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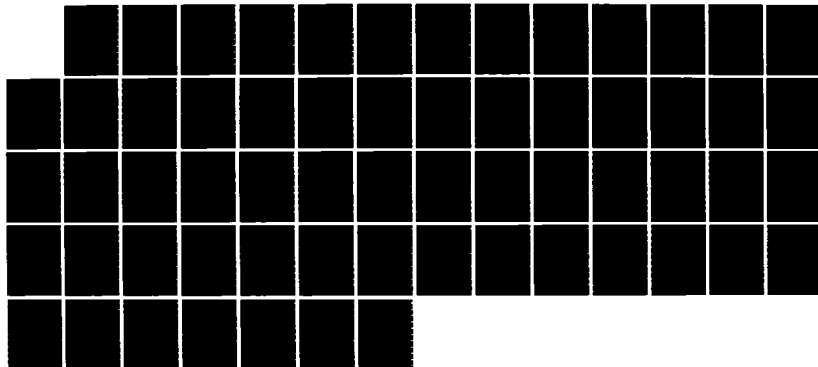
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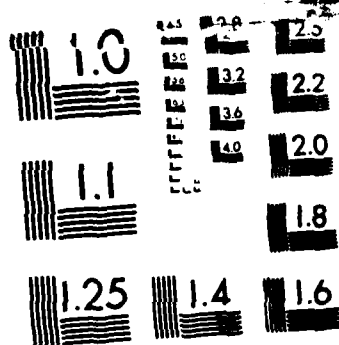
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Organizations As Information Processing Systems

Office of Naval Research
Technical Report Series

Toward a Model of the Research
Factors Associated with
Significant Research Outcomes

Richard Daft
Ricky Griffin
Valerie Yates

April 1986
TR-ONR-DG-19

Department of Management
Texas A&M University

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Richard Daft
and
Ricky Griffin
Principal Investigators

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER TR-ONR-DG-19	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Toward a Model of the Research Factors Associated with Significant Research Outcomes		5. TYPE OF REPORT & PERIOD COVERED Technical Report
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Richard Daft, Ricky Griffin, Valerie Yates		8. CONTRACT OR GRANT NUMBER(s) N00014-83-C-0025
9. PERFORMING ORGANIZATION NAME AND ADDRESS College of Business Administration Texas A&M University College Station, TX 77843		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NR170-950
11. CONTROLLING OFFICE NAME AND ADDRESS Organizational Effectiveness Research Programs Office of Naval Research Arlington, VA 22217		12. REPORT DATE April 1986
		13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approval for public release: distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Three models with the potential to explain significant organizational research outcomes were proposed and tested. Fifty-six organizational scholars were surveyed about one significant and one not-so-significant research project. The findings identified several reported factors that occurred prior to and during research projects that were related to research outcomes. The Ambidextrous model, which includes both organic and mechanistic research		

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TOWARD A MODEL OF THE RESEARCH FACTORS
ASSOCIATED WITH SIGNIFICANT RESEARCH OUTCOMES

Abstract

Three models with the potential to explain significant organizational research outcomes were proposed and tested. Fifty-six organizational scholars were surveyed about one significant and one not-so-significant research project. The findings identified several reported factors that occurred prior to and during research projects that were related to research outcomes. The Ambidextrous model, which includes both organic and mechanistic research characteristics, differentiated significant from not-so-significant research better than the Davis and Antecedents models.

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TOWARD A MODEL OF THE RESEARCH FACTORS ASSOCIATED WITH SIGNIFICANT RESEARCH OUTCOMES

How do organization scholars become engaged in significant research? Why do some research projects yield innovative and significant increments to knowledge, while other projects yield outcomes that seem dull and routine? These questions are difficult to answer. Significant research may be an outcome of investigator creativity (Vessels, 1982), family background (Berry, 1981), research productivity (Jauch and Glueck, 1975), the institutional context (Manis, 1951; Glueck and Deich, 1972; Lambright and Teich, 1981), or chance opportunity (Campbell, Daft and Hulin, 1982). Some questions about significant research may not be analyzable, such as how projects originate in the intuitive and idiosyncratic cognitive processes of investigators. Whatever the explanation, differences in research innovativeness and significance do occur, and these differences are recognized by journal referees and other scholars (Gottfredson, 1978).

The research in this paper was undertaken to explore the antecedents and activities associated with significant organizational research. The research was undertaken to accomplish two goals. First, the findings will test alternative theoretical models for explaining the research process. Systematic research has become a widespread phenomenon in our society. Research is undertaken within business firms, universities, government agencies, and R&D organizations (Pelz and Andrews, 1976), and a stream of research has been devoted to the self reflective understanding of research activities and processes (Andrews, 1979). This literature is the source of the underlying ideas from which three theoretical models are developed to focus our research inquiry. The models identify the basis for differentiating

significant from nonsignificant research. The findings are used to refine the theoretical understanding of organizational research.

The second goal for this research pertains to practical outcomes for organizational researchers. Scholars make choices about which research projects to undertake and which to ignore. These decisions weigh the potential significance and publishability of research outcomes. After research is published, there is continuing concern with significance--by journal referees; by journal editors; by promotion and tenure committees; by colleagues and other scholars doing research on the topic. These evaluations come after the fact, when it is too late to alter the research to enhance its potential. Knowledge about factors associated with the beginning stages of significant research could be used by scholars to make choices with greater likelihood for innovative outcomes.

A potential side benefit from better knowledge of the research process may accrue to research users. A criticism of organization research is that it has little application to the management of organizations (Beyer and Trice, 1982). Organizations have become a dominant fixture on the social landscape. Our organizational world is becoming increasingly crowded (Lawrence and Dyer, 1982; Leavitt, Dill, and Eyring, 1973). Any contribution to the theoretical understanding of the process by which organizations can be successfully studied may also help make research outcomes relevant to organization designers and policy makers.

