Journal of the Association for Information Systems

JAIS

Management Implications in Information Systems Research: The Untold Story*

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Abstract

In this essay, we take a fresh look at the IS academic community's enduring concern with the management implications of its research. We examine in particular what we call the "variables-centered" research paradigm, which focuses its attention on co-variance among independent and dependent variables. As the predominant research tradition in the field, the variables-centered paradigm ought to constitute a major platform from which our community can speak to issues of managerial interest. Unfortunately, the variables-centered paradigm appears to distance researchers from the organizational actors, such as managers, to whom they would give advice and counsel. Particularly disturbing is the systematic erasure of those very actors from the domain of inquiry. Erased, too, are their actions and means of acting. Thus, when it comes time to offer useful prescriptions for action, our community attempts to do so on the basis of research in which, ironically, neither actors nor action directly appear. We offer some recommendations that may help to rectify this problem and, thereby, enrich the capacity of variables-centered research to speak in an informative and useful way to issues of practice.

Keywords: management implications, information systems research, variables-centered research, narrative, process theory, pragmatic generality.

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1. Introduction

On October 20, 2006, Michigan State University launched a project to replace its major administrative systems, including accounting, finance, human resources, and research administration.[1] This project (the Enterprise Business Systems Project, or *EBSP*) has the support of the Trustees, President, Provost, and whole executive management team; even the football coach participated in the university-wide "kick-off" meeting. Office space has been leased near campus, contracts have been signed with the vendors, consultants have been hired, and implementation is under way. The first modules are scheduled to golive in summer 2010. Decisions about scope, architecture, security, workflow, training, and change management are being made on an ongoing basis as the implementation proceeds.

These kinds of systems and these kinds of decisions are mainstream topics for information systems research and are of enormous interest for both researchers and practitioners. In spite of these shared interests, there is a perceived gap between scholarly publications and practitioner needs (Applegate 1999; Benbesat and Zmud 1999; Lee, 1999; Baskerville and Myers, 2003). While it has lately been argued that this gap is unproven (Straub and Ang, 2008), we share with others (e.g., Rosemann and Vessey, 2008; Klein and Rowe, 2008) the view that the gap is real and does not seem to be getting narrower. For example, to aid in their planning, the project leaders at Michigan State did not rely on research findings from academic research. Rather, they visited peer universities that had recently replaced similar systems to learn from their experiences.[2]

We argue that the gap between research and practice arises because we study and write about variables, rather than focusing directly on actors, their actions, and the artifacts they use to accomplish those actions. For example, we know that perceived ease of use and usefulness correlate with technology acceptance. But Michigan State University cannot implement "ease of use" or "usefulness" – it has to implement specific artifacts (such as Kuali Financial Systems), for use by specific actors (such as the manager of the MSU Dairy Store), for specific actions (such as purchasing cream, sugar, and other ingredients, as well as keeping track of inventory and sales). In the analysis that follows, we show that actors, actions, and artifacts are systematically erased from the world portrayed in variables-centered research. As a result, when it comes to offering useful prescriptions for action to the actors in question, we attempt to do so on the basis of research in which, ironically, neither actors nor action actually appear.

A crucial point we wish to make is that *this is not simply a deficiency in how our research is "written up."* While we agree with others (e.g., see Robey and Markus, 1998; Straub and Ang, 2008) that improving the writing in our field would help make communications based on research more accessible, the fundamental problem will not be fixed through clearer or more lively writing.[3] Instead, the trouble originates back at the beginning, when our choice of methodology sets us on a path that shapes the very conceptualization of our research subject.

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[1] http://www.ebsp.msu.edu/, downloaded on January 5, 2009.
[2] Peer experiences are especially relevant because North American universities often include a diverse collection of business units. In addition to academic departments, research labs, libraries, museums, cafeterias, and residence halls, the new systems at Michigan State will serve a dairy farm, multiple medical centers, a hotel/conference center, a performing arts center, various agricultural research stations, international programs, a full range of NCAA sporting events, television and radio stations, a police department, and a power plant.
[3] We agree with Straub and Ang (2008) that our academic journal articles, being written with scholars in mind, should generally not be expected to pull double-duty as a vehicle for communicating insights to practitioners. In fact, for historical and institutional reasons we doubt that practitioners, in any meaningful number, can be induced to read our journals, anyway. Nevertheless, the management implications discussion – which, we note, Straub and Ang do not propose to eliminate – remains important as a statement about how the research in question meets the standard of applicability we should continue to expect of our work as an applied discipline. It is also helpful to think of the management implications section of the journal article as a guide to communicating insights, based on the research, to practitioners through various other outlets, including practitioner journal articles, advice and consulting, teaching, and textbooks (Straub and Ang, 2008).

We accordingly agree with Klein and Rowe (2008: 676) that "… the relevancy problem is real and, in addition to being a communication problem is also a knowledge production problem… That is, it is a function of both how we communicate and what we communicate about." Moreover, we will argue here that the solution involves more than just making a "choice of topics or themes" that veers toward the "more pragmatic," and/or targeting "evidence-based management prescriptions" (Straub and Ang, 2008: viii) – although these measures would clearly help. Instead, seeking "ways that could help improve… [practitioners'] chances of success" and "reaping the purported benefits from… technologies" (Straub and Ang, 2008: viii) poses a how-to question that requires something more to answer.

This essay expands on the preceding argument in the following way. We begin by considering more closely how the properties of variables-centered research appear to hamper researchers in drawing practical implications for action. To verify our suppositions in this regard, we analyze the discursive strategies of thirty highly cited, variables-centered empirical articles in three premier IS publications (ISR, MISQ, and JMIS). While these papers do a fine job of identifying and testing relationships between variables, they are largely silent when it comes to giving an account of the real-world phenomenon behind the correlations. As a consequence, they struggle to draw clear and compelling management implications. We conclude by considering some possibilities for re-situating variables-centered research, so that it can support accounts that contribute more meaningfully to managerial practice.

