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Communications of the Association for Information Systems

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The Effect of an IS Article's Structure on Its Impact

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Abstract:

Information Systems research often uses article citation counts to judge the impact of articles, journals, and authors, and even to assess the maturity of the discipline. Yet little is known about the drivers of article impact. Motivated by the continued debate on the importance of theory development, methodological rigor, and tradeoffs between rigor and relevance, the authors of this paper examine the structure of theory-based empirical IS articles as a potential determinant of their scientific impact. Using the straightforward measure of page counts, the authors assess the structure of these articles at the macro level and develop hypotheses on article impact. Results indicated that, as hypothesized, the structure of IS articles does determine their impact. Conceptualization and theory development in articles tends to payoff in citation counts, while emphasis on methodology and implications does not. They discuss recommendations for review systems and for authors, as well as for the field as a whole. Supplemental analyses show that highly-influential IS research tends to be theory-based empirical and that, consistent with the evolution of the field, concept to method ratio has been going up in IS articles over time; a synchronization that has paid off in terms of impact.

Keywords: citation analysis, IS research, IS field, relevance, rigor, article structure, article impact.

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I. INTRODUCTION

Citation counts are being increasingly used to judge the impact of research articles [Monastersky, 2005; Starbuck, 2005] and the influence of individual researchers [Christenson and Sigelman, 1985; Truex et al., 2009]. In many cases, citation frequency of an author has been an important factor in influencing the author's ability to secure external funding and even promotion and salary [Diamond, 1986; Seglen, 1997]. It is likely that the importance of citation rates will become even stronger in the future due to the advances in information technologies which allow for an easier and ever more precise analysis of citations [Judge et al., 2007].

The information systems (IS) discipline also relies to a large extent on citation counts to gain valuable insights into both its institutions and maturity. For example, extensive research has been conducted on the identification of the most cited IS journals, articles, and authors [e.g., Clark and Warren, 2006; Gallivan and Benbunan-Fich, 2007; Huang and Hsu, 2005; Katerattanakul and Hong, 2003; Lowry et al., 2007] and on the maturity of the IS discipline [e.g., Culnan, 1986; Grover et al., 2006a; Grover et al., 2006b; Karuga et al., 2007; Katerattanakul et al., 2006; Wade et al., 2006]. Agarwal and Lucas [2005] suggested that the IS community should focus on conducting high-impact (i.e., highly cited) research to improve its visibility and identity.

However, despite the importance of citation rates, there is still no in-depth understanding of its drivers [e.g., Baldi, 1998; Judge et al., 2007]. Research may generally be cited when it is in synchronization with the interests and preferences of its target audience. But what aspects of articles tend to be cited? We generally presume that high quality articles are more influential than those of lower quality. We also presume that the rigor of the review process determines quality, and, therefore, high quality articles are housed in high quality journals. Recently, Judge et al. [2007] examining the management discipline, found that the prestige of a journal and the number of pages of an article are indeed among the significant predictors of citation count.

In the IS field, many recent introspective studies looked at the importance of theory development, the importance of methodological rigor, and tradeoffs between rigor and relevance. Some argue that theory development is instrumental to IS research [Benbasat and Weber, 1996; Markus and Saunders, 2007]. Major IS journals have been promoting stronger theory development. MISQ, for example, has recently launched the MISQ Theory and Review Department "to emphasize the criticality of conceptualization and theory development to our field" [Markus and Saunders, 2007, p. iv]. JAIS has been sponsoring numerous workshops for theory development arguing for the need for better theory in IS journals. *Is the emphasis on theory development going to result in greater citation counts?* In the recent past, many studies have assessed the research methods in the field, and argue for the critical importance of methodological rigor for a maturing discipline. *Is greater emphasis on methodology going to result in greater citation counts?*

Straub [2008] pointed to the conflict between journal editors and reviewers about how to judge the contributions of IS articles. While editors tend to emphasize theory and intellectual stimulation when judging the contributions of research articles, reviewers tend to focus strongly on methodological perfection. Others have debated the efficacy of relevance and rigor as major sources of contribution. For example, Sambamurthy [2001, p. xi] suggested that "although researchers should remain alert to the psychometric and statistical criteria of rigor (for example, norms for Cronbach's alpha or goodness of fit), some flexibility in how we view research is also imperative." He then concluded that "Authors and reviewers must balance attention between descriptive relevance ('Did the research capture an elusive phenomenon reasonably well?') and empirical rigor ('Did the research meet all the thresholds of statistical and psychometric rigor?')." Similarly, Benbasat and Zmud [1999] suggested that methodological rigor should no longer dominate relevance. Rather, the outcomes of research projects should be worth emphasizing. In this case, *would greater emphasis on developing strong implications result in greater citation counts?*

Of course, we recognize that papers have a holistic representation and an internal consistency that would require (in most cases) well-developed theory, methods, and implications. However, we are intrigued by the relative importance of these three sections. We attempt to gain insight into the drivers of citation rate in a simple yet useful way. We focus on the macro-structure of research articles to capture their attention to theory, methodology, and implications. With the increasing attention to stronger theory development, conflicting views on the contributions made by theory and methodology, and concerns regarding the tradeoffs between rigor and relevance, the question arises: *What macro-structure of IS articles yields the highest impact.* Specifically, we strive to address two research questions:

- What sections of IS articles have a significant effect on article impact?
- What is the relative importance of these sections with respect to article impact?

Admittedly, by looking at the macro-structure of research articles as a determinant of impact, we lack granularity on the real causes of impact. However, we believe that it offers a simple yet interesting perspective on the allocation of resources.

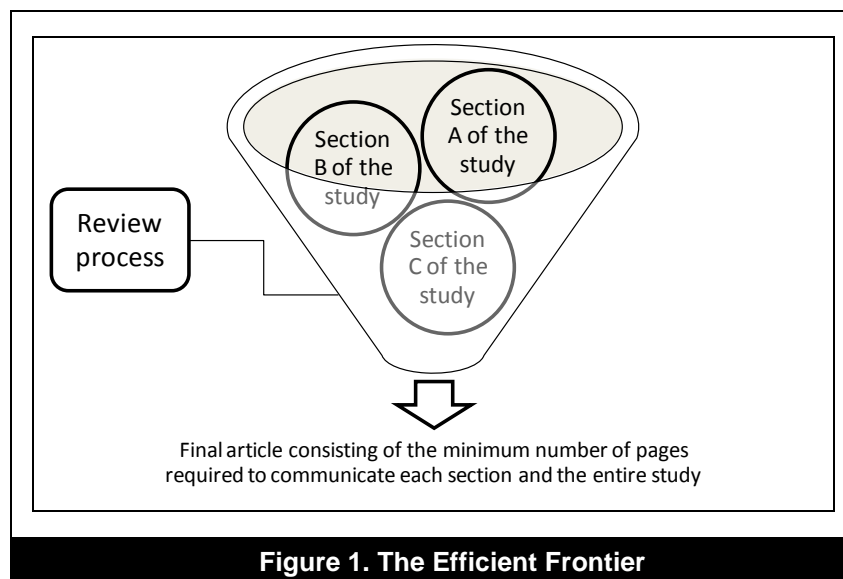
Below we describe our presumption that journal-based communication provides an “efficient frontier,” which means that research is communicated efficiently. Within the parameters of this assumption, our work could assist review systems (editors and reviewers), as well as IS scholars in understanding how to more effectively allocate resources in order to increase the impact of published articles. At the minimum, the results will either reinforce or challenge common beliefs on article impact. At best, the results would begin an introspective journey aimed at determining how to increase the influence of articles in the discipline.

The next two sections introduce and define the concept of article structure that will be used in this study. The paper will then specify the research model before presenting the test of the model and its results. Finally, the implications of our results will be discussed, followed by a discussion of the study’s limitations, suggestions for future research, and contributions.

II. ASSESSING THE MACRO-STRUCTURE OF EMPIRICAL IS ARTICLES

The following discussion of the assessment of the macro-structure of IS articles will be based on the presumption that all published articles, and particularly those that are published in prestigious IS journals, follow an *efficient frontier* (see Figure 1). This means that:

- every page in a journal is precious
- the number of pages devoted to an article is reflective of a review process that results in the minimum number of pages required to communicate the study
- this parsimony holds for each section of the article
- the number of pages devoted to a section of an article is reflective of the importance of that section to the article (i.e., intra-article importance of a section)



The literature supports these assumptions. LaBand and Piette [1994] suggest that journal space is a limited resource that is assigned to authors based on strong competition. Lovaglia [1991, citing Cole et al., 1988; Form 1988] notes that journal space is a precious commodity especially in the social sciences in which the rejection rates are high. Similarly, Stremersch et al. [2007] note that editors often guide authors on the length they will allow for a paper. In fact, due to the scarcity of journal space, the review process often engages in a shortening exercise in order to communicate content more efficiently and have a length commensurate with its assessed contribution. Accordingly, Morse [2007, p. 1163] stated in an editorial note that more significant articles can be longer because “space ... is limited” and an article “must earn its space, or the number of pages of the article.” Similarly, LaBand

and Piette [1994, p. 148] argued that “more substantive scientific contributions will plausibly require greater elucidation than less substantive contributions.” Likewise, Markus and Saunders [2007, p. iv] stated the following about the relationship between journal space requirement and significance of an article’s conceptualization: “Borrowing and tweaking theories from other disciplines is something that can possibly be done adequately in the front half of an empirical research article. But the challenging tasks of conceptualization and theory building often require full-length articles (or even monographs).” Due to the scarcity of space, journals often have page restrictions for different types of articles. We would, therefore, expect authors to allocate the number of pages available to a research article as parsimonious as possible to the different article sections. Further, based on the combination of (b) and (c) we argue that the length or number of pages devoted to a section of an article is reflective of the importance of that section to the article.¹

We admit that these assumptions may be contentious. For example, some might argue that there is little agreement among reviewers [Glick et al., 2007] or between reviewers and editors [Straub, 2008] on the factors comprising a good paper, thus casting doubt on the efficiency of journal-based communication. Others might think that the efficiency of the review process depends on the experience of the reviewers with both reviewing and publishing.