Reasons for Significant Research

Investigations into the reasons for significant research outcomes have typically followed two paths. One path has been to study the personal characteristics of individual scientists. Research into the social background

of Nobel prize winning scientists, for example, reveals that these scientists came from upwardly mobile professional or business families (Berry, 1981; Silver, 1983). These scientists were influenced early in their life by models of parental achievement. Nobel prize winners in literature, by contrast, were likely to have a social background that included a poor family with low social status. Other research indicates that people who produce creative research have characteristics typically associated with creative people. These characteristics include openness to surroundings, self esteem, fluency, curiosity, independence, and autonomy (Vessels, 1982; Stein, 1982). Other factors associated with human creativity are right-left brain integration (Meyers, 1982), and personality characteristics such as effectance motivation, conceptual complexity, and deductive-analytical ability (Pearlman, 1983).

The other path toward explaining research significance has been to examine contextual factors that impinge upon the research process. Factors that have been studied include the incentives available to the researcher for undertaking the research (Campbell, Daft, and Hulin, 1982), the research procedures (Gottfredson, 1978), the source of research ideas (Jauch and Glueck, 1975), and the extent of paradigm development within the research discipline (Pfeffer, et al., 1977). Other variables pertain to the nature of the research problem, such as the extent to which it is applied versus theoretical (Gottfredson, 1978; Campbell, et al., 1982), and the extent to which the research idea produces unexpected variations in the understanding of traditional concepts (Davis, 1971; Moynihan and Mehrabian, 1981).

The research reported in this paper takes the path of research context rather than individual differences. Individual differences are important to significant research outcomes, but they are often confounded with contextual factors. Also, social background and cognitive differences are not things

over which researchers have control. Learning about the personality of prominent scientists can help explain scientific achievements, but will not help other researchers learn to identify important problems or adopt behavior patterns that will improve the significance of their own work. The literature suggests three models of research context, each pertaining to a different aspect of the research process. The models are referred to respectively as the Davis model, the Antecedents model, and the Ambidextrous model. These models provide a theoretical basis for exploring research context while controlling for differences in creativity and cognitive characteristics of investigators.

Davis Model

Davis proposed that sociological contributions were considered significant because they were "interesting." Davis argued that the impact and significance of a theory had little to do with empirical procedures, verifiability, or its relationship to absolute truth. Indeed, he argued that easily verifiable ideas are soon forgotten. A publication is considered great simply because the work is interesting.

Davis (1971) defined interesting work as having the quality of denying some assumptions of the audience. If no assumptions are denied, the theory will be seen as obvious, as restating old ideas. If all assumptions are denied, then the theory is seen as unbelievable or irrelevant. The theory must be in the middle with respect to readers' assumptions. The theory must differ modestly from readers' assumptions in order to surprise and intrigue.

Davis identified twelve characteristics of sociological theories that were related to significance and impact in the sociological literature. These

characteristics are also applicable to the outcomes of organizational research.

1. Organization: What seems to be a disorganized and unstructured phenomenon is in reality a well structured phenomenon, or vice versa.
2. Composition: What seem to be heterogeneous phenomena are actually composed of a single element, or vice versa.
3. Abstraction: What seems to be an individual-level phenomenon is in reality a social system phenomenon, or vice versa.
4. Generalization: What seems to be a local phenomenon is in reality a general phenomenon, or vice versa.
5. Stabilization: What seems to be a stable and unchanging phenomenon is in reality an unstable and changing phenomenon, or vice versa.
6. Function: What seems to be a phenomenon that functions ineffectively as a means for attainment of an end is in reality a phenomenon that functions effectively, or vice versa.
7. Evaluation: What seems to be a bad phenomenon is in reality a good phenomenon, or vice versa.
8. Co-relation: What seem to be independent phenomena are in reality correlated phenomena, or vice versa.
9. Co-existence: What seem to be phenomena which can exist together are in reality phenomena which cannot exist together, or vice versa.
10. Co-variation: What seems to be a positive co-variation between phenomena is in reality a negative co-variation between phenomena or vice versa.
11. Opposition: What seems to be nearly identical phenomena are in reality opposite phenomena, or vice versa.

12. Causation: What seems to be the independent variable in a causal relation is in reality the dependent variable, or vice versa.

These characteristics represent a model of research significance based upon the relationship between the research outcomes and the current state of understanding in the field. An important aspect of this model is that investigator motivation, creativity, and procedures are not important. Research is significant simply because the outcome convincingly denies assumptions on the part of the audience so the findings are considered novel and interesting.

Our hypothesis based on the Davis model is as follows:

Hypothesis 1: Significant organizational research outcomes will possess one or more of the twelve characteristics identified by Davis.

Partial support for the hypothesis is contained in the specific examples of significant research provided by Davis to illustrate the twelve categories (Davis, 1971). Other research that has evaluated research outcomes has found that perceived quality of published research is positively associated with originality and moving the field ahead, and is negatively associated with routine, trivial problems, routine data grinding, and research of little interest (Gottfredson, 1978).

Antecedents Model

The Antecedents model is concerned with the beginning of research projects. This perspective contrasts with the Davis model's focus on the final research product. The Antecedents model suggests that significant research may be traced to conditions at the research beginning. This perspective is influenced by the early work of Manis (1951) and Pelz and

Andrews (1966), and also draws upon more recent findings by Campbell, et al., (1982) and Gottfredson (1978). The argument here is that initial factors determine whether the research question is likely to lead to significant outcomes. The research beginnings include conditions within the investigator's institution, the interpersonal contacts that spark the research question, the incentives motivating the researcher to undertake the project, and the goal of the research as perceived by the investigator. The literature does not provide an explicit statement about the best antecedents, but research findings do suggest five trends that are integrated into the Antecedents model. These trends are reflected in Hypotheses 2-6.