2. The Practical Limits of Variables-Centered Research

The variables-centered approach focuses on abstracting the phenomenon of interest to constructs, operationalizing variables as measures of those constructs, and then examining the correlations among those variables. The abstraction is undertaken in pursuit of statistical generalization, which, it is hoped, will lead to the discovery and substantiation of predictive laws (Flyvbjerg, 2001).

The paradigm's greatest strength — this potential for abstraction and generalization – imposes certain well-known limitations on how we represent the social world. Critiques of variables-centered research have focused on, among other things, its elimination or simplification of context, its removal of participant meanings, and its neglect of history. These deletions have a range of implications for the knowledge that such research can and cannot produce.[4] But abstraction to variables removes not just context but also *content*, and it is here that we find a key source of the trouble when it comes to drawing practical lessons for management.

To do variables-centered research, one needs variables. The problem is, variables do not exist in the world populated by managers and other organizational members who are using IT to make decisions, place orders, and help customers. Variables exist in a parallel world that must be constructed through operations and transformations that abstract and summarize the quantity and quality of things that do exist in the real world. This process of abstraction and summarization lays the foundation for the pursuit of the nomothetic agenda, but has unfortunate side effects when we want to speak to matters of practice. In particular, when we construct the world of variables, we must:

> → remove actors

> → remove actions

> → remove artifacts

In short, the variables-centered paradigm *depopulates* the organizational and social terrain. It creates a world where only variables can exist.

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[4] For classic discussions of the limits of variables-centered research, readers are referred to Cicourel (1964) and Blumer (1968). For a more recent treatment, see Flyvbjerg (2001).

The problem here is not abstraction *per se.* It is perfectly possible to create abstract models that include categories of actors, actions, and artifacts. This kind of abstraction is a fundamental tool in process modeling (Malone et al., 1999), pattern languages (Alexander, 1977; Gamma et al., 1995), and narrative theory (Bal, 1987). The difficulty in variables-centered research is with the particular kind of abstraction, which transforms familiar aspects of organizational life into columns of numbers that can be used to compute a covariance matrix.
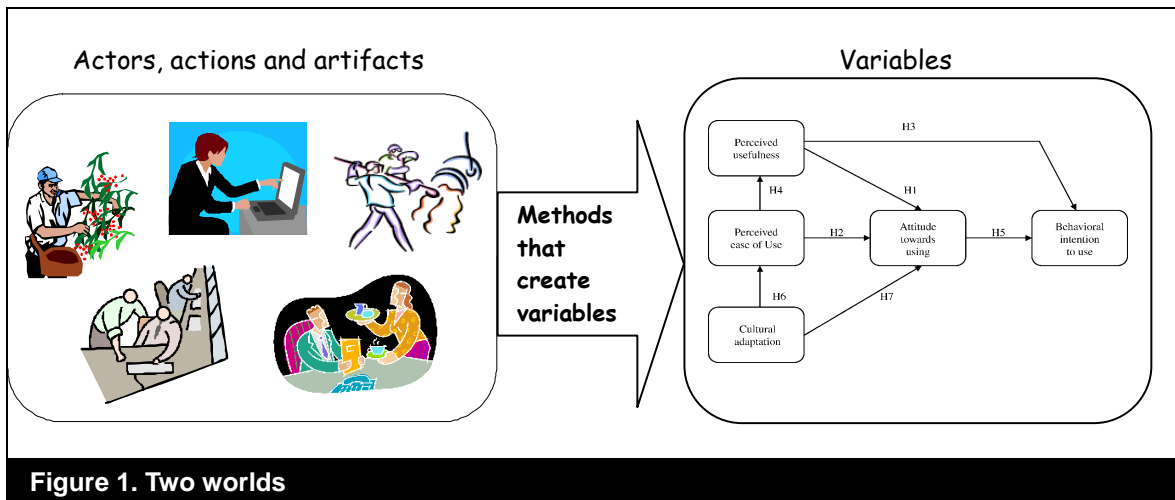

Figure 1. Two worlds

On the left of Figure 1, we have the world of actors, actions, and artifacts. Here, among other activities, managers manage. On the right, we have the world of variables. Here, variables correlate and mediate. To move from the actual world to the variables world, we use methods such as sampling, coding, counting, and correlating.

We do not mean to suggest that the world of variables, as a representation, is less real or less valid than alternative abstractions. Formal research methodologies do a good job of ensuring the correspondence between variables and whatever they are intended to measure. Measurement reliability and validity are well-known problems with equally well-known solutions (Cook and Campbell, 1979). Rather than being less real, variables offer a particular representation that systematically eliminates many of the elements that a typical person engaged in the phenomenon would experience or recognize.[5] And that is what interests us here: When we enter the world of variables, we leave behind the ingredients that are needed to produce a story with the kind of substance and verisimilitude that can give a convincing basis for practical action.

In the absence of a realistic narrative about actors, actions and artifacts, our research literature tells stories about the only thing it has left — the variables. As Abbott (2001: 83) points out, in these stories "variables do things, not social actors." Our claim, then, is that once we have moved from the real world to the variables world, it is very difficult to go back.[6]

3.   Narratives in Published Papers

In an effort to confirm our reasoning (and informal impressions) about the challenge that variables-centered research confronts, we reviewed a sample of thirty published articles based on studies in this tradition. Our goal was to examine what stories actually look like in such articles — what kinds of

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[5] We also do not mean to suggest that organizational actors do not deal themselves in variables during the course of their sense-making, problem-solving, and decision-making. Consider, for example, *employee satisfaction* or *ROI*. Typically, however, such variables find their place in "native models" that are rich in actors, actions, and context.

[6] Rosemann and Vessey (2008) recently proposed a method for "applicability checks" based on *importance*, *accessibility*, and *suitability*. Adopting their terms, we suggest that a variables-only research strategy makes it difficult to meet both the accessibility and suitability standards for practitioner relevance.

stories are told, how they get told, and what rhetorical means are employed in developing statements about management implications on the basis of those stories.