However, as Baskerville and Myers [2002, p. 5] pointed out, “The field has developed an excellent scholarly communication network.” Given the increasing maturity of the IS field [e.g., Baskerville and Myers, 2002; Grover et al., 2006a; Karuga et al., 2007; Katerattanakul et al., 2006] and the increasing quality of IS journals [e.g., Katerattanakul et al., 2006], we believe that our assumption is reasonable. This is especially true for prestigious IS journals, which constitute our focal sample.

III. MACRO-STRUCTURE OF THEORY-BASED EMPIRICAL IS ARTICLES

In order to assess the macro-structure of IS research articles, we restrict ourselves to theory-based empirical research that is quantitative and, by its very nature, deductive. This boundary condition ensures that considered articles are consistent with our study objectives and that article structures are comparable.² No consideration is given to special articles such as research notes, opinions, or purely theoretical articles. While we lose some articles due to this restriction, we include the largest class of IS articles—which represent the modal or “typical” article.³

Generally, the organization of theory-based empirical research in IS follows the hour-glass structure proposed by Hill et al. [1982]. Specifically, these articles have three sections. They are divided into the theoretical front end, the method, and the implications derived from the study. The *theoretical front end* emphasizes what results are expected from the study and why they are expected. It justifies the subject of the study as well as the hypotheses and thus invests into problem statement, conceptualization, and theory development. Specifically, the importance of the problem under study, the theoretical implications, and theoretical propositions are addressed. The *method section* accentuates how the study was conducted. It thus reflects investments into describing the study’s sample, variables, procedure, results, as well as the validity and reliability of the results. The discussion of the *implications of the results* essentially highlights the “so what” of the study. It evaluates and interprets the results. Specifically, it justifies the study’s meaning for researchers and practitioners by investing into inferences for both research and practice. This usually includes a discussion of the study’s limitations for the interpretation of the results. Table 1 exhibits common headings associated with each section.

These three sections will be assessed in terms of the magnitudes of their importance. The evaluation of section importance can be accomplished in either an absolute or a relative fashion. An absolute assessment implies that the importance of one individual section to a paper is directly reflected by the length or number of pages of that section. Depending on the importance of the overall article to the journal and subsequently to the field, all three sections can be of high importance. For example, a particularly good paper that is assigned a large number of pages could have a high theoretical/conceptual importance, high methodological importance, and high importance of its implications. Page limits advanced by IS journals or maximum lengths allowed for research articles do not appear to affect these relationships since only about 1.5 percent of the articles in our sample exceed 90 percent of the page limit. These

¹ While there are no physical cost constraints for electronic journals such as the Communications of the Association for Information Systems, we still believe that our assumptions hold for these publications. It is our suspicion that while the economic aspects of the efficient frontier may not hold for e-journals, the incentives (e.g., higher journal impact factors) for their review systems to publish parsimonious, accessible, and readable articles would still result in similar structures.

² For example, non-empirical articles cannot be considered since they have no method section; implying that (1) they are inconsistent with our study objective of examining whether greater emphasis on methodology is going to result in greater citation counts, and (2) they cannot be compared to empirical papers in terms of article structure.

³ In order to maintain internal consistency in our analysis, we consider only theory-based empirical articles that are quantitative and do neither consider the few “theory building” articles which have a natural tendency to build post-hoc theory based on inductive data analysis nor the few theory-based empirical papers that test theory through qualitative methods, such as case studies.



Table 1: Overview over Common Headings Associated with Each Section	
Section	Associated headings
Theoretical front end	<ul style="list-style-type: none"> • Background • Conceptual development • Hypotheses development • Literature review • Research hypotheses • Research model • Research questions • Theory • Theoretical background • Theoretical development • Theoretical model
Method	<ul style="list-style-type: none"> • Analysis • Data collection • Findings • Methodology • Methods • Model testing • Procedure • Research methodology • Results
Implications	<ul style="list-style-type: none"> • Contributions • Discussion • Future Research • Implications • Implications for future research • Implications for practice • Limitations • Practical implications • Recommendations • Theoretical implications

numbers are based on the “real” total numbers of pages used by the articles in our sample on the one hand and “nominal” page limits on the other hand (i.e., without consideration of whether page limits exclude tables, figures, and references). Taking additionally into consideration that, for at least two thirds of the journals in our study, the page limit excludes not only appendices, but also tables, figures, and references, page limits appear to have even less of an effect on the relationship between section importance and article impact. Moreover, the page limits are handled quite flexibly by the journals in our sample—with clearly stating that the page limit is a “general” rule, where exceptions apply for persuasive justifications provided with article submissions. Finally, any reduction in length due to editing in the final stages is often based on considerations such as readability and redundancy, which are entirely consistent with our efficient frontier argument.

IV. STRUCTURAL PREDICTORS

Our two research questions are matched to the two different possible assessments of section importance: absolute or relative. The concept of absolute importance directly captures whether a section is at all important while relative importance benchmarks one section’s importance with that of another. A relative assessment is directly reflected by the comparison between the number of pages of that section and the number of pages of another section. For example, a paper’s conceptual importance could be compared to the paper’s methodological importance. As a result of the relative assessment, one could argue that conceptualization is more important to the article than methodology.

Absolute Predictors

The absolute predictors will be used to evaluate the importance of the individual article sections on article impact. The direct relationships proposed below are based on certain mechanisms by which section importance influences

article impact. These mechanisms differ by section and relate the intra-article importance of a section to article impact.⁴

Conceptual Importance

Given the criticality of conceptualization and theory development to the IS discipline, investments into a paper's concept section or front end appear likely to influence the paper's impact. There are at least five basic mechanisms by which conceptual importance influences article impact: the completeness of the conceptualization of the problem, the completeness of the literature review, the completeness of the explanation of the phenomenon, the novelty of the idea, and the extent of justification of the hypotheses.

First, conceptual importance may be reflected in the completeness of the conceptualization of the problem, thus contributing to article impact. The more completely and rigorously a problem is conceptualized, the deeper the understanding the reader gains of the problem and appreciation of the study.

Second, the importance of the conceptual section might be reflected in the completeness of the literature review, by this means influencing article impact. The literature review can influence article impact in two ways. (1) A complete and rigorous literature review can constitute a contribution in itself. When background literature is summarized completely and organized in a way that facilitates understanding, the corresponding article might be cited for the use of the summary of the background literature. For example, an article written by Eisenhardt [1985] that used agency theory to investigate control has become widely referenced for its review of agency theory that facilitates management researcher's understanding of this economical concept. (2) The completeness of the review of prior literature could influence article impact as it grounds the theory development. To the extent that the theory development is not well grounded in prior literature, the study's overall contribution might be questioned.

Third, the completeness of the explanation of the phenomenon might be another mechanism by which conceptual importance influences article impact. The more complete the phenomenon under study is conceptualized, the deeper the understanding the reader gains of the phenomenon and subsequently of the entire study. This deep understanding could be through a formal theoretical frame or mid-level theory. This, in turn, provides for a strong anchor upon which to build the study.

Fourth, conceptual importance may be reflected in the novelty of the idea, thus contributing to article impact. Specifically, a more complete and detailed description will be necessary for more novel ideas. This could be, for instance, to address why the new ideas are superior to established work. By contrast, a less complete and detailed description might be sufficient for well-known ideas. While the refinement or extension of an existing idea certainly constitutes an important contribution, it appears less likely to be as intellectually stimulating and substantial as a novel idea. For example, the contributions of the incremental research conducted on the technology acceptance model have been questioned [Benbasat and Barki, 2007]. Introducing a novel idea also implies less competition in the "market of ideas" [Lyytinen and King, 2004, p. 236]. While an existing idea is linked to several articles that could be referenced by a future study, a novel idea is alone in the marketplace and hence constitutes a supplier's knowledge monopoly. Accordingly, developing or introducing a novel idea has been found by Judge et al. [2007] to result in a higher citation rate. Other authors have even found originality to be among the best predictors of article impact [e.g., Beyer et al., 1995; Gottfredson, 1978; Mount and Barrick 1998; Sternberg and Gordeeva, 1996]. Similarly, Straub [2008] suggests that originality and quality of the idea are of major importance to article quality and impact.

Finally, the importance of the conceptual section might be reflected in the fifth mechanism, the extent of justification of the hypotheses. Hypotheses that are rigorously justified engender confidence in the predictions and provide an anchor for further refinement of the study and its use in other contexts.

There is some evidence that conceptualization is related to impact. Sternberg and Gordeva [1996] found evidence for conceptualization and explanation of the phenomenon, originality of the idea, and clarity and testability of the hypotheses to be related to article impact. Thus, in sum, we argue that the more the above mechanisms or aspects are explicated in an IS article, the more article impact they will generate. We propose:

Hypothesis 1: *Conceptual importance is positively related to article impact.*

⁴ Or perhaps to the "extra-article importance of the section (i.e., importance of the section to the IS field)," which will then be related to article impact.

Methodological Importance

Investments into describing a study's methods might yield implications for the study's impact since methodology can constitute a contribution in itself [Bartunek et al., 1993; Van Maanen et al., 2007] and, moreover, constrains the means to draw inferences from the conceptualization [Judge et al., 2007; Van Maanen et al., 2007]. Accordingly, there are at least four basic mechanisms by which methodological importance influences article impact: the description of the statistical test or procedure, description of the design features, the complexity of additional evidence provided to support theory, and the description of the results.

