor. First, they could include more specific and in-depth evaluative criteria of research methodology in their manuscript assessment forms. For example, the form could require the reviewer to rate the validity of a submission's sample, design, measurement and analysis, power, as well as the degree of integration between the theory and study. Editors would also need to hold their reviewers accountable on these dimensions. Second, editors

could assign methodologically rigorous reviewers to manuscript submissions. Such reviewers could be methods experts or scholars who have a solid understanding of the relevant methodology. Implementing this suggestion would require up-front costs, such as adding a field to a journal's reviewer database to identify areas of methodological expertise. However, once created, the maintenance costs would be low and the longer-term benefits of these efforts could be high.

At this point in the historical development of the strategic management field, there is evidence across several independent studies that some empirical studies in the strategic management field have low methodological rigor. This congruence in findings suggests that all involved in the marketplace of ideas—scholars conducting the research and editors and reviewers governing the review process—have each played a role in the creation of that state. Fortunately, each can also improve the rigor of research and raise the quality of how future research is done in strategic management.

Administrators

The study findings have implications for evaluative decisions. Article impact is pertinent to administrators because it can be defined, measured, and interpreted. The results may offer several potential insights into the use of that citation count proxy.

First, most *SMJ* articles do not reach their impact peak within the typical 6-year probationary period associated with tenure review. Given this finding, administrators would need to know whether accurate predictions can be made about an article's future impact using data based on earlier periods. To address that issue, we examined annual citation levels and impact growth rate of two groups of articles. We first identified the articles that appeared in the *SMJ* from 1990 through 1994 (this time period provides 10 years or more for tracking the citations of each article after its publication, long enough to capture maturation). 294 articles were published during that interval. We then rank ordered the 294 articles on their total citation count through year's end 2004 (count as of the end of December). The 20 articles that had the highest total citation counts were noted (the mean citation count for these top 20 articles is 207.25 citations; the standard deviation is 92.28). We then constructed a comparison group that consisted of randomly selected articles that were matched (stratified) by the same publication years as the top 20 articles (for each top 20 article, we randomly selected another *SMJ* article that appeared in the same year. These 20 matched articles were placed into a comparison group (the mean citation count for these articles is 46.00 citations with a standard deviation is 33.85; the mean citation count of the entire sample of 294 articles is 44.68 with a standard deviation of 54.81). The goal with this comparison group was to represent the typical or average *SMJ* article.

Figure 1 provides the annual median citation counts and Figure 2 shows the median cumulative citation counts for both groups of articles.

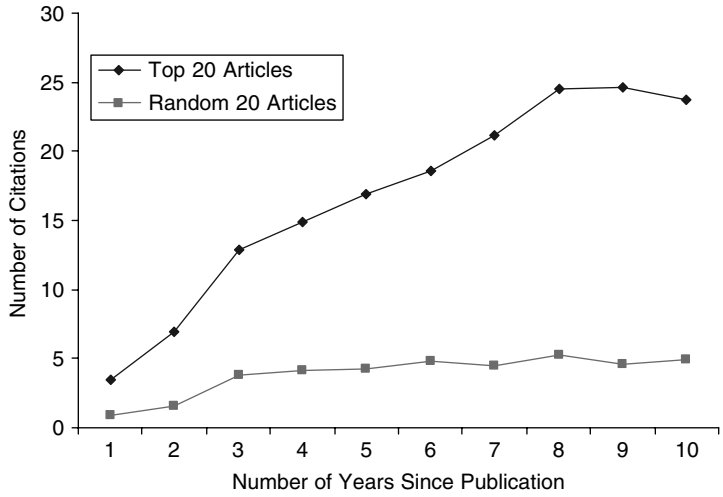

Figure 1. Annual median citation counts for two groups of 1990–94 *SMJ* articles

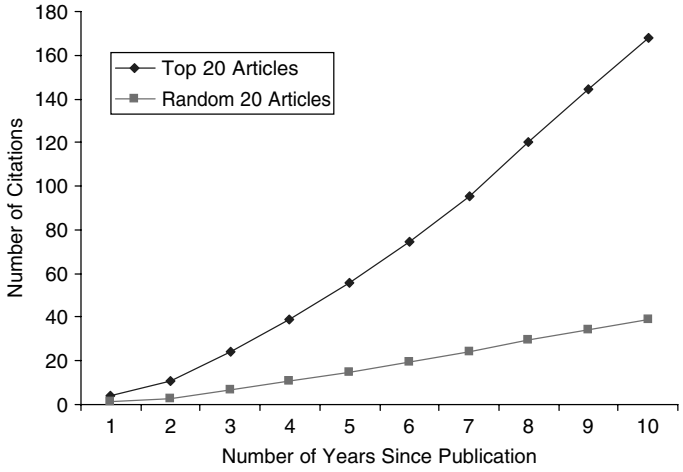

Figure 2. Median cumulative citation counts for two groups of 1990–94 *SMJ* articles

