**A COGNITIVE INQUIRY INTO KNOLWLEDGE CHANGE**

**IN ORGANIZATION STUDIES**

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**INTRODUCTION**

Over the past 60 years, organization studies (OS) has grown into an identifiable and legitimate academic field. Initially drawing on theories and methods from associated disciplines such as economics, psychology, and sociology, this multi-disciplinary field has created its own scholarly identity with distinct knowledge, subfields, schools of thought, professional associations, and academic journals. The literature include histories, stocktaking, and critiques of the OS field (Augier, March & Sullivan, 2005; March, 1996, 2007; Whitley, 1984, 2003) and its knowledge-production process (Astley, 1985; Daft, 1983; Van Maanen, 1995 ; Weick, 1989). Although these studies provide meaningful descriptions of the field’s evolution, better understanding is needed about the mechanisms that drive change in the content of OS knowledge. Current explanations focus on macro forces driving OS knowledge change, such as the field’s historical context (Augier et al., 2005; March, 1996, 2007), contemporary changes in organizations and their environments (Davis & Marquis, 2005), and institutional pressures for legitimacy (Augier, et al., 2005). Our study provides a micro perspective that addresses the cognitive dynamics underlying OS knowledge production. We first describe a theory of how changes in the cognitive processes that researchers use to produce knowledge contribute to predictable changes in knowledge content over time. Then, we use that framework to analyze and explain changes in OS knowledge over the past 50 years. This involves a textual analysis of articles appearing in three of the field’s premier journals from 1956 to 2008: *Academy of Management Journal, Academy of Management Review,* and *Administrative Science Quarterly*.

**THEORY**

The conceptual framework draws on Martindale and others’ extensive research on evolutionary changes in art, literature, and science (Martindale, 1969, 1975, 1984, 1986, 1990; Martindale, Covello, & West, 1986). It identifies the key roles that cognition, arousal potential, and habituation play in the production of art and knowledge. We start from the premise that liking, interest, or excitement for a scientific idea is determined by its arousal potential, the amount of cortical stimulation that it produces (Berlyne, 1971, 1974). In the empirical sciences like OS, at least three attributes contribute to an idea’s arousal potential: fit to reality, generality, and novelty. A fundamental dictum of science is that ideas must correspond to reality; they cannot contradict empirical evidence but must be subject to be shown incorrect (Kaplan, 1964; Popper, 1959). A basic goal of science is to produce general or abstract ideas that apply beyond a specific situation, population, or occurrence (Campbell & Stanley, 1966). Novel ideas contribute to arousal potential by bringing to awareness some previously unknown phenomena or offering additional insights to what is already known or assumed about something (Davis, 1971; Mone & McKinley, 1993). When taken together, a scientific idea’s fit to reality, generality, and novelty determine its arousal potential and hence whether it is preferred or liked by the scientific community. Repeated exposure to a scientific idea or series of similar ideas can be expected to reduce their arousal potential because researchers become habituated to them and they gradually lose their appeal (c.f. Thompson, 2009), at least in the sense of scientists not wanting to do further research related to them. Habituation to a scientific idea does not mean that researchers reject the idea’s validity. Rather, they lose interest in doing research stemming from the idea because such inquiry tends to be increasingly incremental and eventually not worth pursuing (Holton, 1973). To compensate for such habituation, successive ideas in science need to have more and more arousal potential. Thus, scientists face a constant pressure to increase the arousal potential of their work.

Scientists use two major strategies to increase the arousal potential of their work: change in cognition that underlies the creation of their work and change in the laws or research traditions underlying it. Cognition can vary along a hypothetical axis anchored at one end by secondary-process thinking and at the other end by primary-process thinking (Berlyne, 1965; Fromm, 1978; Jung, 1963; Martindale, 1981, 1990; McKeller, 1957; Werner, 1948; Wundt, 1896). Secondary-process thought is abstract, logical, and reality-oriented; it is aimed at the external environment and involves rational analysis, deductive reasoning, and problem solving. Primary-process cognition, on the other hand, is free-associative, whimsical, and irrational; it is self-oriented and stimulates imagination, reveries, and creativity. Scientists generally must engage in successively more secondary-process thinking to create ideas with increasing arousal potential (Martindale, 1990). They must increasingly do more conceptual, analytical, and deductive thought to produce knowledge that is fit to reality, general, and novel. Over time, however, secondary-process thinking is likely to become particularly difficult as more theoretical hypotheses are confirmed, more standard problems are solved, more boundary and mediating conditions are discovered, and more anomalies appear. Thus, at some point, scientists are likely to reduce temporarily the amount of secondary-process thinking and instead seek to increase the arousal potential of their work by changing the laws or research traditions underlying it. In highly-developed fields such as physics, these changes can result in what Kuhn (1962) called a paradigm shift or revolution in which new, generally looser and more intuitive laws and approaches to science replace the old ones. In less developed fields such as OS, the changes are likely to involve loosening the boundaries of what is considered legitimate research problems, theories, and methods. Changes in the traditions governing knowledge production can increase the arousal potential of scientific work. They can introduce new ways to address existing research questions. They can enable a broader array of research topics, concepts, and methods to enter a scientific field, which can spur research in new directions in novel ways. Once these changes have taken hold, secondary-process thinking can be expected to begin to increase anew as scientists respond to growing pressure for increased arousal potential within the new traditions.