First, methodological importance may be reflected in the completeness of the description of the statistical test or procedure, thus contributing to article impact. Specifically, a more complete and detailed description will be necessary for more novel statistical tests or procedures, while a less complete and detailed description will be sufficient for well-known tests and procedures. The presentation of a statistical test or procedure that is novel might in turn inspire other researchers to supplement or replace their traditional methods with the presented one. For example, Chin [1998] has been widely referenced for his presentation of partial least squares modeling. Nunnally [1978] has been frequently cited for presenting a threshold for statistical reliability. Accordingly, the presentation of a novel and useful statistical test or procedure has been found to influence article impact [Sternberg and Gordeeva, 1996].

Second, the importance of the method section might be reflected in the completeness and granularity of the description of the design features. Specifically, a more complete and detailed description will be warranted by stronger design features, while a less complete and detailed description will be sufficient for weaker design features. Stronger design features will in turn enhance the robustness of the results and thus increase the study's trustworthiness. Correspondingly, Shadish et al. [1995] found a significant effect between an article's methods or design features and its citation frequency. Judge et al. [2007] found that articles with longitudinal designs had higher impact.

Third, the complexity of additional evidence provided to support an existing influential theory might be another mechanism by which methodological importance influences article impact. The use of additional evidence in support of an existing influential theory verifies the correctness of the theory in use and hence increases the study's trustworthiness. Accordingly, Sternberg and Gordeeva [1996] found the presentation of evidence that supports an existing influential theory to be related to article impact.

Fourth, methodological importance may be reflected in the completeness and detailedness of the description of the results.⁵ There are at least two ways in which this aspect of the methodological importance is linked to article impact. (1) A more complete and detailed description will be necessary for high levels of surprise inherent in the results (i.e., contradict hypotheses), while a less complete and detailed description will be sufficient for results that are expected. If the results yielded by a study are obvious, there might be less a motivation to further explore the topic. Correspondingly, Sternberg and Gordeeva [1996] found that articles containing surprising results are likely to have more impact. (2) A more detailed description of the results will be necessary if the results are to be discussed with tighter logical reasoning in order to enhance their clarity and unambiguousness and thus increase the study's trustworthiness. Accordingly, a clear presentation of the results and their careful discussion with tight and logical reasoning has been found to influence article impact [Sternberg and Gordeeva, 1996].

The more the above mechanisms or aspects are explicated in an IS article, the more article impact they will generate. Correspondingly, methodological rigor has been directly and positively related to article impact [Bergh et al., 2006]. In the IS field, the strong emphasis on methodological rigor of the 1980s and 1990s continues to have an effect since the field and its methods are still evolving. Method based nuances can thus be expected to be cited more in IS than in a field in which methods are well established and understood. Therefore, we propose:

Hypothesis 2: *Methodological importance is positively related to article impact.*

Implications Importance

An article's implications might also influence its impact, since the implications are an important part of an article's overall scholarly quality (e.g., the Academy of Management Journal best article awards emphasize article implications). There are at least three basic mechanisms by which the importance of the section on the implications influences article impact: the completeness of the interpretation of the results, the extent of abstraction, and the completeness of the implications for future research.

⁵ It is important to note that under methodology, we refer to the description of the output of the analyses (i.e., the significance levels, strength of relationships, support or non-support of hypotheses, etc.). The interpretation of these results for theory or practice is not included here—but in the section on "implications."

First, the importance of the section on the implications may be reflected in the completeness of the interpretation of the results. Complete interpretations can provide different alternative interpretations of the results. Considering alternative interpretations requires greater elucidation than does the consideration of only a single interpretation, while acknowledging the inherently subjective nature of any interpretation. Some interpretations might fit the current Zeitgeist better than others. Some might be more interesting to the readership than others. Therefore, if alternative interpretations of the data are offered, the readership has a greater chance to find one that stimulates its interest and that it finds to be accurate, thereby increasing the chances of being cited. In addition, a creative interpretation of the results, while often requiring more complex and detailed explanations, might as well influence article impact. A greater extent of creativity will be necessary for more original interpretations, while a lesser creativity will be sufficient for straightforward interpretations. A more original interpretation of the results in turn is more likely to be intellectually stimulating and substantial than a straightforward one and will consequently have a greater impact. In fact, there is some evidence linking alternative interpretations and creativity to impact [Sternberg and Gordeeva, 1996].

The importance of the section on the implications might also be reflected in the extent of abstraction. Often, papers examining IS phenomena and models are tailored to these phenomena. Building the logic from the results of testing such models to broader theoretical constructs and relationships requires considerable elucidation and logic. However, such broader abstractions transcend the specific phenomena, and in some cases even transcend the field, increasing the chance of being cited. Generalizations might facilitate subsequent research since they offer anchor points for the use of the study in other contexts. In contrast, without abstraction, the output of the study remains specific and is, in turn, less likely to be useful for a broader audience.

Finally, the importance of the section on the implications may be reflected in the completeness of the implications for future research. Specifically, a more complete and detailed elucidation will be necessary for high levels of originality and thus usefulness of the implications for future research, while a less complete and detailed explanation will be sufficient for obvious and hence less useful recommendations. More useful implications in turn motivate the reader to conduct the recommended research. For example, introducing a new problem for examination or suggesting a modification in an accepted theoretical construct seems likely to influence subsequent research more than does recommending the repetition of the same study using a different or larger sample. Accordingly, Sternberg and Gordeeva [1996] found the usefulness of the implications for future research to influence article impact. Thus, we argue:

Hypothesis 3: *The importance of the section on the implications is positively related to article impact.*

A summary of the mechanisms that relate the intra-article importance of a section to article impact is provided for all three sections in Table 2.

Table 2: Summary of the Impact Influencing Mechanisms Associated with Each Section	
Conceptual importance	Completeness of the conceptualization of the problem
	Completeness of the literature review
	Completeness of the explanation of the phenomenon
	Novelty of the idea
	Extent of the justification of the hypotheses
Methodological importance	Completeness and detailedness of the description of the statistical test or procedure
	Completeness and detailedness of the description of the design features
	Complexity of additional evidence provided to support an existing influential theory
	Completeness and detailedness of the description of the results
Importance of the section on the implications	Completeness and detailedness of the interpretation of the results
	Extent of abstraction
	Completeness and detailedness of the implications for future research

Relative Predictors

The relative predictors will be used to evaluate the effects of the relative importance of article sections on article impact. Both Judge et al. [2007] and Sternberg and Gordeeva [1996] have found methodological aspects to influence article impact to a lesser extent than conceptual and theory development-related aspects. While Judge et al. [2007] discovered a bivariate correlation of .24 between article citations and the development or introduction of a novel idea, the two significant methodological aspects showed bivariate correlations of only .10 and .11. One of the

methodological factors even exhibited a negative correlation of -27 . Similarly, Sternberg and Gordeeva [1996] found several factors related to conceptualization and theory development to be of major importance, while those factors related to methodological interest were located in the bottom half of their ranking. Given our field's growing emphasis on theory development since the mid-1990s [Lyytinen and King, 2004], we propose:

Hypothesis 4: *The ratio of the conceptual importance to the methodological importance is positively related to article impact.*

Both Judge et al. [2007] and Sternberg and Gordeeva [1996] found aspects of the implications to influence article impact to a lesser extent than do methodological aspects. While Judge et al. [2007] discovered insignificant bivariate correlations of .09 and .10 between article citations and the extent to which an article notes its limitations and describes its implications, respectively, the two significant methodological aspects showed bivariate correlations of .10 and .11. Similarly, Sternberg and Gordeeva [1996] found the presentation and discussion of the results to be slightly more important than the interpretation of the results. As IS researchers have particularly emphasized methodological rigor over the past decade [Benbasat and Zmud, 1999], we argue:

Hypothesis 5: *The ratio of the importance of the section on the implications to the methodological importance is negatively related to article impact.*

Control Variables

We controlled for several factors in order to more accurately assess the effects of article structure. First, we controlled for the broad topic area of each article, since it is known that some research areas draw more attention than others [Garfield, 2006; Judge et al., 2007; Kerr et al., 1977]. Second, because the length of research articles has often been found to predict article impact [e.g., Ayres and Vars, 2000; Judge et al., 2007; Kostoff, 2007], we controlled for the total number of pages of an article. Third, we controlled for the number of authors of each article, since this variable has been shown to significantly influence citation rate [Bergh et al., 2006; Kostoff, 2007; Stremersch et al., 2007]. Fourth, because more complex studies might draw more attention and could provide more anchor points for subsequent research, we controlled for the number of constructs included in each article. Fifth, we controlled for sample size, since a larger sample enhances the trustworthiness of a study's results as compared to a smaller sample. Sixth, because more modern statistical techniques might draw more attention and because method type as a key differentiator among research projects has been significantly related to citation rate [Bettencourt and Houston, 2001], we controlled for the "modernity" of the statistical technique used. Seventh, we controlled for the prestige of the journal in which an article is published since this factor has been found to be a strong predictor of article impact [Judge et al., 2007]. Last, we controlled for differences in the journal space provided by a single page across journals. By incorporating a high level of control based on previously studied factors, we hope to enhance the internal validity of our study for the macro-structural factors of interest.

V. METHODOLOGY

In order to test the hypotheses, we needed to sample articles from the IS field. We used the following sampling criteria: (a) articles should be representative of the IS field, (b) articles should be "typical" and contain both theoretical and empirical components, (c) articles should be housed in widely accepted top IS journals, whose chance to represent the efficient frontier is substantial, and (d) articles should be given sufficient time to influence subsequent research.