3.1. The Data Set

We examined the 10 most highly-cited empirical articles that adopted a variables-centered approach in each of the following journals: *MIS Quarterly*, *Information Systems Research*, and *Journal of Management Information Systems*. The selection of articles was based on an examination of the Social Sciences Citation Index in Fall 2003. For *ISR* and *JMIS*, we considered the entire period during which those journals were covered by the Index; for *MISQ*, we considered the preceding 10-year period. We focused on the most highly cited papers in order to examine research efforts that could be considered influential, high-quality representatives of the variables-centered approach.

To qualify for consideration, an article had to use an empirical covariance strategy to develop or test theory about some IT-related phenomenon. Accordingly, we excluded case studies, qualitative research, non-empirical theory development papers, and papers focusing mainly on construct development and measurement. The Appendix lists the articles we examined.

3.2. Methodology

Our framework for characterizing the articles was based on the core concept of *story*. Combining characterizations of narrative analysis offered previously by Pentland (1999) and Ramiller (2001), which were based, in turn, on classic work on narrative by such scholars as Bal, Barthes, Burke, Bruner, Polkinghorne, Ricoeur, and White, we regarded the story in the following way:

>A story involves <u>actors</u> undertaking <u>actions</u> intended to accomplish certain <u>goals</u> by certain <u>means,</u> within specific <u>settings</u>, leading to particular <u>outcomes</u>.

Of primary interest was the way in which the article told a story about *the organizational, managerial, or technical phenomenon* that was the focus of the study. For example, if the research concerned adoption of technology by end users, we asked, "What story does the article actually tell us about end users adopting technology?" Depending on the level of analysis, the phenomenon might involve the organization as a whole or some constituent part (e.g., individual members, groups or teams, organizational projects, etc.). In conducting this analysis, we took care to distinguish the story about the phenomenon from the story of the research process, and from other stories that might be present.

The coding for each article involved three main parts: (1) identifying the story elements suggested by the definition above; (2) characterizing the "factualism" of the story; and (3) determining the plot outline of the story that described the phenomenon.

<u>Identifying narrative elements</u>. We focused on the elements that provide the essential content of the narrative: actors, actions, and artifacts.[7] Coding for narrative elements was simply a matter of reading through the article looking for nouns and verbs, and identifying those that played significant roles in the text. Nouns were candidates for actors or artifacts; verbs were candidates for actions.

<u>Characterizing the factualism</u>. *Factualism* refers to the basic ontological standing of the action reported in the story. Adapting a classification scheme for narrative offered by Reissman (1993), we categorized the narrative presented in each article according to one of the labels offered in Figure 2.

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[7] In IT-related research, artifacts are one important part of the "means" included in our working definition for "story" (Orlikowski and Iacono, 2001; Benbasat and Zmud, 2003).

	SPECIFIC	**Actual**	**Fictional**
	GENERAL	**Typified**	**Hypothetical**
		DESCRIBED	DEVISED

Figure 2. Four kinds of factualism

The factualism of a research article's narrative is *actual* where the article describes something that took place historically, with specific actors doing things in a particular time and place. Actualism is common in qualitative research; it is a defining feature of realist ethnography (Van Maanen, 1988). *Typified* action is what is found in a story that tells about how things typically happen or how things take place in the average case. Both actual and typified stories involve descriptions of things that have really happened; the distinction lies in whether a specific instance is being represented or whether a generalization is being offered. *Hypothetical* factualism characterizes a story that, like typified factualism, generalizes; it describes what will tend to happen if something is done under some particular set of circumstances. However, in contrast to typification, it does not entail the assumption that the claim in question is based on actual cases. Finally, a story is *fictional* if it is specific in the way noted above for actualism, but it is understood not to have really happened. We expected fictional stories to be rare or non-existent in the research articles.

Determining the plot. A plot involves an underlying temporal *sequence* that unites the action in the story. Furthermore, "[e]mplotment… means introducing structure that allows making sense of the events reported" (Czarniawska, 2004: 122). To rise to the demand of "making sense," a plot goes beyond mere chronology to identify the causal connections among actors, actions, events, and outcomes. For example, "The king died and then the queen died" is mere chronology; "The king died and then the queen died of grief" is a plot (Forster, 1927). In our analyses, we sought to identify the sequential and casual relationships among the primary elements in the story.

3.3. Observations

Actors, actions, and artifacts. The articles included references to actors, actions, and artifacts. In classifying these references, we discovered that different labels were often used to refer to the same entities. These labels varied in abstraction. Consider an example from Hu et al. (1999), as summarized in Table 1.

Table 1: Actors, actions, and artifacts in a typical article			
	Actors	**Actions**	**Artifacts**
Most abstract	"users" "professionals" "organizations"	"acceptance" "use" "investment"	"information technology" "IT infrastructure"
Most concrete	"physicians practicing at public tertiary hospitals in Hong Kong"	"solicitation of a second opinion" "patient transfer" "admission assessment"	"telemedicine technology"

The upper row of Table 1 shows the most abstract labels applied to the actors, actions, and artifacts in Hu et al. (1999). They are, indeed, highly abstract, and quite typical of all the other research articles. The interesting part of Table 1 is the lower row: the most concrete labels given to the same entities. Hu et al. (1999) would seem to offer a very concrete description of their focal phenomenon,

except that nearly all of this concreteness occurs in a single sentence on p. 97: "Common inter-institutional service collaborations include solicitation of a second or a specialist's opinion, patient transfer or admission assessment, team-based collaborative patient management and urgent medical care needs." While this sentence refers to categories of action more specific than "use" or "acceptance," it does not describe any instance of these actions. On p. 96, we learn, "The targeted technology was telemedicine in general, rather than specific telemedicine programs/technologies." If you are a hospital administrator, you cannot implement "telemedicine in general" – you need to implement a particular technology, along with appropriate policies and procedures for its use. Similarly, Michigan State cannot implement "accounting systems" or "information technology"— it has to implement specific systems. These kinds of details are never mentioned in this article, nor in any of the other articles we surveyed.