Hypothesis 2: Significant research begins under supportive institutional conditions.

Supportive conditions include resources and research grants (Andrews, 1979; Manis, 1951), institutional size and research eminence, adequate physical facilities, and an internal climate that supports research productivity (Manis, 1951; Pelz and Andrews, 1976). Positive institutional conditions enable and reinforce behavior that leads to significant research outcomes. Financial grants, research assistance, and a supportive climate all enable the researcher to pursue ideas without having to use up energy in basic resource acquisition and maintenance activities.

Hypothesis 3: Significant research ideas begin as a convergence from several sources rather than from a single source.

The argument for Hypothesis 3 is that good research begins from diversity and the linking together of different lines of thought that are combined in novel and nonlinear ways. This diversity was recognized in the laboratory by Pelz and Andrews (1976). Investigators surveyed in the Campbell, et al. study

(1982) reported that good projects often started as the chance convergence of a research idea with exposure to a new method, and perhaps access to a research site. Research that begins from a single source, such as a journal article or as an answer to the next logical question from a traditional research stream, tends to produce outcomes that are less significant.

Pelz and Andrews (1976) also reported that the communication patterns of successful investigators displayed frequent contacts with colleagues from diverse specialties and technical functions. Campbell, et al. (1982) argued that significant research was the result of involvement in the physical and social world of organizations. Investigators who stayed in their offices and had limited communications produced less significant outcomes. Campbell, et al. advised that the appropriate way to begin research was through wide exposure and diverse experiences that included visits to organizations, interactions with students and colleagues, listening to managers, and in other ways having diverse communications outside the purely academic resources of books and journals.

Hypothesis 4: Significant research begins with a focus on theoretical explanation rather than on the application of research methods.

Hypothesis 4 is concerned with whether the research project is theory based or method based. Campbell, et al., found that when investigators undertook a project with a desire for theoretical explanation, the research outcome tended to be more significant. Many studies, however, originated for nontheoretical reasons, such as the availability of a data base or the desire to apply a new research technique to a problem. These projects did not focus on theoretical understanding, and the outcomes were perceived as less

significant. Research designed to simply exploit or grind data also tended to be less significant (Gottfredson, 1978).

Hypothesis 5: Significant research begins with a research question that has relevance to the world of organizations or to the academic world.

Hypothesis 5 may seem obvious, but a number of research questions are asked in response to narrow academic interests. Campbell, et al. (1982) found that studies undertaken to solve a problem that was considered high priority within the discipline tended to be more significant. Manis (1951) found that research undertaken to test academic theory tended to be more relevant than research which was not designed to test theory. Gottfredson (1978) found that research characterized as not answering the "who cares" or "so what" questions did not produce outcomes of high quality. One aspect of relevance is that the research can be anchored in the practical world as well as the academic world. A number of significant studies explored by Campbell, et al. began with the desire to solve a real world problem. The solution to the real world problem was accomplished in a way that revealed new theoretical knowledge about organizations.

Hypothesis 6: Significant research begins with the goal of making a contribution to knowledge rather than to provide short term returns to the investigator.

Hypothesis 6 is based on the goal of the investigator and the incentives for undertaking the research project, which were associated with research quality in the Campbell, et al. (1982) findings. Several respondents reported undertaking a study for short term expedience, including the opportunity to get a quick publication, to earn money through a research contract, the need to fulfill obligations on a research contract, or the desire for promotion and

tenure. When goals of expedience were identified, the research tended to be less significant. Investigator goals of making a theoretical contribution to the field of organizations, and goals of not responding to short term expediencies, tended to lead to research rated high in significance.

To briefly summarize the Antecedents model, several ideas in the literature suggest that the beginnings of the research process may plant the seeds that eventually grow into significant versus nonsignificant research outcomes. Antecedents to significant research are hypothesized to include positive institutional conditions, diverse idea sources and widespread communications, a goal of theoretical understanding, a relevant research problem, and a goal of contributing to knowledge rather than short term expedience. The Antecedents model suggests that these factors will be associated with the ultimate significance of the final research outcome.

Ambidextrous Model

The term "ambidextrous" was used by Duncan (1976) to describe innovative organizations. Ambidextrous organizations are simultaneously organic and mechanistic to foster both the initiation and implementation of innovations. The Ambidextrous model as we apply it to academic research is concerned with the procedures and processes used to conduct the research. A research project is a transformation process that begins with an idea and ends with a set of findings for publication. The nature of this transformation may influence the significance of the final outcome.

The Ambidextrous model fills in between the Davis model that focuses on the final research product and the Antecedents model that focuses on research beginnings. The Ambidextrous model is based upon a somewhat different set of factors as identified in the research duality proposed by Campbell, et al.

(1982). They argued that the total research process was characterized by both organic and mechanistic conditions. The research beginning was often characterized by uncertainty and lack of clarity. The investigator became involved through a spontaneous, intuitive choice rather than through a well-defined, logical decision about a clear research problem. The research process transformed the organic beginning into a mechanistic ending. The final outcome was often a well-defined model or set of findings, empirically rigorous and precise, that produced a publishable article or book. The investigator started under equivocal, uncertain conditions with an unclear problem that felt good intuitively, and used the research project to achieve an outcome that was specific and precise.

The point made by Campbell, et al. was that a research transformation process that did not capture both aspects of the organic-mechanistic duality tended to produce less significant research outcomes. Investigators might deviate from the model in two ways. First, investigators sometimes chose a topic that was already well defined based upon previous journal articles or their own research. When researchers used logical thinking to begin a well-defined project, then research outcomes were often characterized as dull and unimportant. The use of mechanistic processes at the beginning of the project tended to lead investigators down paths that were less significant. Second, if the final outcome of the research was fuzzy, unclear and organic, this too tended to mean insignificant findings. Organic outcomes were often seen in a manuscript that was unclear, data that did not test the research question, misrepresentation of other viewpoints in the literature, inexact or unclear conclusions, and a general lack of theoretical understanding (Gottfredson, 1978). Thus the research process most likely to lead to significant outcomes began organically and finished mechanistically, thereby accomplishing the

reduction of equivocality during the research process. This transformation is reflected in the following hypothesis.