Journals and Sample

We focused on three major IS journals, namely *Information Systems Research* (ISR), *Journal of Management Information Systems* (JMIS), and *MIS Quarterly* (MISQ) so as to represent the mainstream of the IS discipline, include articles containing both theoretical and methodological components, and control for the prestige of the journal in which an article is published and subsequently for the quality of the articles in the sample. While high-quality research can appear in any journal, the outlet in which an article is published is generally a robust indicator of article quality [Judge et al., 2007]. These three journals fit the aforementioned criteria best. The comprehensive journal ranking [<http://ais.affiniscap.com/displaycommon.cfm?an=1andsubarticlenbr=432>] of the Association for Information Systems that is based on the average rank of IS journals across nine studies conducted between 1995 and 2005, clearly ranks MISQ and ISR as the two best journals in the field. While JMIS is ranked fifth, it overall matches the sampling criteria well. Communications of the ACM (CACM) and Management Science (MS), which are ranked third and fourth, respectively, do not necessarily represent the mainstream of the field. Clearly, they are not primarily IS journals. Rather, ISR, JMIS, and MISQ are consistently considered to be the top "pure MIS" journals [Rainer and Miller, 2005]. CACM and MS were thus not included in the sample. Further, focusing on ISR, JMIS, and MISQ is consistent with Sidorova et al. [2008], who analyzed a large body of published IS research using solely these three IS journals to uncover the intellectual core of the IS discipline.



We included all theory-based empirical *articles* in our sample that were published in the aforementioned three journals between 1990 and 2005. This period gave all articles enough time to influence subsequent research [Ayres and Vars, 2000; Bergh et al., 2006]. Our final sample consisted of 180 papers, 56 of which appeared in ISR, 76 in JMIS, and 48 of which appeared in MISQ.

Measures

Section importance

The assumption of the efficient frontier indicates that we should use the number of pages of each section of an article to measure section importance. This essentially means that we rely on editors, editorial boards, and authors to assess section importance because evaluating it ourselves would be “inherently flawed” [Stremersch et al., 2007, p. 175]. Article length itself is commonly operationalized as the number of pages [e.g., Ayres and Vars, 2000; Judge et al., 2007; Kostoff, 2007; LaBand, 1986; LaBand and Piette, 1994; Stremersch et al., 2007]. For example, Stremersch et al. [p. 175] applied article length as a measure of article quality based on the argument that “because editors often provide specific guidance to authors on the length they will allow for the manuscript; article length may be considered a function of its contribution (i.e., contribution to length ratio).” They further operationalized article length as the number of pages of an article. Therefore, we used section length to measure section importance. This operationalization of article length is meaningful for this study as well since it allows for the measurement of both absolute and relative importance of the article sections.

We hence assessed absolute importance of the individual article sections using a normalized number of pages per section, while relative importance of the sections were evaluated using ratios. Specifically, the ratio “concept to method page ratio,” divides the number of pages devoted to the front end of an article by the number of pages allocated to describe the paper’s methods, while the “implication to method page ratio,” divides the number of pages devoted to the implications by the number of pages allocated to describe the paper’s methods. The advantage of using those ratios lies in the simplicity with which they can be interpreted. For example, a “concept to method page ratio” greater than one implies a greater conceptual importance than methodological importance, while a “concept to method page ratio” smaller than one implies the opposite by definition.

Scientific impact

As is common practice, we measured article impact by using citation counts from Thomson Scientific’s Social Science Citation Index. Specifically, article impact was measured by the number of citations that each article received in its third year after publication. Our decision to use total third year citation count as the dependent variable was based on the studies conducted by Bergh et al. [2006] and Ayres and Vars [2000]. Bergh et al. [2006, p. 95] discovered that “an article’s ultimate impact may be apparent quite early in its life cycle.” They found that three to four years after publication, the median citation frequency of a set of top articles reached a level that the median of the control group did not even reach by their tenth year. Ayres and Vars [2000] gained similar results. They found that citations per year peaked a couple of years after publication. Bergh et al. [2006] found that the annual growth rate of median citation counts peaks in year three. After year three, especially the control group showed only marginal differences in annual median citation counts.

Control variables

Number of authors, total number of pages, number of constructs, and sample size of each article were simple counts. The broad topic area was coded by classifying each article’s content as being either individual or group-oriented, organizational, or interorganizational or market-oriented. Dummy variables were then computed for these broad content domains. The modernity of the statistical technique used was coded as a binary variable distinguishing between Ordinary least squares regression analysis or single indicator path analysis on the one hand and Partial least squares analysis or Structural equation modelling for multiple indicator latent variable models on the other hand. The prestige of the journal in which an article is published was controlled through sampling from only premier IS journals. The differences in the journal space provided by a single page across journals were controlled through normalizing all page numbers by journal. Specifically, five articles were randomly selected per journal. The words on the first page free of figures, tables, bullet points, footnotes, author names, etc. were then counted for each article. MISQ was used as the reference group. While a page in ISR exhibited almost the same number of words (.9953) as did a page in MISQ, pages in JMIS had less words (.7871), on average.

Analyses

Individual articles were used as the unit of analysis. We apportioned the number of pages of each article contained in our sample into the three segments front end, method, and implications. Specifically, we counted the pages per section of the theory-based empirical articles published between 1990 and 2005 in ISR, JMIS, and MISQ. Since there was clear demarcation of the three sections front end, method, and implications, there was no ambiguity in measuring section pages. Figures or tables were viewed as belonging to the sections referencing them. The entire

coding was accomplished by one of the authors. Least Squares Regression analysis was then used to conduct the analysis.

VI. RESULTS

The means for the number of pages of the three sections theory development, methodology, and implications were about six, eight, and three, with standard deviations of 2.7, 3.0, and 1.6, respectively.

The analysis regarding the absolute importance of the individual article sections (hypotheses one through three) was accomplished by running separate regression models for the three predictors. Since we included the total number of pages per each article as a control variable, we would have faced the problem of ipsativity. A set of measures is called *ipsative measures* if the sum of its scores per observation equals a constant [Clemans, 1966]. In our case, the sum of the numbers of pages over the three sections for each article equals the total number of pages per article. This has the practical implication that one section always has to be excluded from the analysis. As there is no generally recommended approach as to how to conduct an analysis using ipsative measures, we decided to run separate models. This approach allowed us to maintain the integrity of the regressions without oversimplifying the analysis. Table 3 presents the descriptive statistics and correlations of our study variables. As the table shows, citations in the third year after publication averaged about six, with a standard deviation of approximately eight.

Table 3: Means, Standard Deviations, and Correlations of Study Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Organizational-level Research	1.00												
2 Individual/Group-level Research	-0.80 **	1.00											
3 Number of authors	-0.12	0.11	1.00										
4 Total number of pages	0.19 *	-0.21 **	0.05	1.00									
5 Number of constructs	0.04	-0.05	-0.03	0.19 *	1.00								
6 Sample Size	0.05	0.02	0.15	0.12	0.13	1.00							
7 Modernity of statistical technique	-0.10	0.15 *	0.21 **	0.02	0.04	0.19 **	1.00						
8 Number of pages of the section on the concepts	0.16 *	-0.19 *	-0.04	0.70 **	0.33 **	0.03	0.06	1.00					
9 Number of pages of the section on the methods	0.13	-0.12	0.09	0.69 **	-0.06	0.08	-0.02	0.08	1.00				
10 Number of pages of the section on the implications	0.07	-0.10	0.06	0.53 **	0.11	0.16 *	0.01	0.25 **	0.09	1.00			
11 Concept to method page ratio	0.02	-0.06	-0.11	0.02	0.25 **	-0.02	0.09	0.61 **	-0.59 **	0.12	1.00		
12 Implication to method page ratio	0.00	-0.01	-0.01	0.05	0.10	0.06	0.06	0.16 *	-0.46 **	0.75 **	0.52 **	1.00	
13 Article Citations	-0.06	0.09	0.13	0.34 **	0.22 **	0.07	0.21 **	0.45 **	0.12	0.05	0.25 **	0.03	1.00
Mean	0.31	0.59	2.37	17.35	5.92	267.26	0.63	6.23	7.99	3.14	0.89	0.44	6.19
Standard Deviation	0.46	0.49	0.85	4.87	2.85	280.57	0.48	2.74	3.02	1.62	0.49	0.29	7.98

* and ** indicate significance at 0.05 and 0.01 levels, respectively. EQS 6.1 was used for computation.

Regarding the effects of the absolute importance of the individual article sections on article impact (see Table 4), we found support for the proposed relationship between article structure and impact. Specifically, the statistics showed strong support for hypothesis 1, indicating that the conceptual importance indeed influences article impact. Regarding hypothesis 2, the statistics did not show the expected relationship between methodological importance and article impact. The obtained result for hypothesis 3 was statistically significant, but showed a negative relationship between importance of the implications and article impact. For the control variables, the total number of pages, the number of constructs, and the modernity of the statistical technique were significant. Multicollinearity among the predictor variables was not observed. When the three predictors were combined in a single model without the control variables, the observed variance inflation factors for all three predictor variables were all substantially below 1.1, indicating no significant multicollinearity [Mathieson et al., 2001].

As shown in Table 5, the overall effect of the relative importance of the sections on article impact, which was modelled in step two of the regression, was highly significant, again indicating strong support for the proposed relationship between article structure and impact. The model explained 6.3 percent of the variance in impact over and above what was explained by the control variables, which were included in the first step of our regression. Specifically, the statistics showed strong support for hypothesis 4, suggesting that empirical papers with greater conceptual importance than methodological importance have more impact than pieces with an opposed structural characteristic do. Regarding hypothesis 5, which posits that empirical papers with greater methodological importance than importance of the implications have more impact than pieces with an opposed structural characteristic do, again the statistics supported the conclusion (see Table 5). The support provided for all hypotheses is summarized in Table 6.