In both cases, the top 20 articles quickly distinguished themselves from the comparison group. By 3–4 years after the publication year, the median citation count of the top 20 articles reached a level that the median of the other articles did not reach by their tenth year. These results suggest that an article's ultimate impact may be apparent quite early on in its life cycle. Indeed, the correlation of annual citation counts at 3 and at 10 years after publication is 0.792 ($p < 0.001$) for a non-top 20 *SMJ* article. The correlation of annual citations at 3 and 10 years after publication is 0.546 ($p < 0.001$) for a top 20 *SMJ* article.

Second, administrators also evaluate scholars by their article count (the total number of published articles in a particular outlet). Our study also provides some insights into this practice. Specifically, a frequency analysis of author names for the entire population of articles appearing in the *SMJ* over the 1990s shows that most authors had one *SMJ* article during the 10-year study period (392 author names appeared on one article, for 65.55% of all authors). 129 authors had two *SMJ* articles (21.57%), 43 had three (7.19%), 20 had four (3.34%), 11 had five articles (1.83%), 2 had six (.33%) and 1 author had eleven *SMJ* articles (0.16%). The cumulative aspect of the frequency distribution means that 65.55 percent of the *SMJ* authors appeared once during the 1990s. 87 percent of authors had two articles or fewer and 94 percent had three or fewer. What these data imply is that requiring multiple publications in the *SMJ* for tenure or promotion requires that a scholar achieve a productivity level that places him/her in unusual company. For example, standards such as 'six A articles for tenure' may be unrealistic. Using the *SMJ* as an example, meeting the six-article benchmark would mean that the author would have the same level of activity that only two others had met and one that had surpassed. And this performance was based on 598 articles! Requiring five or even four *SMJ* publications seems similarly difficult. These results are consistent with Boyd, Finkelstein, and Gove's (2005) findings that only 1 percent of strategy scholars have a total of six publications among a larger sample (six) of top journals over a 6-year period following the scholar's graduation.

Such results raise important questions for administrators. Namely, how many top-tier articles should be required for promotion or tenure? What is necessary for distinction? Using the 1990s as a basis, if three *SMJ* articles were required for promotion or tenure, then the scholar would have had to reach nearly the top 5 percent of all authors who also published in that top journal during a 10-year period. At a minimum, objective comparisons must be used when creating yardsticks for assessing performance in terms of publication counts. Care must also be applied to time period; we did not create an evaluation of author publication number by reducing the time period, but it seems unlikely that those with high numbers of articles attained them in a shortened period. The implication is that a lower number of required articles may be more realistic, especially given the typical 6-year tenure probationary period for tenure.

Third, administrators may gain new insights from the apparent trade-off between quantity and

quality (in terms of impact) of a scholar's article publications. The results imply that they would benefit by recognizing that quantity and quality represent different constructs. It does not appear plausible for promotion evaluation to expect a positive association between quantity and quality; realizing high quantity and quality is rare and does not serve in most cases as an attainable or realizable standard. Therefore, an administrative review may be best based on a scholar's quantity of publications relative to other quantity levels, or alternatively, the scholar's quality relative to other articles that have a quality baseline. Mixing quantity and quality is not justified from our data.

A more general question is raised by these observations: namely, what constitutes contribution and meaningful work? The answer depends upon whether the institution rewards quantity or quality. Quantity can be operationalized in terms of relative ranking of publication numbers (e.g., publish x numbers of articles in some defined set of journals, or publish more than y percent of other authors in a particular journal for a given period of time). Quality can be assessed too; for example, an institution might require a scholar to have articles with citation counts that are above the median count impact given the article's cohort counts (quality would include other dimensions too, such as how is an article used in the development of the field). Both dimensions are objective and can be used in evaluation work. The administration and institution would benefit by recognizing, defining, and communicating which of these dimensions are most valuable given its respective goals.

Administrators make important, life-changing decisions, especially when such decisions involve a scholar's promotion and tenure. It stands to reason that such decisions should be based on objective criteria that can be clearly communicated to all parties before, during, and after the evaluative or probationary period. Our study's data provide insights into forecasting impact, publication numbers as benchmarks (six As for tenure), and the trade-off between volume and quality (viewed in terms of citation counts). We urge administrators to consider objective data such as these in their decision-making process.