Hypothesis 7: Significant research outcomes are associated with the transformation of organic conditions into mechanistic conditions during the research process.

There is a second aspect of the transformation process also identified by Campbell, et al. (1982). The amount of personal involvement, energy, and commitment displayed by the investigator was greater for significant research. Equivocality reduction takes hard work. Starting with a routine problem to produce a routine outcome is easy by comparison. Transforming a messy beginning into a well-defined ending requires strong commitment. Bringing a fuzzy idea into focus, and developing the appropriate research methods to test a new idea in a reasonably precise way represent difficult intellectual achievements. Moving from the equivocal to the unequivocal requires commitment and energy on the part of the investigator, as indicated in our final hypothesis.

Hypothesis 8: Significant research is associated with intense personal involvement and commitment on the part of the investigator.

The notion of the Ambidextrous model has not been tested directly in the literature, but there is some supporting evidence. Research that began with extensive formal planning (Glueck and Deich, 1972; Hall, 1981) or with other linear, calculative decision processes was not sufficiently organic to allow for the unique and organic initiation of events that produced creative outcomes. On the other hand, when equivocality was not reduced during the research process, the ultimate finding was ambiguous and poorly defined, and was not accepted as an important contribution (Cottfredson, 1978). Wilson

(1966) proposed in the organizational world that conditions generating innovative ideas were different from conditions that ultimately secured implementation of those ideas. Innovative organizations are ambidextrous and begin the innovation sequence with loose, organic characteristics to generate innovative ideas and finish with tight mechanistic characteristics to implement those ideas (Duncan, 1976; McDonough and Leifer, 1983).

Organization research projects also require structures that permit loose and tight conditions sequentially. It is this combination of organic beginning and mechanistic ending that represents the transformation process most likely to be associated with significant research outcomes.

Summary

The Davis, Antecedents, and Ambidextrous models have been proposed to provide theoretical explanations for significant organizational research. The models represent alternative explanations that focus on research beginnings, research outcomes, and the research transformation process. However, the models are not mutually exclusive. Successful research may incorporate aspects of more than one model. Data are reported that include measurements of variables relevant to all three models. In this way we will try to identify the best model for explaining significant organizational research.

Method

Sample

A major issue in the design of this research project was to control for the impact of personal ability in producing significant research. On the average, highly capable scholars would tend to produce significant research outcomes while less capable scholars would produce less significant outcomes.

The confounding effect of personal ability was a threat to the validity of inferences about the role of antecedent conditions or the research process on the research outcome.

The solution was to compare research projects for each investigator rather than across investigators. Campbell, et al. (1982) interviewed several established scholars and found that each one typically had conducted several research projects. Some projects were quite successful, and indeed were the reason for the scholar's reputation, but several projects also were not very significant. Thus the decision was made to interview established scholars about two projects, one considered significant and one considered not-so-significant. Since the same person was directing each project, the impact of investigator ability would be at least partially controlled. Other factors associated with the project context that were related to significant research outcomes could then be identified.

The initial sample of researchers consisted of 132 editorial review board members who had served on either The Academy of Management Journal or the Administrative Science Quarterly during a recent six year period. Editorial review board members were selected based on the assumption that these individuals had done research and were recognized as capable scholars, and had research projects in both the significant and not-so-significant categories. The sample was purposely limited to the editorial review boards of AMJ and ASQ due to the study's focus on organizational research. The journals selected were viewed as the core organizational science journals which publish empirical research.

The published outcomes from the surveyed research projects could appear in any journal, such as The Journal of Applied Psychology, Organizational Behavior and Human Performance, Management Science, The American Sociological

Review and The Academy of Management Review. Some members of our sample also served on the editorial boards of these journals. We did not sample all board members of these other journals based on the researchers' view that AMJ and ASQ best represented mainstream, broadly-defined organizational science research. Journal of Applied Psychology and Organizational Behavior and Human Performance were viewed as having a focus that is almost exclusively micro, while the American Sociological Review was determined to be purely "macro." Management Science published statistical and mathematical research. The focus of The Academy of Management Review was appropriate for the sample, but it was not included because it is limited to conceptual and nonempirical research.

Procedure

The editorial review board members were initially contacted by letter. While the primary purpose of this letter was to introduce the study and invite participation, it also described what would be involved in participating. Participation would require the individual to complete two interview/questionnaire forms--one each for a significant and a not-so-significant research project they had undertaken. Although the questionnaire contained primarily closed-ended questions which could be completed in 25 minutes, several open-ended questions were also included. Participants were given the option of either responding to the open-ended questions in writing or over the telephone. The letter requested individuals to return a self-addressed, postage-paid card indicating whether they would participate in the study.

The interview/questionnaire forms were mailed within 2 weeks following the receipt of a postcard. The questionnaires were accompanied by a letter which reiterated several of the issues discussed in the initial letter.

General guidelines and a list of suggested criteria for research significance were also included. The general guidelines stated specifically:

"From the pool of research projects in which you have participated, please select two that can be contrasted in terms of significance. The significance criteria you use is up to you (e.g., collegial response vs. citations vs. awards). Our only requirement is that the two projects you select rank differently on significance.

As a general guideline, we would like for both pieces of research to have been completed and submitted for publication to journals generally known and available to organizational scientists."