The unstandardized regression coefficients reveal that an increase in the number of conceptualization and theory development pages by one was found to lead to approximately one more citation (see Table 4). In contrast, an



Table 4: The Effects of the Absolute Importance of the Individual Article Sections on Article Impact

Regression Step and Variable	R2	ΔR2	b	Std. Error	t-value
1. Organizational-level Research	0.207	0.207	0.493	1.981	0.249
Individual/Group-level Research			2.585	1.877	1.377
Number of authors			0.648	0.661	0.982
Total number of pages			0.554	0.117	4.751 **
Number of constructs			0.466	0.195	2.394 *
Sample Size			-0.001	0.002	-0.461
Modernity of statistical technique			2.745	1.171	2.345 *
2. Number of pages of the section on the concepts	0.274	0.067	1.117	0.282	3.966 **
Number of pages of the section on the methods	0.223	0.016	-0.483	0.259	-1.869
Number of pages of the section on the implications	0.232	0.025	-0.918	0.391	-2.346 *

Research stream was dummy coded. Dummy variables were Organizational-level research and Individual/Group-level research. Market and interorganizational-level research served as the reference group. * and ** indicate significance at 0.05 and 0.001 levels, respectively.

Table 5: The Effects of the Relative Importance of the Article Sections on Article Impact

Regression Step and Variable	R2	ΔR2	b	Std. Error	t-value
1. Organizational-level Research	0.207	0.207	0.493	1.981	0.249
Individual/Group-level Research			2.585	1.877	1.377
Number of authors			0.648	0.661	0.982
Total number of pages			0.554	0.117	4.751 **
Number of constructs			0.466	0.195	2.394 *
Sample Size			-0.001	0.002	-0.461
Modernity of statistical technique			2.745	1.171	2.345 *
2. Concept to method page ratio	0.270	0.063	4.960	1.302	3.809 **
Implication to method page ratio			-4.410	2.131	-2.069 *

Research stream was dummy coded. Dummy variables were Organizational-level research and Individual/Group-level research. Market and interorganizational-level research served as the reference group. * and ** indicate significance at 0.05 and 0.001 levels, respectively.

Table 6: Summary of the Support Provided by the Data for the Hypotheses

Hypothesis	Support provided
<i>H1: Conceptual importance is positively related to article impact.</i>	Supported**
<i>H2: Methodological importance is positively related to article impact.</i>	Not supported
<i>H3: The importance of the section on the implications is positively related to article impact.</i>	Not supported
<i>H4: The ratio of the conceptual importance to the methodological importance is positively related to article impact.</i>	Supported**
<i>H5: The ratio of the importance of the section on the implications to the methodological importance is negatively related to article impact.</i>	Supported*

* and ** indicate significance at 0.05 and 0.001 levels, respectively.

increase in the number of pages of the section on the implications by one was found to reduce citation frequency by about one. As shown in Table 5, increasing the number of conceptualization and theory development pages by the number of methodology pages was found to lead to about five more citations. In contrast, an increase in the number of pages of the implication section by the number of methodology pages reduced the number of citations by approximately four.

Clearly, not all highly influential theory-based empirical IS articles with an important concept section will show all of the characteristics of that section that determine article impact. Moreover, there is no guarantee that an article that has an important concept section will be influential. However, article structure seems to capture some reasonable understanding of article impact and what authors and readers might want to look for when assessing the potential impact of a theory-based empirical IS article.

VII. IMPLICATIONS

We found support for the proposed relationship between article structure and article impact. Specifically, we found that—consistent with recent calls for stronger theory development in IS—researchers can potentially increase the citation frequency of their work by emphasizing theory development and conceptualization in their theory-based empirical articles. As this aspect is well under an author's control, its potential to assist IS scholars in gaining higher impact for their work may be high. Students of the IS discipline can use our findings to decide how to more effectively allocate their time and other resources. However, as we enumerate below, our findings have stronger implications for reviewers and editors, by reinforcing prior understanding of the importance of conceptual development in the field.

Interestingly, article impact did not show a relationship with methodological importance. One plausible explanation relates to the journal review process. Reviewers generally focus on methodological nuances rather than intellectual content. Indeed, “reviewers focus on methodology nearly to the exclusion of novel ideas” [Straub, 2008, p. vii]. Hence, the complete and accurate use of well established methodologies appears vital for articles to survive the review process. This suggests that novel methodologies that are not well understood and established will seldom be utilized by such authors, who would like to see their articles published. Since authors want their articles to be published, the methodologies used in IS can be expected to seldom constitute strong contributions in themselves. In a similar vein, established methods used in theory-based empirical IS research like Structural Equation Modeling often refer to the original source papers (in Psychology or Marketing) and other research that uses similar methods may also refer to source papers—thereby lowering the citation count. Editorial policies might also have something to do with this result. For example, in the mid-1990s, *MIS Quarterly* decided not to accept papers whose primary objective was to achieve minor improvements in research methodologies via the use of sophisticated methods [Benbasat and Weber, 1996]. Contributions to IS theory were deemed more important than minor contributions to research methodologies or statistical analysis [Benbasat and Weber, 1996]. While that policy has subsequently changed, it might have reduced the influence of methodological contributions on subsequent research.

Unexpectedly, article impact did not show a positive relationship with the importance of the section on the implications. In our opinion, this might be reflective of the inadequate job many theory-based empirical IS articles do in “completing the loop” and revisiting the theory with their implications section. Much IS research simply reiterates the theory at the front end and articulates why hypotheses are supported; thereby providing redundant content. This redundant content may explain the unexpected result. This is particularly true if implication sections reduce the accessibility and readability of theory-based empirical articles by making them longer—without adding any content. Providing implications for future research might be less important in IS than in other fields since the IS discipline has been arguably less successful than others in developing a cumulative research tradition [Benbasat and Zmud, 1999]. IS researchers tend to focus on conceptualization and methodology rather than the output of their studies [Benbasat and Zmud, 1999], indicating limited investment in developing strong abstraction from the results of their studies.

Figure 2 guides the process of deriving implications from the study. It shows how article impact arises when the preferences and interests of the consumers of IS research are synchronized with the IS field's constitution of codified knowledge (i.e., the articles published in IS journals).⁶ The constitution of codified knowledge is primarily shaped by editors, but also by reviewers and authors; reviewers and editorial policies guide editorial decisions, which in turn shape how published IS research is constituted. Reviewers can also exert direct influence, although to a weaker extent. Furthermore, because review systems are partly constrained by the constitution of submitted papers, authors also have some influence on the body of codified knowledge. Scholars (consumers) cite published research to the extent to which they find its constitution to be synchronized with their preferences; thereby generating impact.

This paper sheds light on one granular facet of this synchronization and its implications for review systems, authors, and the field itself: the macro-structure of theory-based empirical IS articles. For an editor, synchronization in terms of macro-structure implies—on average—higher citation rates for the papers she accepts and in turn higher contributions to her journal's impact factor. For an author, synchronization may potentially increase the likelihood of promotion and tenure through an increased chance of manuscript acceptance along with a greater influence in the field. Further, synchronization engenders prosperity for the discipline as codified papers are cited. This indicates that generated knowledge is reflected in high impact research. Greater high-impact IS research may be subsequently associated with stronger influence of IS faculty through higher visibility [Agarwal and Lucas, 2005]. Synchronization may also promote a cumulative research tradition and thereby strengthen the field's contributions to practice [Benbasat and Zmud, 1999].

⁶ In other words, synchronization here refers to consumer preference-codified knowledge fit.