Limitations

The foregoing interpretations should be considered in light of several limitations. First, this study examined articles published in the *SMJ* only. To the degree to which the *SMJ* is different from other leading journals, the results may not apply to describing or predicting the impact of articles in those other journals. Second, author effects were defined using first author and solo authors only. The results do not reflect the possible influence of co-authors who appear in secondary or a later ordering and therefore cannot be generalized to those authors. This creates a potential for bias; co-authors might also affect an article's impact. We assumed that with a sample of 598 articles co-author effects would balance out; the number of articles having low-reputation co-authors would exceed the number of articles with high-reputation co-authors. Nonetheless, the possible bias effect associated with co-authors must be recognized as a possible limitation in the generalization of the study findings. Third, this study did not examine all or even the most salient determinants of an article's impact. Other factors, such as the nature or type of the conceptual and theoretical contribution, would most certainly matter. The results should therefore be considered as a starting point in trying to understand the determinants of article impact. Fourth, there are other dimensions of article impact that were not measured. Our use of citation counts, while common, is incomplete (Kacmar and Whitfield, 2000). There is more to impact than just citation counts and we strongly suggest that future research examines the dimensions and measures that we did not. Finally, the results of the empirical study differed somewhat from the tests of the aggregated studies. Some of the findings with respect to article characteristics do not appear to apply to empirical articles. It appears that empirical articles are less influenced by author and article characteristics than the sample as a whole.

CONCLUSION

Article impact is becoming an important indicant of scholarly influence. Yet we know little about it. To date, we do not have objective baselines of impact or a basis for differentiating high- from low-impact articles. Increasing our knowledge of article impact would help inform important decisions that have very high opportunity costs.

For example, strategy researchers would have evidence for deciding how and where to allocate their time and resources. Reviewers and editors can use the findings for gaining more insight into their important decisions about what appears, and what does not, in the field's journals. Administrators would benefit from knowing the relationships between article count and impact measures, enabling them to better develop evaluation requirements that best fit the goals and traditions of their particular institutions, as well as help them make more informed decisions regarding promotions.

The findings show that author characteristics, article attributes, and some aspects of methodological rigor have roles in predicting impact. In particular, we find that the high-volume article strategy required by many prestigious research institutions for promotion and tenure is unlikely to produce high-impact articles unless those articles also have high citation counts, which is very rare. Institutions need to be clear about what they require; article counts (volume) or article impact (quality). Our results suggest that they cannot have both. The quality of an author's research methodology also matters. The findings support the recent calls for improving research methodology in the field of strategic management. Finally, authors writing on subjects that receive higher citations are likely to have bigger-impact articles.

Overall, our findings help shed light on a critical subject, one that scholars and administrators heretofore could wrestle with using only intuition, conjecture, and subjectivity. Before this study, little publicly reported data or model existed that provided objective bases for evaluating and predicting article impact. The results therefore provide researchers, reviewers, editors, and administrators some insights into what additional impact means and what factors might influence it. However, the study results should be recognized as an initial inquiry only. Although the current study attempts to extend knowledge of impact to include properties and predictors, much remains to be learned. For example, what other predictors exist? Our results indicate that much variance remains to be explained. What other variables will help explain differences in article impact levels? In addition, what other dimensions of article impact are meaningful and important? Citation counts may be a conventional approach to defining and measuring article impact, but there is more to this concept than citations. We urge researchers to help develop our understanding of impact, what it means and how it can be understood better. Overall, we hope that our study improves understanding of such an important topic and motivates others to explore this critical aspect of researcher performance.

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APPENDIX: CITATION COUNTS OF *SMJ* ARTICLES BY STUDY YEAR

Year	Statistic	Regular articles	Research notes	Non-empirical articles	Empirical articles	Special issue articles	All articles
1990	Minimum	1.00	0	1.00	0	12.00	0
	25th percentile	22.25	2.00	17.25	19.00	28.50	19.00
	50th percentile	34.50	16.00	36.50	31.00	51.00	34.00
	75th percentile	59.50	28.00	59.50	53.00	65.50	57.00
	Maximum	114.00	47.00	104.00	114.00	70.00	114.00
	Mean	42.09	17.00	41.94	37.14	47.33	38.65
	Variance	700.97	273.33	1010.06	593.54	423.00	711.67
1991	Minimum	0	4.00	1.00	0	3.00	0
	25th percentile	21.00	8.00	17.50	17.00	27.00	17.75
	50th percentile	34.00	20.00	27.00	31.00	54.00	31.00
	75th percentile	67.50	23.00	59.50	66.00	90.00	64.75
	Maximum	362.00	56.00	183.00	362.00	362.00	362.00
	Mean	55.58	19.64	45.57	51.28	78.79	49.41
	Variance	3983.59	199.46	2280.56	4162.92	7016.26	3506.56
1992	Minimum	0	5.00	1.00	0	5.00	0
	25th percentile	19.25	11.00	15.75	19.00	20.50	18.50
	50th percentile	33.00	20.00	25.50	25.00	36.00	30.00
	75th percentile	48.50	46.50	83.75	44.00	69.25	48.00
	Maximum	338.00	82.00	338.00	93.00	338.00	338.00
	Mean	50.58	30.11	81.31	32.79	54.60	47.56
	Variance	3988.45	655.61	8055.45	503.64	5140.67	3531.15
1993	Minimum	1.00	5.00	1.00	1.00	1.00	1.00
	25th percentile	14.00	5.50	7.00	14.00	7.00	12.00
	50th percentile	28.00	7.50	25.00	26.50	20.00	25.00
	75th percentile	49.50	12.50	38.00	48.75	42.50	47.50
	Maximum	402.00	14.00	402.00	184.00	272.00	402.00
	Mean	53.08	8.50	81.13	38.81	36.80	49.95
	Variance	6204.19	15.00	18340.98	1304.40	3541.01	5893.80
1994	Minimum	5.00	5.00	5.00	1.00	5.00	5.00
	25th percentile	13.75	9.00	16.00	14.00	28.50	13.50
	50th percentile	34.00	17.00	40.00	26.50	40.00	30.00
	75th percentile	47.75	34.00	62.00	48.75	61.00	46.50
	Maximum	175.00	73.00	139.00	184.00	175.00	175.00
	Mean	40.46	26.36	48.60	38.81	53.86	37.92
	Variance	1370.46	490.26	1654.97	1304.40	1926.13	1230.78