Hu et al. (1999) actually contains some of the most concrete description in our sample of articles. The other articles hew to an exclusively high level of abstraction, referring to actors such as managers, organizations, and end users; actions such as investing and deciding; and artifacts such as information technology and infrastructure. References to more specific categories, like those in Hu et al. (1999), are rare, and they never occur in the context of a narrative that connects the actor, the action, and the artifact to an organizational goal or outcome.

Factualism. Naturally, each of these papers states a set of hypotheses about the variables. For example, Dennis and Kinney (1998, p. 262) hypothesize, "performance improves as immediacy of feedback increases." But these are stories about the variables, not stories about the actors or their actions. In the fragmentary descriptions of the underlying phenomena that do appear, nearly all of the papers (29 out of 30) express typified action.[8] For example, in their study of media richness, Dennis and Kinney (1998, p. 257) state: "When teams of two or more individuals work together to complete a task they communicate through some medium." This statement is a typification, because it does not refer to any specific, historical occurrence. Their typification helps to focus the attention (and imagination) of the reader on cooperative work that requires communication.

The coding of factualism was, in certain cases, problematic, as we observed ambiguity between the typical and the hypothetical. For example, citing a long stream of research on the topic, Wheeler and Valacich (1996) argue for the effectiveness of groups in decision making: "Groups often possess a greater variety of task-relevant knowledge, facts and insight than individuals, and the pooling of these resources can lead to emergent knowledge or insight." The use of the modifier "often" suggests a typification, but this particular claim could also be characterized as the "working hypothesis" that motivates the entire line of research on group decision support systems.

Contrary to our expectations, we found it impossible to rule out the use of fiction in the descriptions. After all, as Abbott (1992) points out, researchers in the variables-centered tradition are often forced to invent stories that explain connections between variables. However, because the descriptions used generalized categories rather than specific instances (e.g., "users" instead of "Katie Hansen"), they might be more appropriately classified as hypothetical.

Plot structure. We were surprised to discover that none of the articles in our sample contains a tangible and well-rounded narrative that describes the phenomenon being studied. Fragments of stories are quite common, as in this example from Barua et al. (1999, p. 4): "The rapid growth of IT investments puts pressure on managers to make more informed decisions." But in their study of the business value of IT investments, there is no description of a manager actually making a decision of any kind. And none of the articles in the sample presents a sequence of actions that could be analyzed in terms of the causal connection between elements that relates to some goal or outcome. Lacking any narratives to analyze, then, our analysis of plot structure proved to be moot.

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[8] The single exception, Barua et al. (1995), describes the subject of their study – the business value of information technology investment – in entirely hypothetical terms. Their most specific example is: "In a manufacturing environment, investment in material requirement planning (MRP) systems may improve overall capacity utilization…."

3.4. Variables and Their Stories

Our findings confirm the erasure of actors, actors, and artifacts in the papers we examined. Instead, as in most variables-centered research (Abbott, 1992), the variables are the actors. This invited a further examination of the stories that feature the variables themselves, in terms of goals, settings, actions, means, and outcomes.

The articles present richly detailed stories about the life history of all the major variables, including their appearances, via citations, in other research stories. As actors within their own narratives, variables inhabit a setting constituted by the researcher's model. Variables "act" upon other variables, commonly articulated in language of the sort "X affects Y." Stories of variables are logically typified in their factualism, since they are based on central tendencies. Relationships showing statistically significant effects constitute statements about what typically happens or happens in the majority of cases.

The outcomes are the changes in the levels of the dependent variables. Variables, however, have no goals (or intentions), so the larger meaning of the outcomes depends on reference to the goals held by the researcher. These, of course, are found elsewhere, in the story of the research effort itself and its scientific motivations. Typically, significance in this regard is measured by an improved understanding of how the variables in question interrelate or, more broadly, by the successful performance of a model the researcher has proposed.

In the story of the variables, what we commonly regard as actors (e.g., people, organizational units and, in theoretical contexts such as actor-network theory, technologies) are not actors at all but are instead the means or instruments through which the variables act. In the text, variables-centered articles shift the grammatical position of socio-technical actors so they do not act at all. Instead, actors and artifacts are reduced to vehicles for the production and display of variables.

The resulting linguistic transformations have become commonplace in the literature of our discipline. For example, instead of positioning the user as a true agent ("Why do some users accept personal computing more readily?"), the user *exhibits a variable*:

> "Why are some users able to exhibit greater acceptance of personal computing?"
> (Igbaria et al., 1997: 281)

In another example, where anonymity reduces evaluation apprehension, the language positions the people as the medium for the interaction of variables.

> "Anonymity (offered by the EMS) reduces the evaluation apprehension of members
> and increases their focus on ideas. Such increased topic focus can improve the
> interaction process among EMS groups" (Chidambaram & Jones, 1993: 472).

In summary, we observe the following. The variables are the *actors*. *Actions* are intangible and abstract (affect,influence, cause, etc.), and are typically characterized as changes in the level of the independent variables. The *setting* is the researcher's model, which lays out a collection of relationships among the variables. Actors and artifacts from the everyday world become the *means* through which the variables act. *Outcomes* are changes in the level(s) of the dependent variable(s). Finally, since variables as actors cannot have objectives of their own, *goals* originate in the scientific motivations advanced by the researcher in his/her parallel story about the research project.

3.5. Making Recommendations for Management

In order to speak to management implications, the authors of the articles had to make their way back from a story about variables to the world in which actors act and managers manage. In our study of the articles, we identified two main tactics to accomplish this transit. We will refer to these as "the control-room metaphor" and "micro-process reasoning."

The control-room metaphor. In a study that reports that variable X affects outcome Y, it seems logical to recommend that managers should increase (or perhaps decrease) variable X. This suggestion evokes the image of a control room, with the manager pulling levers and throwing switches in response to indicator lights and readouts.   But in what sense can managers really do this? Where is the control room? Where are the levers and switches?