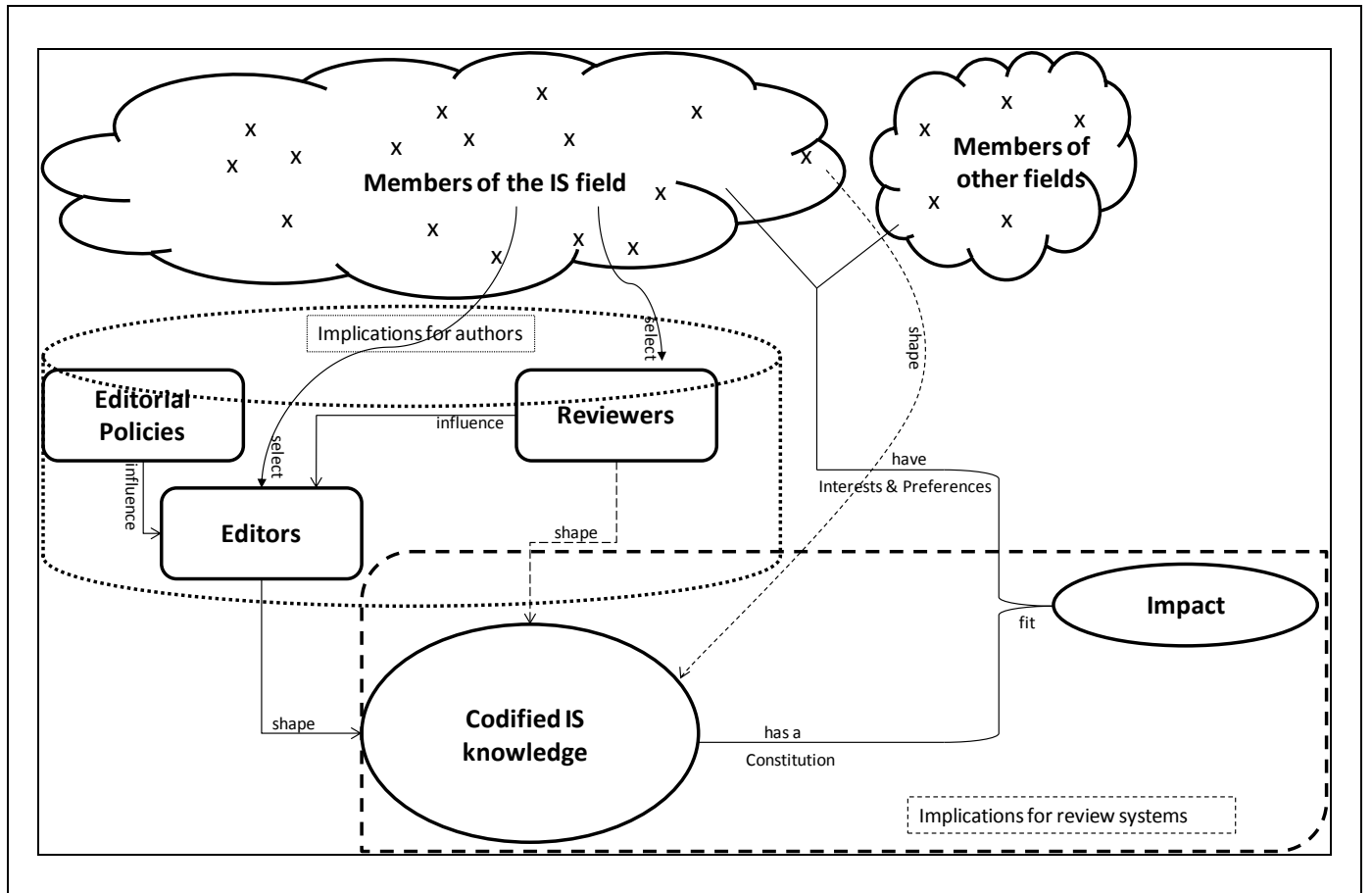


Figure 2. Synchronization Model of IS Research

Implications for Editors and Reviewers

Review systems may benefit substantially from an understanding of the factors associated with the impact of theory-based empirical IS articles. Editors in particular have an interest in seeing their journals thrive through high journal impact factors. Hence, they have a substantial interest in seeing the papers they accept cited and can influence the citations drawn by individual theory-based empirical articles—consistent with the efficient frontier posited above—through ensuring enhanced readability, accessibility, and synchronization in general for each accepted article.

The results indicate that an emphasis on conceptualization and theory development will likely yield a paper that is synchronized with the preferences of the consumers of IS research, while an emphasis on a study’s implications may have the opposite effect (see Figure 3).

In deriving implications for review systems, we could argue rather simplistically that the results suggest that more focus on conceptualization and theory development in theory-based empirical articles at the cost of methodology and implications might be a productive avenue. However, such a conclusion might be rather naive. For example, it is possible that the IS field does not invest adequate effort in developing implications of theory-based empirical studies to further theory development in the field. So, should we reduce the method and implication sections to allow for richer conceptualization? Or, alternatively, should we work toward developing novelty in methods and deeper theoretical implications? In our opinion, the results suggest that both paths are viable and should be pursued.

Regarding the method section, authors are advised to generally refrain from elongated descriptions of a study’s methodological and analytical procedures. This is particularly true for well-understood techniques. Indeed, often even very well-known and established procedures, such as ordinary least squares regression analysis, are discussed in too much detail and can be eliminated or relegated to an Appendix. Shortening the space devoted to the discussion of a study’s techniques in general and well-established procedures in particular is consistent with the ideas developed by Benbasat and Zmud [1999] and would allow for space to be reallocated from the method section to the theoretical front end. Additionally, for novel methods or sub-methods (techniques) that are being introduced to the field for the first time, authors should provide as much detail as possible. By doing this, contributions from method sections can be substantial, as the work establishes a new “way of doing things” in the field. In such papers, the tradeoffs between the novel methods and more established methods should be clearly explicated.



		Conceptualization and Theory Development	
		Low	High
Implications	High	<p>Negative effect of article structure on article impact (-) [e.g., Hardgrave et al., 2003: 2 citations p.a.]</p>	<p>Neutral effect of article structure on article impact (0) [e.g., Devaraj et al., 2002: 9 citations p.a.]</p>
	Low	<p>Neutral effect of article structure on article impact (0) [e.g., Bhattacharjee and Premkumar 2004: 10 citations p.a.]</p>	<p>Positive effect of article structure on article impact (+) [e.g., Gefen et al., 2003: 59 citations p.a.]</p>

Figure 3. Effects of Different Article Structures on Article Impact

The discussion of a theory-based empirical study's implications could be shortened as well. Common practice is to reiterate the theory at the front end to justify why hypotheses are supported. This is redundant content—since many of the arguments are formulated prior to hypotheses development. Instead, consistent with Benbasat and Zmud [1999], it might be more effective to more strongly tie the implications to the relevance of the study for practice and future research. This would require abstraction of the results and integration with existing theory. Thus, the two converse options are (a) to shorten implications, particularly for theoretical aspects that have been set-up early in the manuscript, thereby allowing for more space to be reallocated to the conceptualization at the front end and/or (b) to further develop novel theoretical implications from the results, as well as future research and practical implications.

It should be cautioned, however, that over allocating space from both the method section and implications to the theoretical front end should be avoided. It can be expected that a limit exists for redistributing space that, once exceeded, leads to fewer citations. There might be a curvilinear relationship between conceptual importance and article impact, particularly as the other sections become shorter and an imbalanced article results. Each article is unique and editors have to evaluate the possible uses of journal space based on their understanding of the study. For example, overemphasizing the front end in order to increase citation count might not be meaningful for simple conceptualizations or theories that have been institutionalized in the field's literature base. Alternatively, it might be an effective way to elaborate on new theoretical gaps or build missing logic in developing new mid-range theories for the phenomena of interest.

Implications for Authors

Authors generally focus on the acceptance of papers rather than subsequent citations and hence largely work within the constraints of the review process. Nonetheless, authors may benefit from an understanding of ways to increase citations for theory-based empirical work. We see at least three reasons for such benefits. First, because potential article impact matters to editors as argued before, authors may increase their chances of acceptance by crafting their papers for maximal influence on subsequent research. While the potential impact of a manuscript is only one of several aspects editors consider in their judgment, it is an important one. Second, to the extent that article impact matters to promotion and tenure decisions of IS faculty, authors may be more likely to achieve career goals if they crafted their manuscripts with a focus on potential citation rate. Finally, while IS researchers may care more about acceptance of their articles than impact, they may start (albeit in a limited way) crafting a paper for maximal impact once the article is accepted by a journal and in the proofreading stage.⁷ They could thus design their theory-based empirical work for maximizing the likelihood of both acceptance and impact by shifting their focus from acceptance to citations during the post-acceptance process.

⁷ We are indebted to a member of the review team for pointing this aspect out.

Authors of theory-based empirical articles may benefit from avoiding detailed and extensive descriptions of well-understood methodological and analytical procedures. Still, they should provide more methodological details when introducing a novel technique since substantial contributions may spring from such a method section. At the same time, authors may benefit from shortening the discussion of a study's implications or from tying it more strongly to the relevance of the study for practice and future research. Indeed, some editors (at the end of the review process) try to cultivate papers after acceptance by moving methodological material to an Appendix, pointing out conceptual novelty, or encouraging authors to bring out unique implications. Our study suggests that such refinement is indeed appropriate from the perspective of building the impact of the work. However, as cautioned before, articles need to be crafted carefully—and allocating space from both the method section and implications to the theoretical front end involves a delicate balancing act.

Implications for the IS Field: Further Analyses

The IS field has long endured feelings of inadequacy and illegitimacy [Benbasat and Weber, 1996; Benbasat and Zmud, 2003; Lyytinen and King, 2004]. Agarwal and Lucas [2005] suggested that the field may not survive, since the impact of IS research has remained relatively small and so has the visibility of the discipline within academia. High-impact research, on the other hand, may move the discipline toward prosperity. At the very least, it will increase the field's chance of survival. Accordingly, synchronization between the interests and preferences of the consumers of IS research and the constitution of codified IS knowledge is important to the field. Synchronized research could increase the discipline's visibility and impact; thereby generating more influence within academia.

We conducted two additional analyses to better understand the implications of this study for the IS discipline as a whole. First, we examined the proportions of article types (i.e., theory-based empirical, inductive, conceptual, and other articles) across citation ranks (i.e., high, average, and low citation counts). This analysis allowed us to derive synchronization-related inferences for the entire body of IS research, which transcends theory-based empirical work.

Second, we examined temporal trends in the ratio of conceptual to methodological importance. We sought to understand whether changes over time in the macro-structure of theory-based empirical IS research reflect the evolution of the IS field. Such reflection indicates that IS scholars' debate on the importance of theory development versus methodological rigor has resulted in sustained synchronization in the field.

Examination of Article Types Across Citation Ranks

In order to get a broader assessment of article impact beyond the theory based empirical articles studied above, we examined which types of articles have low and high citations. This analysis allowed for the combined examination of (a) synchronization for the entire body of IS research, (b) the evaluation of whether our findings can and should generalize to article types other than theory-based empirical ones, and (c) the validation of using theory-based empirical research as a reasonable boundary condition. To conduct this analysis, we collected all research articles published in JMIS, ISR, and MISQ in 2003, 2004, and 2005. We then separated these papers into four article types (theory-based empirical, inductive, purely conceptual, and other articles) and three impact-related clusters: articles that received high numbers of citations (one standard deviation above the mean), articles that received low numbers of citations (one standard deviation below the mean), and articles that received an average number of citations (within one standard deviation from the mean).

Our preliminary expectation was that (a) inductive and purely conceptual articles would be more predominant among top-cited than among low-cited papers, and (b) this ratio of top-cited to low-cited articles would be lower for theory-based empirical work. We expected to see these patterns since induction tends to focus on theory-building [Eisenhardt, 1989; Orlikowski and Baroudi, 1991] and entirely conceptual papers tend to focus on conceptualization, while theory-based empirical research tends to be testing-oriented [Lee, 1991; Orlikowski and Baroudi, 1991] and is hence more methodological in nature (recall that we found an emphasis on theory development and conceptualization to have a stronger relationship with article impact than methodology—at least for theory-based empirical work). Due to its wide range, the category of "other" article types (which includes mathematical modeling, simulation, design science, and other papers) did not lend itself to such a prediction.