(*continued overleaf*)

(*Continued*)

Year	Statistic	Regular articles	Research notes	Non-empirical articles	Empirical articles	Special issue articles	All articles
1995	Minimum	4.00	5.00	9.00	4.00	10.00	4.00
	25th percentile	13.25	13.25	17.50	11.00	23.00	14.50
	50th percentile	31.00	22.50	41.00	27.00	37.00	28.00
	75th percentile	48.00	32.25	60.50	39.00	74.50	45.50
	Maximum	172.00	48.00	85.00	172.00	85.00	172.00
	Mean	36.31	23.50	42.69	31.74	43.67	34.71
	Variance	931.24	203.50	679.73	904.90	767.50	852.34
1996	Minimum	1.00	0	0	1.00	2.00	0
	25th percentile	13.25	1.75	7.25	13.25	27.00	11.50
	50th percentile	26.00	6.50	18.50	24.00	48.00	24.00
	75th percentile	50.50	21.75	68.75	43.75	122.50	47.25
	Maximum	267.00	24.00	267.00	219.00	267.00	267.00
	Mean	46.79	10.30	49.11	38.31	76.71	41.26
	Variance	2908.10	99.34	4704.34	1928.39	5200.81	2648.23
1997	Minimum	2.00	3.00	4.00	2.00	3.00	2.00
	25th percentile	10.50	4.25	15.00	9.00	26.50	9.00
	50th percentile	19.00	10.00	48.00	16.00	37.00	17.00
	75th percentile	36.00	16.25	74.25	25.00	45.25	29.50
	Maximum	503.00	19.00	503.00	77.00	72.00	503.00
	Mean	34.43	10.25	98.25	20.39	37.00	29.97
	Variance	4716.56	16.25	27389.93	305.28	344.44	3927.47
1998	Minimum	2.00	5.00	2.00	2.00	4.00	2.00
	25th percentile	10.00	5.00	8.50	8.25	11.00	8.25
	50th percentile	17.00	9.00	19.50	15.00	21.00	16.00
	75th percentile	27.00	22.50	39.50	22.00	85.00	26.75
	Maximum	143.00	41.00	143.00	122.00	143.00	143.00
	Mean	23.55	14.22	31.56	19.13	42.60	22.23
	Variance	670.44	188.19	1327.60	353.43	3221.30	609.23
1999	Minimum	2.00	3.00	4.00	2.00	N/A	2.00
	25th percentile	8.00	4.25	7.00	8.00	N/A	7.00
	50th percentile	13.00	8.50	9.50	13.00	N/A	13.00
	75th percentile	22.50	15.50	17.25	21.00	N/A	20.00
	Maximum	56.00	19.00	56.00	55.00	N/A	56.00
	Mean	17.73	9.83	15.17	16.43	N/A	16.18
	Variance	172.24	31.42	232.88	138.29	N/A	153.58
1990–99	Minimum	0	0	0	0	1.00	0
	25th percentile	13.00	5.00	10.00	12.00	22.75	12.00
	50th percentile	26.00	13.00	29.00	22.00	38.00	23.00
	75th percentile	46.00	21.00	59.50	39.00	64.00	43.00
	Maximum	503.00	82.00	503.00	362.00	362.00	503.00
	Mean	40.23	16.96	51.97	31.30	55.74	36.69
	Variance	2747.49	253.07	5673.14	1193.13	3700.98	2436.86