For example, the well-known Technology Acceptance Model (TAM) suggests that perceived ease of use will increase intention to use a particular technology. Perceived ease of use is the lever, but how do we pull it? Follow-on studies or, more commonly, speculations about selected antecedent variables (e.g., training), in effect add to the complexity of the control room. However, while some antecedents may, indeed, be actionable in some way within a particular organizational setting, adding levers to a non-existent room is not directly helpful.

Because it offers implications for action based on statistical generalization, the control room story constitutes an invitation to managers to commit the *ecological fallacy*. The ecological fallacy arises when one assumes that a relationship that holds at an aggregated level also applies at a lower level. For example, knowing that accountants in the MSU College of Veterinary Medicine tend to have high computer self-efficacy does not imply that each of those accountants feels confident about his or her ability to learn Kuali Financial Systems or that they can skip training.

Lave and Wenger put it this way (1991: 33-34):
> … even so-called general knowledge only has power in specific circumstances. Generality is often associated with abstract representations, with de-contextualization.   But abstract representations are meaningless unless they can be made specific to the situation at hand… Knowing a general rule by itself in no way assures that any generality it may carry is enabled in the specific circumstances in which it is relevant.

In addition to the ecological fallacy, actions based on statistical generalization must rely on what Lee and Baskerville (2003) call "Hume's truism" (also called the "uniformity of nature" assumption). To generalize a statistical finding beyond the immediate context or sample where it was first observed, one must assume that the new context is like the old one, and furthermore, that the future is like the past. In the fast-changing world of information technology, this assumption is definitely unwarranted: If we know anything at all, we know that the future will not be like the past.

For the astute manager, then, the news that more X gives more Y for some firms, some of the time, in a study conducted (perhaps well) in the past, is not a sound foundation for assured action. For a number of reasons, the effect may not exist for his/her firm or, worse, the opposite effect may result. For example, a training session could convince users that the new system is hard to use ("If it's so easy to use, why do we need training?"). Moreover, if the manager buys into the control-room representation, his or her options for action are in effect limited to the variables that have been studied. The manager does well to suspect that there is too little to the story for him/her to judge whether the stated relationship is likely to hold for his/her organization and what, in any event, to do about it.

Micro-process reasoning. Another strategy to move from findings based on variables to actors acting is to use what Abbott (1992) calls "just-so stories." These bits of micro-process reasoning can help to underpin hypotheses, illuminate findings, or give accounts of unexpected observations. Such stories, or fragments of stories, harmonize with underlying theory in some cases, and in other cases are more or less *ad hoc* in nature. In neither case do they signal a significant exercise in process theorizing (Markus and Robey, 1988; Pentland, 1999), nor are they based on the empirical investigation of process. Instead, they are introduced rhetorically in order to help make sense of the action of the variables within the models (Lawrence, 1997).

Micro-process narratives do depict some kind of action in the organization (as opposed to within the model). For example, Compeau and Higgins (1995b) offer a brief narrative to help explain an unexpected negative relationship between organizational support and self-efficacy (p.206):

> When faced with a computer problem that he or she cannot resolve, a user will often call a technical support person for assistance. If the support person, as the authors' experience suggests they sometimes do, dashes into the office, sits down in the users' chair, bangs away at the keyboard for a few minutes and then proclaims that the problem is fixed, it would not be surprising that the user would begin to doubt his or her capabilities.

The storytelling here is fresh, concrete, and vivid. It provides a plausible connection between organizational support and reduced self-efficacy. As micro-process reasoning, then, the story provides an account that makes sense of the correlation. However, it is also important to recognize that the story did not actually occur as part of the data collection for this research. At best, it is hypothetical. Elsewhere, we found other instances of micro-process reasoning that would fall further short of what we would truly regard as stories, since they lack many of the elements identified in our definition.

Micro-process reasoning is more common when authors go from the world of actors acting to variables-centered representations, and, in particular, when introducing and justifying hypotheses. For example, consider the following fragment of prescriptive and typified narrative used in developing the reasoning for a particular hypothesis (Yoon et al., 1995: 87):

> In order to elicit the decision rules, developers must ask relevant questions and quickly comprehend the decision procedures reasoned by domain experts while problem solving.

In the variables world, this micro-process is reduced to the form, more X gets you more Y:

> H2: Developer(s) skill is positively related to ES success.

In a similar vein, we see the following process reasoning (Boynton et al., 1994: 302):

> ... partnership relationships ..., through ensuing information exchanges, enrich organizational knowledge structures — and consequently absorptive capacity — related to IT innovation.

being invoked in support of the related hypothesis:

> Higher levels of managerial IT knowledge will directly and positively influence an organization's extent of IT use.

In micro-process reasoning, organizationally situated actors and their actions briefly appear, but they typically do not originate in the research data, nor do the data, in turn, speak to their veracity. They are simply brought in as hypothetical story elements that accord with common sense or informal observation (Abbott, 1992; Lawrence, 1997).

4.   Discussion

The problem with control-room advice ("just increase X") and micro-process reasoning is that you can't make something from nothing. Where actors, actions, and artifacts have been taken out, it is not so easy to put them back in. Variables-centered texts often acknowledge their limited ability to reach practical conclusions, but then beg off on drawing management implications until more research can be carried out — within the variables-centered frame, of course. The promise is that the larger research stream will pay off when enough knowledge is finally accumulated —when enough independent variables, interaction terms, and contingent factors are added, and enough data points collected — so that something useful can at last be said. But this just amounts to a call for the future installation of more gauges and levers in the control room.

In contrast, we think it's fair to ask whether enough can <u>ever</u> be known without considering actors acting. Can the chosen *manner of knowing* produce the kind of insight that is needed?

4.1. Pragmatic Generalization

In considering this question, we think it is helpful to examine the contrast between statistical generality and what we will call "pragmatic generality."