The data partly supported the predictions. Table 7 shows the proportions of article types within and across citation ranks. For example, 72 percent of all top-cited articles are theory-based empirical, while only 18 percent of all low-cited papers have this characteristic. Supplementary to this table, Table 8 exhibits the distribution of each article type across citation ranks. For instance, of all theory-based empirical articles, 43 percent are highly-cited and 12 percent are low-cited. Visual inspection of the tables indicates that theory-based empirical and purely conceptual papers are more predominant in the higher than in the lower ranks. Specifically, theory-based empirical research is approximately four times more prevalent in the highly-cited than in the low-cited cluster, whereas entirely conceptual research is about twice as common in the top than in the low cluster. By contrast, inductive papers and other article types are more predominant in the lower than in the higher ranks. While inductive research is approximately two and

a half times more prevalent in the low-cited than in the highly-cited cluster, other article types are even about six times more common in the low than in the top cluster.

Table 7: The Proportion of Article Type by Citation Rank

Citation Rank	Article Type				Sum
	Theory-based empirical	Inductive	Conceptual	Other	
Top counts	72% (35)	6% (3)	12% (6)	10% (5)	100% (49)
Average counts	33% (37)	15% (17)	11% (12)	41% (45)	100% (111)
Low counts	18% (10)	15% (8)	6% (3)	61% (33)	100% (54)

Numbers in parentheses show raw counts.

Table 8: The Distribution of Article Type by Citation Rank

Citation Rank	Article Type			
	Theory-based empirical	Inductive	Conceptual	Other
Top counts	43% (35)	11% (3)	29% (6)	6% (5)
Average counts	45% (37)	61% (17)	57% (12)	54% (45)
Low counts	12% (10)	28% (8)	14% (3)	40% (33)
Sum	100% (82)	100% (28)	100% (21)	100% (83)

Numbers in parentheses show raw counts.

Interestingly, inductive and theory-based empirical research did not match the predicted patterns. While this follow-up analysis does not provide the details necessary to derive clear rationales for these findings, it allows for some speculation. As for inductive research, we see three reasons for the surprising finding that—on average—it may not yield much impact. First, this result might reflect the structure of inductive articles, which tend to devote much attention to methodology and implications (neither of which was positively related to article impact). The hesitation that many in the IS field have toward accepting induction as a valuable research approach [Lee, 1991; Orlikowski and Baroudi, 1991] may be another reason. Inductive research may also be cited less than theory-based empirical work as a result of article structure, because theory comes later (in the back end) in inductive papers.

Regarding theory-based empirical work (and its greater impact than purely conceptual research), we may have underestimated the importance of theory-testing to the field at large. While emphasizing methodology in a paper over and above theory development may not be a productive avenue, some quantitative theory-testing is important since methodological rigor has historically been important to the field [Benbasat and Weber, 1996]. Consistent with this notion, some in the IS community still distrust the contributions of articles that do not also test the proposed theories [Markus and Saunders, 2007].

We believe that these findings are not in conflict with those reported earlier for the macro-structure of theory-based empirical research. Rather, the two analyses complement each other in what they imply for synchronization between the preferences of the consumers of IS research and the constitution of codified knowledge. Together, the analyses indicate that theory-testing is generally rewarded by the consumers of IS research, but that its coverage in individual articles should be kept to the minimum necessary so that theory development and conceptualization can be emphasized. This implies that the results from our main analysis primarily hold for theory-based empirical articles. Yet, while our prior findings may not extend to other paper types, the results do hold for much of the entire body of codified IS knowledge, 38 percent of which—according to our analysis—was theory-based empirical between 2003 and 2005, compared to 13 percent of inductive, 10 percent of purely conceptual, and 39 percent of research of another nature. Perhaps even more importantly, our prior findings seem to hold for the vast majority (72 percent) of the most influential IS literature (see Figure 4).

Temporal Trends

During the 1980s, many introspective studies in the IS field focused on how to study IS phenomena. This focus on methodological rigor arose from the calls for new directions in IS research. Research approaches, such as design selection, measurement, and statistical analysis were increasingly emphasized in the literature [e.g., Benbasat and Weber, 1996; Straub, 1989]. By the mid-1990s, the importance of theory development became more widely acknowledged; methodological rigor had increased as a result of the previous focus on methodology. Papers without



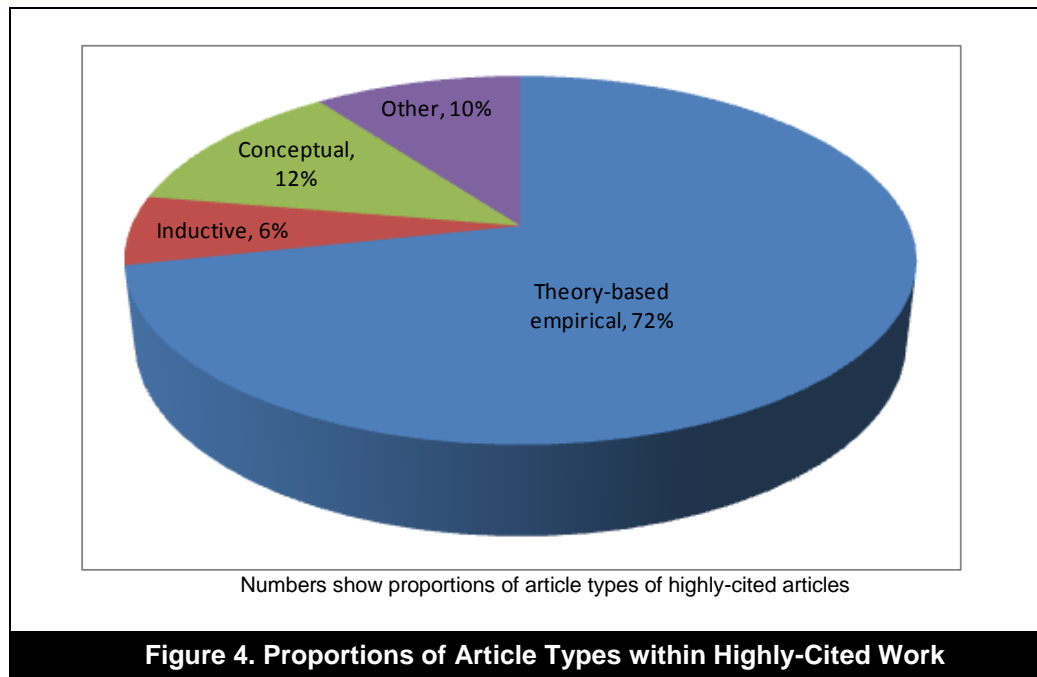


Figure 4. Proportions of Article Types within Highly-Cited Work

high levels of measurement validity and reliability became very difficult to publish in premier IS journals. At the same time, it was recognized that the intellectual contributions made by IS researchers were deemed problematic at best by colleagues in other fields. Many in the IS community started debating whether the field's survival depended on the focus on a theoretical core [e.g., Benbasat and Weber, 1996; Lyytinen and King, 2004]. The focus on theory development has continued until today. Calls for better and more IS-specific theory have continuously been published in articles and editorial comments [e.g., Gregor, 2006; Grover et al., 2008; Watson, 2001; Weber, 2003].

The question arises whether this evolution is reflected in the trend of the macro-structure of theory-based empirical IS articles over time. If it were, the ratio of the conceptual importance to the methodological importance would have increased between 1990 and 2005.

When conducting a least squares regression analysis on this issue, we found that indeed the ratio “concept to method page ratio”, which divides the number of pages devoted to the front end of an article by the number of pages allocated to describe the paper's methods, has increased over time. The publication year explained 3.3 percent of the variance in the ratio over and above what was explained by the control variables. We controlled for the broad research stream, sample size, number of constructs, modernity of the statistical technique used, and journal. Figure 5 shows a clear upward trend from 1990 to 2005. The ratio increased from 0.51 in 1990 over 0.60 in 1998 to 1.06 in 2005, indicating an upward trend for conceptualization and theory development as compared to methodology. This trend was statistically significant at the 0.05 level of significance. Thus, consistent with the evolution of the IS field, conceptualization and theory development as compared to methodology have indeed received increased attention in theory-based empirical IS work.⁸

We can thus conclude that the debate on this important issue has been fruitful in that it affected the macro-structure of theory-based empirical IS research; thereby ensuring continued synchronization with respect to structural aspects of this article type. This could imply that the discipline's review systems are effective in shaping the body of IS knowledge over time by adapting their standards according to the major introspective debates in the field.

Benbasat and Zmud [1999] noted that IS researchers focus on the inputs into their studies rather than the outputs gained from them. We provide the magnitude of this imbalance—on average, approximately 80 percent of the pages available to theory-based empirical IS articles are allocated to the input (conceptual development and methodology) and hence approximately 20 percent to the output. However, our results suggest that the input orientation within the IS field, particularly on conceptual development, results in more impactful research.

⁸ No significant trend could be observed for the “implication to method page ratio.”