The criteria suggested to respondents for research significance included the following indicators:

Indicators of Significant Research

1. Favorable response by colleagues
2. Favorable response by reviewers
3. Cited by others (academic research and/or textbooks)
4. Reprint requests
5. Nominated for or winner of award(s)
6. Generated positive feedback from readers
7. Recognized as making a contribution to the field
8. Basis for research by others
9. Perceived as novel, creative or insightful by others
10. Practical applications through consulting or business adoption

Indicators of Not-So-Significant Research

1. Unfavorable or negative response by colleagues
2. Unfavorable or negative response by reviewers
3. Seldom or never cited
4. Few or no reprint requests
5. Received little or no recognition
6. Published in a low level journal or rejected
7. Even though published, the research had little, if any, impact on academic research or business thinking
8. Published and never heard from again

Self-addressed, postage-paid envelopes were provided for returning the questionnaires. It was requested that a reprint or other copy reference be included in the envelope along with the forms.

After a period of several weeks, a follow-up letter and questionnaires were sent to those editorial board members who had not yet responded. The two

mailings resulted in a final sample of 56 sets of responses (42 percent). While there was some minimal missing data from among the 56 sets, the final sample provided fairly complete and detailed information.

Measures

The interview/questionnaire form was developed by using the Campbell, et al. (1982) measure as a starting point. Specifically, the instrument contained a variety of open-ended and closed-ended questions developed to tap various aspects of the Davis model, the Antecedents model, and the Ambidextrous model. Seventy-five Likert-type items were developed to test the three models. Due to the exploratory nature of the research as well as a lack of existing instrumentation to measure relevant concepts, little can be said as to the construct or predictive validity of the scales. However, care was taken to maximize the face validity of the items. Items were pretested for clarity and revised as needed to ensure accurate understanding. Other types of questions designed to test other aspects of the research process also were included in the interview/questionnaire form.

Analyses

The analyses undertaken to test the three models were simple and straightforward. Items were first grouped according to the model they were designed to test. Next, differences between the significant and not-so-significant research were assessed via t-tests and Chi-square analyses. Discriminant analysis was used to test which model's items best discriminated between significant and not-so-significant outcomes.

Relative Significance

The study design yielded an assessment of "relative" significance for each research project. Each respondent selected two projects that differed in terms of significance. To determine the criteria of relative significance used by the investigators, ten items were included in the questionnaire to measure the degree of significance as ascribed by the researchers themselves. These ten items, their means, standard deviations, and values of t are arrayed in Table 1. All ten items are significantly different beyond the .001 level. The items that differentiate least well between research projects pertain to consulting opportunities and receiving awards. The items discriminating best pertain to the contribution to knowledge, citations, and recognition as a novel, original contribution by others. The Table 1 findings indicate that the researchers themselves saw clear and consistent differences in the projects along academic criteria typically associated with significant and nonsignificant research outcomes.

Insert Table 1 About Here

In an effort to cross-validate the respondents' assessments of the relative significance of their work, a panel was used to provide independent assessments of significance. First, ten names were randomly selected from the sample and copies of both pieces of their research obtained. Next, a panel of five doctoral students familiar with organizational science theory and research but unfamiliar with this study was created. The panel members were given the 20 manuscripts paired by author and were asked to rank each pair in terms of their "general significance and overall contribution to the field." Obvious indicators of quality, such as journal name, were removed from the

articles. Panel members worked independently and were not allowed to discuss their rankings. There was perfect agreement between the five panel members and study respondents. For each pair of studies, the five students independently rated as significant the same study chosen by the researchers who did the research. Thus researchers' assessments of the relative significance of their work has some degree of external validity.

Results

Davis Model

Table 2 summarizes the results for the set of seventeen items developed to test the Davis model. There is at least one item for each of the twelve

Insert Table 2 About Here

characteristics identified by Davis, although some characteristics were measured with more than one item. Six of the seventeen items are significantly different, although there is little discernable pattern across the items. For example, the single items developed to measure organization, abstraction, and causation are significantly different for significant and not-so-significant outcomes. In addition, one of two items for composition, one of two items for generalization, and one of two items for opposition are significantly different. The tests are not very significant, however. The characteristics defined by Davis do not seem to be good predictors of significant outcomes in this sample of organizational research projects.

Antecedents Model

One set of analyses for testing the Antecedents model is shown in Table

3. Respondents were asked to indicate the presence or absence of various institutional conditions and the effects of that condition on each of the two

Insert Table 3 About Here

projects. Chi-square analyses revealed that two of the twelve factors were different for the two research projects. Specifically, the effects of collegial interaction had a more positive impact on significant research than not-so-significant research. Similarly, the presence of a Ph.D. program also tended to have a positive impact on significant research.

Table 4 presents results pertinent to other antecedent conditions. Three

Insert Table 4 About Here

of twelve items were significantly different for the two categories of research, all in the expected directions. The three items relate to research method and integration. Bringing together theoretical ideas from diverse fields was associated with significant research, as was the adoption of a method originally designed for use in another field. Using a research method because it was convenient, however, was a characteristic associated with not-so-significant research.

Ambidextrous Model

Two sets of analyses were used to assess the Ambidextrous model. First, researchers were asked to indicate which adjectives were descriptive of their work at the beginning, midpoint, and end of each research project. The rationale for these data is that some descriptive terms are expected to differ

between the two projects, and some terms are expected to change from organic to mechanistic over the life of the project. The adjectives and corresponding pattern of responses are summarized in Table 5.

 Insert Table 5 About Here

In rows 1-8 of Table 5, there are differences in the frequency with which adjectives describe significant versus not-so-significant research. For example, adjectives such as "excitement," "inspired," "sense of discovery," and "committed," were more frequently checked for significant research during the beginning, midpoint and end of the research project. "Routineness," however, was rated more frequently for not-so-significant research. The adjectives also show changes in feelings over time, as reflected in rows 9-15. "Unclear" described significant research more often at the beginning of the research (18 versus 14), but less often at the end of the research (2 versus 11). The same is true for the term "uncertain." The adjective "indifferent" was checked only four times during the beginning stages of not-so-significant research, but twelve times for the end of the research. The term "certain" was checked eleven times for the beginning of significant research, which increased to twenty-six at the end point of research. These changes suggest that over time significant research becomes clarified, more certain, and methodical.