Statistical generalizations take the form:
$$Y = f(X_1, X_2, \ldots) \text{ (under conditions Z with probability } p).$$

Beyond the problem, which we noted earlier, that a statistical generalization is only true for some fraction of the specific cases that are included (the disregard of which can lead to ecological fallacy), claims of this form do not give any guidance about what to do. It is like a cookbook with only pictures and no recipes. The soup looks good with the soufflé, but how do we make them? Herbert Simon (1969) makes a similar criticism of research that compares static alternatives without offering any insight about how the better alternative might be achieved.

In contrast, pragmatic generalizations take the form of rules for action, heuristics, or stories:
$$\text{If you do } X_1, X_2, \ldots, Y \text{ will happen (under conditions Z with probability } p).$$

Like a statistical generalization, a pragmatic generalization relies on the uniformity of nature (Lee and Baskerville, 2003): It is contingent on specific conditions Z, and it is not guaranteed to work (sometimes the soufflé falls, even when we follow the recipe). How it differs is that pragmatic generality aims for a representation of reality that can be the basis for future action. Pragmatic generalizations answer "how" questions: How do I make a soufflé? How do I implement a new workflow system? Unlike their statistical counterparts, pragmatic generalizations *require* the inclusion of actors, actions, and artifacts. And these are brought together in a representation of process — the steps required to get from the current state to the desired state.

Pragmatic generalization is the foundation of *parable*: that is, stories that have a lesson to offer. Here, obviously, we find our connection with the effort to write up management implications. Lave and Wenger point to this connection, when they state (1991: 33):

> … the world carries its own structure so that specificity always implies generality (and in this sense generality is not to be assimilated to abstractness): That is why stories can be so powerful in conveying ideas, often more so than the articulation of the idea itself.

In short, what happens in the world does so for a reason. And so, particular events often have substantial potential for illuminating underlying principles and processes that apply to other occasions as well. Consider, for example, the impact of Hammer and Champy's (1993) story of re-engineering the Ford purchasing process. The gist of this story was that IT-enabled processes could be much more efficient if unnecessary process steps were eliminated. This story (and the book that explained it) launched a transformation of business practices that is still with us today.[9] It is hard to think of any variables-based story that has had anything like the same level of impact.

Because "specificity … implies generality," the pragmatic generalization does not depend on amassing numbers, as does the statistical generalization.[10] Moreover, for a manager or other organizational actor, a story need not fit present circumstances in all of their details, or even match especially closely, in order to be useful. This is why it made sense for the project managers from Michigan State to visit their peers at Illinois and Indiana.

Stories are useful because they encode pragmatic generality; they "help explain the relationships between events in a process" (Pentland, 1999: 711). And stories are easily understood because they embody narrative, which provides an organizing principle for cognition and learning (Bruner, 1991; Boland and Tenkasi, 1993). Unlike paradigmatic reasoning (e.g., formal logic, statistics, etc.), which must be taught, narrative is innate. People develop the capacity at an early age to extract important lessons from narrative (Bruner, 1990, p. 79); even young children have "an abundant and early armament of narrative tools." Because of this, individuals will often find much more that is true and useful in a story of a particular case than they will in a set of correlations that speak only, and thinly, across a large aggregation of cases. This is why Santayana's famous aphorism, "Those who cannot

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[9] Subsequent interpretations, applications, and co-optations of this story also launched a storm of well deserved controversy and criticism (see e.g., Davenport, 1995; Grint and Willcocks, 2007). While the excesses of the re-engineering fad are regrettable, it reinforces our point: stories can have impact.

[10] It certainly helps when evidence can be acquired across multiple cases that testifies to the prevalence of the observation or rule, and, thereby, helps to establish what we can regard as a *pattern*.

remember the past are condemned to repeat it," makes sense. All historical events are unique and particularistic, but we can still draw lessons from those events that apply to situations and experiences yet to come.

In the context of applied scientific research, pragmatic generalization and statistical generalization certainly need not be at odds. It depends on how you collect the data.

To see how statistical generality and pragmatic generality can be complementary, consider the example of medical research. In medical decision making, statistics provide an excellent guide for practical action. They are statistical generalizations, but they are also pragmatic generalizations. Medical statistics are pragmatic because they are based on clinical trials — a set of cases, involving specific people, taking specific actions, with specific artifacts. The history of each patient in a clinical trial is like a carefully documented story. These stories form the basis for the statistics that help physicians prescribe particular medications for particular conditions. As a result, they offer actionable advice. For example, "If you have a sinus infection, and you take 500 mg of azithromycin once a day for three days, then you will get better (with some probability)." When generalizations like this are released for use in medical decision making, practical details like dosage are included, along with a list of indications and contra-indications, possible side effects, and so on.

This points to an instructive difference between medical research and information systems research, at least as our community has historically practiced it. Clinical researchers study specific formulations, including active and inactive ingredients; they don't study abstract categories like "medication," or even the more specific categories like "antibiotics" or "antidepressants." This would serve no practical purpose, since doctors don't prescribe "medication." Imagine taking a prescription for "medication" to the pharmacist, who fills the little bottle with a random selection of whatever he has on hand that day... would you take the pills? Yet, information systems researchers deliberately focus on abstract categories, such as "technology," or more specific categories such as "decision support systems" or "computer mediated communication." Is it any wonder that managers are skeptical about our prescriptions?

As the medical example demonstrates, the lack of pragmatic implications is not brought about by the use of statistics. It has to do with conceptualizing the research domain in a way that systematically erases actors, actions, and artifacts.

While it would not be practical (or desirable) for all information systems research to be based on clinical trials, it should be possible to engage in multi-modal research that includes cases or stories. We turn to this part of our argument next.

4.2. Speaking to Managers as Practicing Pragmatists

Can pragmatic generality offer something to the traditional, variables-centered researcher who wishes to speak in a compelling way to practice? We believe so. However, as our argument here has suggested, it will require the researcher to go beyond the boundaries of the typical variables-centered data set.