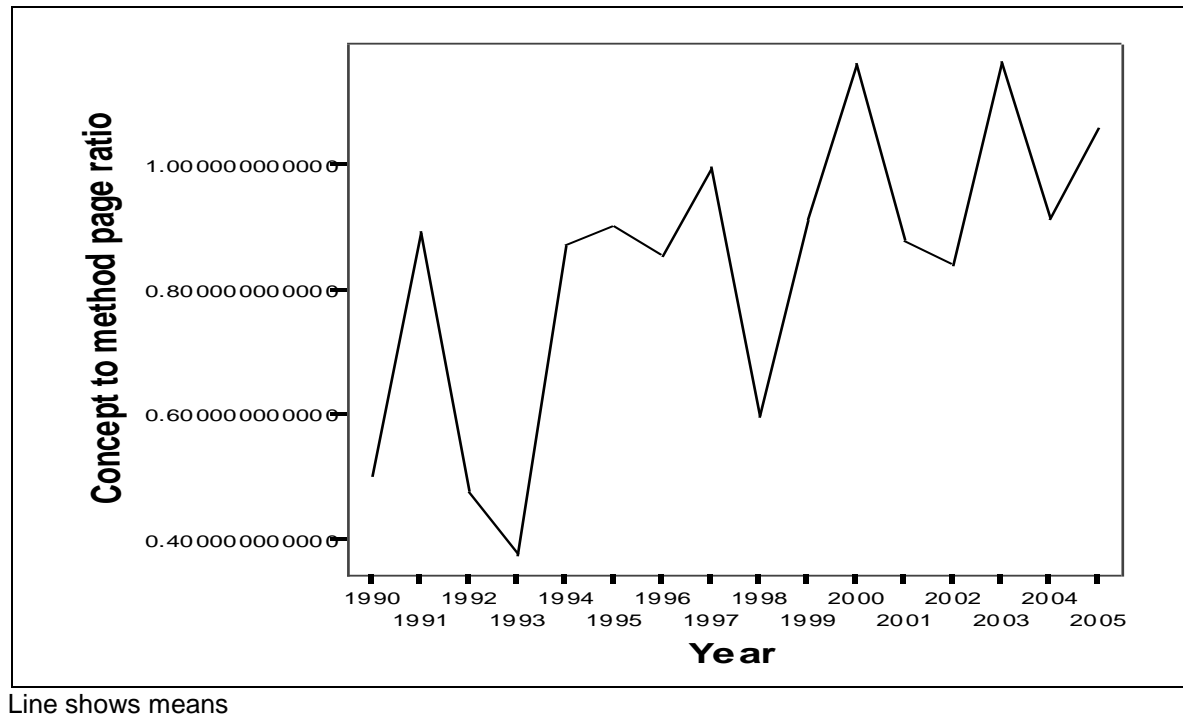


Figure 5. Trends in the Macro-Structure of IS Articles from 1990 to 2005

VIII. LIMITATIONS AND FUTURE RESEARCH

Citation analysis has two potential limitations that deserve mentioning. First, self-citations can constitute a problem. Nonetheless, we decided not to remove self-citations. This decision was based on the evidence that removing self-citations has only little effect on the final results [Gottfredson, 1978]. A second potential problem with citation analysis concerns articles that are cited because they represent examples of bad research. For example, an article might be cited for its errors that another study corrects. While some have challenged this interpretation [Shadish et al., 1995], even if plausible, we would argue that such negative articles can be considered important contributions since they stimulate research debate and they account for less than 10 percent of the total number of citations [Karuga et al., 2007, citing Cote et al., 1991; Moravcsik and Muragesan, 1975]. Despite these potential limitations, citation frequency is an established indicator of quality [Straub, 2008].

This study also intentionally takes a very simplistic approach to article sections and their importance. Based on the assumption of efficiency of journal-based communication (the efficient frontier) we suggest that pages allocated to sections are an optimum representation of section importance. To the extent that this is not considered valid, perhaps because some randomness may still exist in the review process with some reviewers being more supportive than others, our results are not valid. However, we would stress that the top journals in our field (our sample frame) have indeed reached a level of maturity that is generally reflective of efficient and careful allocation of precious journal pages. Future research can examine more refined metrics, based on the content and quality of the articles and their sections in order to further understand impactful research. Also, Van Maanen et al. [2007] argue that the quality of research depends on the interaction between conceptualization and methodology and that emphasizing one over the other would limit this interaction. Thus, emphasizing conceptualization over methodology might result in less promising empirical articles. Linkages or synergies between the article sections might be worth consideration in subsequent studies.

Future research could assist the field in its advancement even further by separating the factors determining citations from within the discipline from those factors determining citations from without. This separation appears meaningful since the factors that determine whether an IS article is being cited by other IS researchers might be very different from the factors that drive whether an IS paper is cited by researchers from outside the discipline. Once we know the factors that lead to citations from outside the IS field, we can more directly influence the discipline's maturity as assessed by citation frequency from reference disciplines [e.g., Karuga et al., 2007]. Another interesting question pertains to the possible curvilinear relationship proposed above for conceptual importance and article impact. Specifically, at what point do returns for additional descriptions of conceptualization and theory development become negative, and what role do the other two sections play in this regard? Can we conceptualize and measure a

“balanced” paper and observe the impact of deviations from this balance? Furthermore, future work could examine in more detail the cyclical nature of the concept to method page ratio. Specifically, can this characteristic of the ratio as shown in Figure 5 be mapped against the editorial regime of an editor in chief? It is possible that editors begin their terms with an emphasis on methodology, and shift toward a focus on conceptualization over time.

Another interesting avenue for future research is to examine what the growing number of electronic journals, such as the *Communications of the Association for Information Systems*, implies for article structure in general and for our results in particular. Although we believe that electronic journals still constrain authors as a result of the incentives (e.g., higher journal impact factors) for review systems to publish parsimonious, readable, and accessible articles, it is possible that such publications have different structures and impact patterns as a consequence of their (often) substantial degree of specialization. More specialized readerships may require fewer details for conceptual or methodological concepts. Moreover, future work could examine why people use citations in the first place. For example, scholars may use citations to show that an idea or technique is not new, to credit other researchers for an idea or concept they conceived, to provide a guide to more detailed information about an idea or technique, to show familiarity with a research area or journal, or to lend an aura of authority to their work. Another interesting question is whether our findings are specific to IS research or whether they hold across fields. While our study indicated that the IS community engaged in the right kinds of debates to ensure continued synchronization, other fields may have engaged in different debates, resulting in different implications of articles structure for article impact. However, if our results—which are based on IS articles—would indeed hold across disciplines, they may be useful to those fields as well; thereby allowing us to contribute back to reference disciplines. In the same vein, future work could examine whether our findings are specific to U.S. research or whether they hold across continental regions. Such international outlets as the *European Journal of Information Systems* and the *Information Systems Journal* may emphasize different aspects of IS research and may accordingly differ from U.S.-based journals in their allocation of journal space.

Finally, future research could examine under what conditions inductive, conceptual, and other article types are cited more. A more granular examination of the impact-related implications of the article types we aggregated to “other articles” may be particularly beneficial. An aggregate measure may obscure the impact implications of such “other” article types. For instance, design science papers may be highly influential, while modeling papers may generally yield little impact, or vice versa. When evaluated as a monolith, “other” article types appear to have little influence on subsequent research, when perhaps different components of this paper type have conflicting implications for impact.

IX. CONCLUSION

This study raises the awareness of an article's macro-structure and its impact in the IS field. Admittedly our macro-structure is a gross measure and lacks the granularity to determine the real causes of impact. However, at the minimum this study exposes some interesting patterns to the field that deserve further scrutiny. First, it shows that the way in which theory-based empirical IS articles are structured is a strong determinant of their impact. Specifically, papers that focus on theory building and conceptualization have more impact than those that focus on methodological aspects. Second, we also found that theory-based empirical articles that focus on methodology have more impact than those that focus on the output of the study (see Figure 6). These findings at the minimum force us to ask questions on the efficacy of allocating more pages to conceptual development and/or increasing the novelty and development of post-result theory.

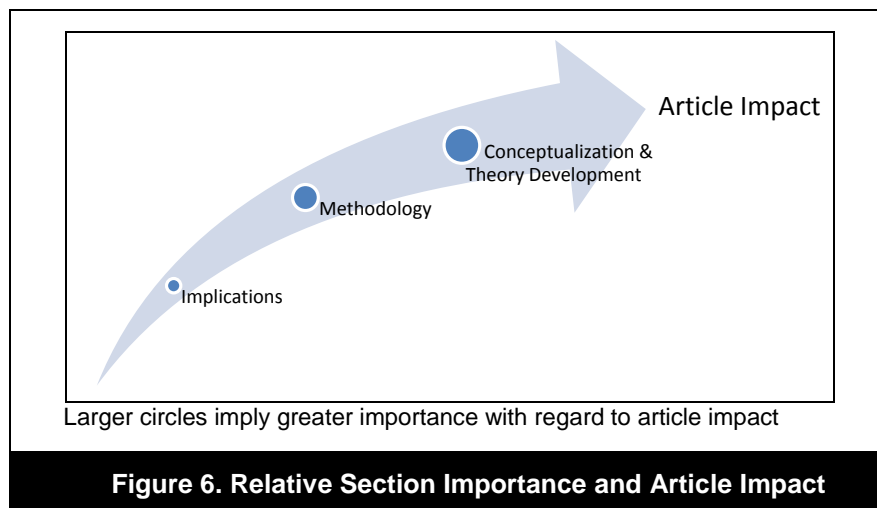


Figure 6. Relative Section Importance and Article Impact

Third, we show that—in contrast to our expectations—theory-based empirical research dominates high impact IS work and may generally draw more citations than purely conceptual or inductive efforts. In conclusion, we believe that the field has a vested interest in publishing work that is highly cited. We hope that this study exposes some interesting patterns at the gross level that are worthy of further micro study that can lead to stronger prescription for the field and its constituents.

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that

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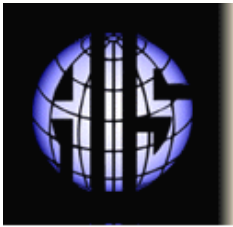
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