Table 6 presents the other set of results pertinent to the Ambidextrous model. Nine of the ten items developed to tap ambidextrous processes are

 Insert Table 6 About Here

significantly different between the two categories. These nine items are quite strongly associated with differences in research significance and all are in the expected direction. The significant projects are characterized by a large amount of effort devoted to thinking, and having to figure things out as the investigator went through the project, which are consistent with organic conditions at the beginning of the project. Investigators were emotionally more committed to significant projects, spent more time thinking about methodology, and the methodology ended up being more systematic and rigorous. For projects that were not-so-significant, the investigator knew exactly what to do from the beginning and had highly quantifiable variables. The general findings from Table 6 support the idea that strong commitment is needed for significant research and this commitment is used to reduce an equivocal research problem into a clearly defined, testable outcome.

The final step in the analysis was to run a step-wise multiple discriminant analysis to compare the three models. It was not possible to analyze all items simultaneously because there are more items than cases. Thus the closed-ended questions for each model were summed into a single score. The questions in Table 2 were summed into the Davis model scale, the questions in Table 4 were summed into the Antecedents model scale, and the questions in Table 6 were summed into the Ambidextrous scale. The score for each scale was the basis for discriminating between significant and not-so-significant research.

All three scales are included in the Table 6 discriminant function, and the function is statistically significant ($p < .0001$). The weighting among the three scales indicates the items for the Ambidextrous scale are much stronger for discriminating among research projects. The Davis scale has a coefficient of .4, and the Antecedents scale of .19 compared to the

Ambidextrous scale of .81. All three coefficients are statistically significant. The percentage of cases classified correctly using this function was 77 percent. The Ambidextrous alone can classify correctly 73 percent of the cases, indicating the strength of the Ambidextrous scale for discriminating significant from not-so-significant research.

In summary, the results provide modest support for Hypothesis 1 developed from the 12 research characteristics in the Davis model. Rather weak support is provided for Hypotheses 2-7, derived from the Antecedents model. The strongest support is provided for Hypotheses 8 and 9 from the Ambidextrous model.

Discussion

This study addressed the relationship between research context and the significance of research outcomes. The findings suggest that a number of factors differentiate significant from not-so-significant organizational research. Some of these factors occur prior to the research, other factors characterize the process of doing the research, and yet other factors pertain to the research outcome.

The Antecedents model received moderate support as a predictor of significant research. Antecedent conditions that seemed important were researcher interactions with others, the presence of a Ph.D. program, the integration of ideas and methods from different fields, and taking advantage of chance opportunity. The Davis model pertains to research outcomes, and it was only partially supported. Outcomes that differentiated significant from not-so-significant research were integrating diverse phenomena by a single explanation, generalizing a finding to a larger system in a novel way, or discovering a causal relationship that runs in the opposite direction.

The Ambidextrous model, which is about the transformation occurring during research projects, received rather consistent support for differentiating significant from not-so-significant research. Significant research was characterized by less clarity and more uncertainty during the beginning stages than was not-so-significant research. Significant research was also characterized by high levels of excitement and commitment through the life of the project. An important aspect of significant research seemed to be the reduction of equivocality during the research process. Investigators expended effort thinking through the theory, and they had to figure things out as they went along. Factors such as knowing exactly what to do from the beginning, quantifying variables in objective fashion, and being methodical and orderly were characteristic of the beginning stages of not-so-significant research. Significant research projects, however, tend to be more certain, clearer, and orderly in the final publication stage than not-so-significant research.

An important idea from this study is that significant research is characterized by a particular kind of duality. Significant research seems to be characterized by both organic and mechanistic processes, by both linear and nonlinear thinking. The research begins in an organic setting, including widespread personal contacts, involvement in many streams of research, and lack of clarity or certainty. The choice of the research project is often based on intrinsic interest and intuition. The research outcome, on the other hand, is more mechanistic. The final outcome is clear and well-defined. The equivocality has been reduced to produce a rational product that can be published for use by colleagues or managers. The successful research process is not easy. Translating poorly understood, intuitive ideas into a well understood, publishable outcome requires intensity and commitment.

Nonsignificant research may be dull and routine because it fails to capture the duality. The research may start with mechanistic, linear thinking and end up there as well. Investigators may choose topics that are already well-defined and simply make minor adjustments to them. Equivocality reduction does not take place, and the research outcome has little impact.

The implication of these findings is that researchers should avoid mechanistic conditions and linear thinking early in the research process. Researchers can immerse themselves in the physical and social world of organizations. They can look for wide exposure and diverse experiences, and exchange ideas with colleagues and managers. Investigators who stay isolated from these experiences will tend to undertake research based upon the next logical step from a recent journal article, and are less likely to achieve something outstanding.

How do researchers know when research is likely to be significant? One answer is that the project feels right. The researcher's intuition says that the project is a good idea, and there is a feeling of excitement and commitment. The project is not chosen strictly on the basis of logic or of publication certainty.

Another indicator is that the investigator will feel the need for extensive intellectual effort. The research idea may be in a fuzzy state, but it must end up well understood. Substantial effort will be needed for theoretical development and clarification. Significant research is not convenient. Significant research is not designed to achieve a quick-and-dirty publication. It requires intense resolve and effort. When a study turns out to be not-so-significant, it may be because the effort required to develop theory or to clarify poorly defined concepts was not expended.