To see how this might work, let's return to our example of the Michigan State University Enterprise Business Systems Project. Imagine that the Vice Provost for Planning and Budget has just approved your proposal for a multi-year study of the implementation. You have time to gather baseline data, and the University is interested in tracking progress over time as four major modules are rolled out to over 300 administrative units. These units will not be required to abandon existing applications, so adoption, use, and assimilation of the new systems are genuinely problematic outcomes. Thus, you have a longitudinal quasi-experiment with hundreds of replications across a diverse set of artifacts, business processes, and business units. Although many details remain to be worked out, it may be possible to collect data on actual use and productivity.

How should this research be designed to generate useful knowledge? First, building on the insights

of Straub and Ang (2008), we need to acknowledge that our research may have more than one audience, including: (a) end-users (e.g., department administrators, Associate Deans for Research, and so on); (b) designers and implementers (e.g., the EBSP project team); (c) system owners (e.g., university trustees and top administrators); and (d) our own academic research community.

The variables-centered paradigm offers a rigorous guide for the design of such research. Valid, reliable instruments must be used to collect variables of theoretical interest, such as perceived ease of use, perceived utility, adoption, assimilation, and so on. Along with the data on use and productivity, this would facilitate statistical tests of various hypotheses about how these familiar variables affect business outcomes. At Michigan State, this data could be collected via a web survey and analyzed rather quickly after the first module is rolled out. By the time the second module is ready to roll out, the project managers could be armed with the knowledge, for example, that for each X percent increase in perceived ease of use, system adoption increased Y percent. More variables and controls could be added to increase the accuracy with which this correlation can be estimated.

This situation offers a best-case scenario for variables centered research, because we could eliminate the usual multi-year publication cycle and offer findings that would be directly tied to the local context and the local project. Nevertheless, the inherent shortcomings of the pure variables-centered paradigm should be evident: Our findings would lack any connection to the actions that the actors at Michigan State could actually take. There is no "ease of use" lever in the MSU project manager's control room.[11] Such a study would allow stories about the variables, of course, and might provide a publishable contribution of interest to audience (d), the scholarly community. But it is hard to see how a purely variables-centered study could be of much use to the first three audiences, because it would lack examples of relevant actions, actors or artifacts. And if such a study were irrelevant to users, implementers, and owners of the *current* project, it is hard to imagine that its value would be greater for *future* audiences, where the connection to context would only be weaker.

For this reason, research that aspires to application cannot be based entirely on variables-centered inquiry. Instead, the most convincing efforts to draw management implications will be built on multi-modal research strategies. Variables must be supplemented by actual stories from real actors, such as a research administrator at the National Superconducting Cyclotron or a bookkeeper in the Animal and Dairy Science Department. These actors could be asked to describe specific tasks that they were doing, or trying to do, using specific artifacts. We are forced to resort to fictional examples because the artifact has not been released as of this writing. Consider two fictional examples, one positive and one negative:

From a research administrator: "I used Kuali Coeus to set up an NSF grant that had PIs from three different colleges. Cross-college collaborations used to be a headache because each college had its own system, but it was easy with Kuali. Now all three colleges can see the information, and when the money comes in, we'll all be able to track the spending in real time."

From a bookkeeper: "I'm trying to use Kuali Financials to keep track of our dairy herd, but it's not working out. We've got 180 Holsteins, but I can't figure out how to account for calves that are born on campus. I used to just have a column on my spreadsheet."

Such stories could be collected in many different ways. They could be collected in case studies of key departments. They could be collected as part of a sample survey. They could be collected via a web site or in face-to-face interviews. They could be taken from incident reports at the help desk or skimmed from end-user blogs. While the mechanics of how stories are collected would naturally influence their convenience and utility for different purposes, such stories would have immediate value to the first three audiences at MSU.

For endusers, such as bookkeepers and research administrators, such stories provide ideas about what works and what doesn't. If posted as questions with responses, these stories become the

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[11] The second author has been there and looked. There is no such lever.

starting points for threads in the familiar genre of peer support. For project managers and technicians, such stories indicate areas that need attention. In fact, core IS governance processes, such as incident, problem, and change management, are driven by such stories. Those processes are mostly fed by negative stories (e.g., bugs). But success stories could form the basis for positive guidance that could be disseminated via various means, or re-integrated into the technology itself.[12] In other words, stories reveal actual levers that can be pulled to increase ease of use or usability. For project owners, the value of stories is less direct. But if users and implementers gain value, then owners should gain value, as well.

The question is, could such stories help us generate knowledge of lasting value beyond the immediate context? In other words, can they generate value to the academic research audience? The answer is obviously yes, because the stories could be analyzed to identify patterns using any number of familiar qualitative research strategies (Denzin and Lincoln, 2000). Even so, we believe stories can be especially valuable if tied to familiar variables such as ease of use, usability, or information satisfaction and outcomes such as use and productivity.[13]   The variables would provide the connection to theory, while the stories would provide the connection to action and context. Figure 3 summarizes the choices in terms of statistical and pragmatic generality.

		Pragmatic Generality	
		High	Low
Statistical Generality	High	**Multi-modal Research**	**Variables-Centered Research**
	Low	**Case study Research**	**Opinion**

Figure 3. Blending research methods

The most familiar quadrants in Figure 3 involve high statistical generality (variables-centered research) or high pragmatic generality (case study research). In the usual framing of the debate on rigor *vs.* relevance, these quadrants are treated as mutually exclusive. But we see no reason why cases cannot be added to variable-centered research to improve pragmatic generality.   Stories like the two provided above are like little case studies that encode some pragmatic generalization. Cases like these — even very short ones — provide two kinds of information that are missing in the pure variables-centered paradigm. First, they reveal actual levers in the control room — actions that people can take.   For example, the first story indicates that convenient accounting for cross-college collaboration is useful to research administrators.   In the second example, we learn that Kuali Financials does not have an obvious way to account for new calves. These stories provide concrete, actionable items that the project manager can deal with. Second, to the extent that they can be connected to more familiar variables, they provide micro-process *evidence* and a basis for empirically-grounded micro-process reasoning.   Rather than relying on fiction for our managerial