In the final analysis, research is significant because it reaches into

the uncertain world of organizations and returns with something clear, tangible, and well understood. Significant research takes a problem that is not clear, is in dispute, or is out of focus, and brings it into resolution. Rigor and clear thinking are needed to make this transformation. Significant research begins with disorder, but ends with order. Significant research embraces the duality by transforming initial organic conditions into mechanistic outcomes. The result is something specific and tangible that can be understood and used by others. Logic and certainty do not begin the process, but are outcomes of the process. If the researcher knows in advance what the research answer will be, if the researcher understands the phenomena well enough to predict and control everything that happens, then the problem is probably not significant. Good research requires the researcher to be ambidextrous, to welcome uncertainty in the early stages, and to then strive toward certainty as the final outcome.

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Table 1

Characteristics of Significant and Not-So-Significant Research

Characteristics	<u>Significant</u>		<u>Not-So-Significant</u>		t
	Mean	S.D.	Mean	S.D.	
1. The research was published in a top journal.	4.53	1.2	3.10	1.9	4.71***
2. The research elicited a positive response from colleagues and reviewers.	4.73	0.6	2.66	1.0	12.74***
3. The research has been cited by others.	4.71	.8	2.28	1.1	13.21***
4. The research has been nominated for or received reward(s).	2.46	1.7	1.17	.6	5.24***
5. The research generated favorable feedback from readers.	4.46	.8	2.41	1.0	11.81***
6. The research has been recognized for making a contribution to knowledge.	4.34	.8	1.83	.8	16.56***
7. The research was perceived by others as novel, original, or creative.	4.47	.7	2.21	1.1	12.60***
8. The research has been the basis for research by others.	4.41	1.1	2.04	1.0	11.81***
9. The research has led to consulting opportunities.	2.57	1.6	1.57	1.1	4.91***
10. The research has appeared in textbooks.	4.00	1.4	1.92	1.3	8.16***

*** $p < .001$

Table 2
The Davis Model

Characteristics	Significant		Not-Significant		t
	Mean	S.D.	Mean	S.D.	
1. ORGANIZATION: The project findings suggested that a phenomenon previously considered random or unstructured has an underlying structure.	2.84	1.3	2.30	1.2	2.28*
2. COMPOSITION: The project determined that diverse phenomena are united by a single explanation (simplification or integration).	3.37	1.5	2.27	1.3	4.15***
The project provided evidence that a standard phenomenon (construct) is actually composed of several subparts.	3.34	1.5	2.90	1.4	1.55
3. ABSTRACTION: The project findings suggested that what had been previously considered to be the property of one element is in reality the property of some whole of which the element is a part, or vice versa.	3.05	1.3	2.04	1.1	4.31***
4. GENERALIZATION: The project applied to organization settings or individuals in general (rather than to limited type of limited population).	4.00	1.2	3.37	1.1	2.79**
The project findings suggested that some property previously considered a characteristic of one group of social category also characterizes another group where its existence was not suspected.	2.51	1.4	2.23	1.2	1.10
5. STABILIZATION: The project findings indicated an unexpected stability and even permanence of seemingly unstable social phenomena, or vice versa.	2.67	1.5	2.44	1.3	0.84
6. FUNCTION: The project findings suggested that a phenomenon previously considered to function ineffectively in reality is a phenomenon that functions effectively, or vice versa.	2.38	1.3	2.29	1.3	0.37
7. EVALUATION: The project provided evidence that a phenomenon previously argued to be bad (inefficient, dysfunctional) is actually good, vice versa.	2.21	1.4	2.04	1.2	0.71
8. CORRELATION: The project identified a relationship between variables that previously were believed not to be correlated.	2.98	1.5	2.68	1.2	1.18
The project showed no relationship between variables where one was previously believed to exist.	2.05	1.3	2.00	1.2	0.22
9. COEXISTENCE: The project findings suggested that phenomena, previously considered incapable of coexistence are phenomena which may exist together.	2.27	1.2	2.02	1.2	1.08
The project findings indicated that phenomena, previously thought to coexist may actually be incapable of coexistence.	1.74	1.1	1.85	1.1	-0.49
10. COVARIATION: The project provided evidence that a previously accepted relationship actually has the opposite sign (now - instead of + or + instead of -).	2.36	1.4	2.08	1.1	1.15
11. CONTRADICTION: The project findings suggested that phenomena previously considered dissimilar actually have an underlying similarity.	2.84	1.3	2.23	1.1	2.66*
The project findings indicated that phenomena previously considered to be similar are actually dissimilar.	2.37	1.2	2.17	1.2	0.83
12. CAUSATION: The project provided evidence that a previously accepted causal relationship is actually in the opposite direction ($x \rightarrow y$, not $y \rightarrow x$).	2.28	1.4	1.70	1.0	2.55*

*** $p < .001$

** $p < .01$

* $p < .05$

Table 3

Antecedent Institutional Conditions (Frequencies)

Factor	Significant	Not-So-Significant	χ^2
Teaching Load:			
1. Light	17	16	2.63
2. Moderate	29	23	
3. Heavy	2	6	
Effect of Load:			
4. Facilitated	24	19	.58
5. Hindered	5	5	
6. No Effect	22	24	
Collegial Interaction:			
7. Infrequent	7	16	5.81
8. Occasional	16	16	
9. Frequent	30	18	
Effect of Interaction:			
10. Facilitated	39	23	8.59*
11. Hindered	4	11	
12. No Effect	11	17	
College Research Orientation:			
13. Research	37	37	2.16
14. Teaching	0	1	
15. Mixed	17	13	
Effect of Orientation:			
16. Facilitated	42	36	2.03
17. Hindered	1	1	
18. No Effect	10	14	
Internal Financial Support:			
19. Weak	21	22	2.73
20. Moderate	20	23	
21. Strong	13	6	
Effect of Support:			
22. Facilitated	23	20	.28
23. Hindered	4	3	
24. No Effect	26	27	
Reward and Promotion System:			
25. Research	44	41	.02
26. Teaching	1	1	
27. Mixed	8	7	
Effect of System:			
28. Facilitated	38	29	4.19
29. Hindered	0	3	
30. No Effect	16	18	
Ph.D. Program:			
31. Yes	52	49	.39
32. No	1	2	
Effect of Program:			
33. Facilitated	38	25	29.53***
34. Hindered	0	24	
35. No Effect	15	7	

*** $p < .001$ * $p < .05$

Table 4

Other Antecedent Conditions

Condition	Significant		Not-So-Significant		t
	Mean	S.D.	Mean	S.D.	
To what extent...					
1. was your involvement in the project attributable to your activity and exposure (frequent inter- actions, being in the right place at the right time, contact with managers or colleagues) at the time?	3.51	1.3	3.28	1.5	0.83
2. was your decision to undertake this project influenced by money, promotion, research contract, or the like?	2.49	1.4	2.65	1.5	-0.59
3. did the project lack a theoretical base?	2.09	1.3	2.21	1.2	-0.48
A primary reason for doing this project was...					
4. to apply a new research method or technique as a way to shed light on a research problem.	3.15	1.6	2.73	1.6	1.33
5. to use an improved, more rigorous method than was previously used to study the phenomenon (greater internal validity).	3.25	1.7	2.96	1.5	.95
6. to use a method originally for use in another field of research.	2.84	1.4	2.15	1.4	2.53*
7. to bring together ideas from two or more fields or sub-fields of study.	3.08	1.4	3.07	1.4	3.33***
8. to investigate a topic because it was controversial or in dispute.	3.25	1.4	2.87	1.5	1.41
9. your personal interest and curiosity rather than interest to the academic discipline.	3.80	1.2	3.40	1.2	-1.76
10. the opportunity to use a method that was convenient for you (familiarity, low cost, etc.).	2.02	1.3	2.98	1.4	-3.06***
11. the potentially important application to a real world problem.	3.61	1.4	3.30	1.4	1.13
12. the perceived opportunity for a publication.	3.59	1.2	3.73	1.1	-0.67

*** $p < .001$ * $p < .05$

Table 5
Description of Researcher Feelings Toward Research (Frequencies)

Description	Beginning of Research		Mid-Point of Research		End of Research	
	Significant	Not-So-Significant	Significant	Not-So-Significant	Significant	Not-So-Significant
Differences	(1)	(2)	(3)	(4)	(5)	(6)
1. Excitement	48	28	40	2	50	11
2. Inspired	28	17	24	7	24	6
3. Serendipity	13	8	11	6	13	5
4. Fluid	15	7	15	6	6	2
5. Sense of Discovery	46	22	40	13	38	15
6. Organic	13	4	13	2	6	1
7. Committed	44	23	44	26	47	22
8. Routine	0	10	3	15	0	16
Change Over Time	(7)	(8)	(9)	(10)	(11)	(12)
9. Unclear	18	14	14	16	2	11
10. Uncertain	15	12	10	15	1	11
11. Orderly	15	21	12	18	19	17
12. Indifferent	1	4	1	9	1	12
13. Methodical	16	23	19	23	24	18
14. Unenthusiastic	1	4	2	10	1	11
15. Certain	11	12	13	14	26	18

1. χ^2 for (1) (2) = 19.531 significant (at $\alpha = .05$)
2. χ^2 for (3) (4) = 43.437 significant (at $\alpha = .05$)
3. χ^2 for (5) (6) = 44.263 significant (at $\alpha = .05$)
4. χ^2 for (7) (8) = 7.142 not significant (at $\alpha = .05$)
5. χ^2 for (9) (10) = 9.896 not significant (at $\alpha = .05$)
6. χ^2 for (11) (12) = 21.902 significant (at $\alpha = .05$)
7. χ^2 for (1) (3) (5) = 15.225 not significant (at $\alpha = .05$)
8. χ^2 for (2) (4) (6) = 29.054 significant (at $\alpha = .05$)
9. χ^2 for (7) (9) (11) = 35.811 significant (at $\alpha = .05$)
10. χ^2 for (8) (10) (12) = 10.673 not significant (at $\alpha = .05$)

Table 6

Ambidextrous Characteristics of Research

Condition	Significant		Not-So-Significant		t
	Mean	S.D.	Mean	S.D.	
To what extent...					
1. did you have firm expectations about empirical outcomes?	2.90	1.3	3.30	1.2	-1.59
2. would you say the methodology and argument were systematic, rigorous, and right?	4.25	.8	3.57	1.1	3.57***
3. was the project exploratory and open ended so that you were uncertain about the outcomes (asking a question rather than testing hypotheses)?	3.07	1.5	2.49	1.5	2.04*
4. were the variables of interest quantifiable in an objective rather than subjective fashion?	3.02	1.3	3.57	1.3	-2.16*
5. did you know exactly what you wanted to do from the beginning?	2.95	1.4	3.53	1.3	-2.26*
6. was the project based on your desire for greater "theoretical" understanding of some aspect of organization?	4.27	1.1	3.45	1.3	3.55***
7. did you have to figure things out as you went through the project?	4.02	1.1	2.96	1.2	4.69***
8. did you expend a large amount of effort thinking through the theory for this project?	4.32	.9	2.72	1.2	8.00***
9. were you emotionally committed to and involved in this project?	4.43	.9	3.38	1.3	4.89***
10. did you spend a large amount of effort thinking through the methodology for this project?	4.14	1.1	3.07	1.4	4.45***

*** $p < .001$ * $p < .05$

Table 7

Standardized Canonical Discriminant Functions for
Ambidextrous, Davis and Antecedent Scales

Ambidextrous Scale	.81
Davis Scale	.40
Antecedent Scale	.19

(Percent of cases correctly classified: 77%)

Canonical correlation = .61

Chi square = 43.9 with 3df; $p < .0001$.

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