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[12] In regard to positive guidance, we intend something more nuanced than the familiar concept of "best practice." In contrast to that one-size-fits-all (and often hyperbolic) notion (Ramiller, 2006), we refer here to guidance that can support action that remains mindful of contingency and the corresponding degree of relevance in the success stories themselves. Accordingly, when we say "case studies" in this paper, we are thinking of critical explorations, rather than teaching cases meant to showcase best practices or the kinds of cases that technology vendors use as sales tools.
[13] Quantitative methods can be tailored to focus on particular actions, artifacts, and context in the construction of variables, as in the "ACTS" approach (Chin, Johnson and Schwarz, 2008). By incorporating these narrative elements in the construction of variables, the variables may gain pragmatic value, but they may lose some statistical value.

implications, we can rely on fact. Such stories need not consume large numbers of journal pages to have value and impact.

We are aware that combining case studies with variance methods in the same paper stands in stark contrast to the conventional wisdom concerning research strategy. Researchers have been told that they should do case studies first, perhaps collect a few stories, and then use this material to develop constructs that can be applied and tested through more rigorous, generalizable, quantitative methods (Eisenhardt, 1989, 1991). This well-known prescription reflects the belief that management research should follow the idealized natural-science model (Flyvbjerg, 2001). This approach was advocated in some of the earliest writings about information systems research that considered the proper role of case studies (Benbasat et al., 1987: 369):

> Case research is particularly appropriate for certain types of problems: those in which research and theory are at their early, formative stages…, and 'sticky, practice-based problems where the experiences of the actors are important and the context of the action is critical'…[14]

While Benbasat et al. (1987) meant to argue for a progression from cases to variables, their reasoning supports the opposite interpretation. First, since our research context is constantly and rapidly changing, it may be safer to assume that our research is always in the "early, formative stages." Second, as applied social scientists, "sticky, practice-based problems," in fact, ought to be the point of much of our work. So this statement could be viewed instead as a call for our community to include case studies in all of its research.

This logic resonates with Flyvbjerg's (2001) argument that, contrary to the conventional wisdom, case studies are potentially *always* appropriate. Case research, as well as other kinds of research that describe sequence and process, can be informative both early and late in the lifecycle of a topic. In fact, such research is appropriate as long as it can add more richness to our understanding of the patterns of action that occur in the domain of interest, and help to guide the interpretation of processes behind co-variation among factors, where data of the latter kind have been collected.

This complementarity among research approaches points to a need to replace conventional thinking about research stages and comparative rigor with a more sophisticated view of the dependence of variables-centered research on cases and narrative forms of inquiry. In recognizing this dependence, there is an opportunity to do so much more in making our work useful for managers.

5. Conclusion

In this essay, we have taken another look at the IS academic community's enduring concern with drawing management implications from research. We have explored how the conceptualization of research problems in terms of variables brings about a transformation in the subject matter that makes it difficult, subsequently, to frame compelling advice based on the findings of the research. As a step toward rectifying this problem, we have recommended that researchers hoping to speak to practice move toward more fully multi-modal inquiry, and thereby ground their findings, based on variables, in conceptualizations and observations that are much closer to the world in which actors act. We believe that this approach will almost certainly help make for better science as well.[15]

The core challenge in actually formulating recommendations for practice lies in *how to frame our knowledge as a basis for organizational members to act.* As Rosemann & Vessey remark (2008: 3), "Many proposed models lack … detailed insights into how their tenets can be achieved in practice." In order to provide such insights, we need better stories. Not stories about variables, but stories about actions that actors can take, employing some means, in order to accomplish their goals under a set of circumstances. Scientific products in this form represent something with which non-academic

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[14] The citation for this quotation within the quotation is Bonoma (1983).

[15] Taking information systems to be one of the *human sciences*, we note further that this will help make sure that the humans are actually included in the science.

audiences can effectively engage. In contrast to variables in correlation matrices, linear regressions, structural equation models, and the like, stories of actors acting are inherently generative in nature, filled with possibilities for action and forward-looking design (Boland and Collopy, 2004).

Stories of this kind constitute, in the terms used by Klein and Hirschheim, *boundary spanning objects* that can help in "bridging the communication gap" (2008: 299) between academics and practitioners, by relating what we learn as scholars to the "experience-based or application-based knowledge" (2008: 294) of actors in industry. Moreover, grounded as they are in the *lingua franca* of narrative, stories have the potential also to bridge distinct communities of practice and knowledge within the academy (Klein and Hirschheim, 2008). We have proposed just such a role here for stories of actors acting, especially in relation to the long-lamented gaps in information systems research both between variance and process theory, and between quantitative and qualitative methodology.

The change we are calling for does not involve saying things that are in any way less rigorous or less true, but rather more compelling and more useful. In fact, in keeping within view the world of actors acting, researchers conducting co-variance analyses have an enhanced opportunity to leverage the inherent persuasiveness of statistical regularities as a rhetorical resource.[16] So long as the variables can be convincingly linked to the underlying processes, such regularities can be enlisted to speak to the prevalence and importance of those processes.

The larger aim is nothing less than the elevation of our science as a contributing form of social practice. The social sciences, in general, have increasingly been faulted as an elitist and disengaged exercise "of defining, in the actors' place and most often against them, the forces that manipulate them without their knowledge" (Latour 2004: 225). By contrast, through a commitment to telling true and useful tales of actors acting, our work can be more than something that takes place apart from everything else in some exotically abstracted scientific domain. Instead, it can become a resource that organizational actors themselves employ, going forward, in the design and construction of the socio-technical order. In making our texts actionable in this way lies the true transformational potential of our work as applied scientists, yielding knowledge that fits readily with the propensities, capabilities, and resourcefulness of the subjects we study.

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[16] We certainly do not intend "rhetoric" in the pejorative sense, but rather in reference to rhetoric as the ancient and noble art of persuasion.

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