This cognitive framework can help to explain how the content of knowledge within a particular academic field such as OS is likely to change over time. In response to constant pressure for increased arousal potential, successive works of science should include more and more content indicative of secondary-process thinking. OS knowledge, for example, would increasingly display more inferential reasoning, rigorous analyses, and sophisticated methods. This increase in secondary-process content should proceed in a cyclical pattern. It should rise over relatively long periods of time when researchers engage in more and more conceptual, analytical, and deductive thought to produce knowledge having progressively more arousal potential. Temporarily, it should decrease during periods of scientific change, and then rise again and so on.

**METHODS**

**Data**

To assess changes in the content of OS knowledge over time, we analyzed the language that researchers use to communicate that knowledge. Language in the form of written text is the primary medium for discourse among OS scholars. It is not simply a passive vehicle for communicating scientific knowledge but plays an active part in how members of a field construct, negotiate, and authenticate it (Bazerman, 1988; Ford & Peat, 1988; Gergen, 1982; Hyland, 2004; Locke & Golden-Biddle, 1997; Myers, 1990). Examination of OS’s written text can help to uncover the underlying thought processes that researchers used to create it. As described below, we used a text analysis method that provides measures of secondary-process thinking. We analyzed the language used in the published articles of three of the OS field’s long-standing journals: *Academy of Management Journal* (*AMJ*)*, Academy of Management Review* (*AMR*)*,* and *Administrative Science Quarterly* (*ASQ*). We examined all articles published in these journals from inception through 2008. This included the text of the body of each article, which is the main source of narrative for communicating an article’s knowledge. The title, author, abstract, notes, tables, figures, and references were excluded. In total, over the period from 1956 through 2008, 5,341 articles were analyzed containing 27,486,716 words.

**Measures**

We used Martindale’s (1969, 1973, 1975) 2,900-word Regressive Imagery Dictionary (RID) to measure the use of concept-based language and image-based language in the texts. The former is an indicator of secondary-process thinking and the latter of primary-process thinking. The RID is based on extensive research relating word usage to these two types of cognition (Comeau & Farthing, 1985; Martindale, 1975, 1984b; West, Martindale, & Sutton-Smith, 1985). We used the RID in conjunction with WordStat 5.0, a computer-assisted text analysis program, to process the text from the journal articles. For each year, we combined the text of the body of all articles published in the three journals into a Microsoft Word document. Then, we entered the document into WordStat, which used the dictionary to compare a list of words associated with each of the two types of language against the entered text. WordStat tabulated the percentage of words in the text that match words in the dictionary, thus measuring the frequency of concept-based words and image-based words in the text. To control for article length and the total number of articles published each year, we created two indices: concept-based language was calculated as the number of concept-based words divided by the total number of words; image-based language was calculated as the number of image-based words divided by the total number of words. Following Martindale (1990) and others’ method (Simonton, 1990), a summary measure of concept-based language, “net concept-based language,” was computed by subtracting the image-based index from the concept-based index. These computations included only the words from ASQ for 1956 and 1957, from both ASQ and AMJ for 1958 through 1975, and from all three journals from 1976 through 2008.

**Analysis**

We used polynomial regression analysis to examine whether changes over time in net concept-based language in the OS journals studied are consistent with the cognitive theory described above (Hair, Anderson, Tatham, & Black, 1998). We adopted a third-order polynomial regression to examine the relationship between time and net concept-based words. Adding a higher-order term introduces multi-collinearity to the polynomial regression model. To address this problem, we centered the independent variable timeand it’s higher- order terms prior to entering them hierarchically into the regression equations (Cohen and Cohen, 1983).

**RESULTS**

The findings are consistent with the theory that over time knowledge in a scientific field can be expected to display more and more content indicative of secondary-process thinking as researchers seek to produce ideas having progressively more arousal potential. This rise in secondary-process content should persist over a relatively long time period and then decrease temporarily during periods of scientific change, and then rise again. The results show that net-concept-based language first increased from 1956 to 1990 and then decreased at a diminishing rate to the end of our study in 2008 (Model 1, Δ R2 = 0. 053, F = 2.863, p < 0.10; Model 2: Δ R2 = 0. 341, F = 28.168, p < 0.001; Model 3: Δ R2 = 0. 078, F = 7.219, p < 0.01). The positive sign of the first beta coefficient of model 1 (Model 1: bº1 = 0.409, p < 0.15) and the negative signs of the second and third beta coefficients (Model 2: bº2 = -0.584, p < 0.001; Model 3: bº3 = -0.698, p < 0.01) of model 2 and 3 respectively reveal this effect. Overall, Model 3 shows that time explains 47.2 percent of the variation in the use of net-concept-based language (Model 3: R2 = 0.472, p < 0.01).

**DISCUSSION**

Our findings provide insight into the cognitive processes underlying OS knowledge change. The results follow a pattern consistent with the conceptual framework presented here and tell a cognitive story of how OS knowledge changed during the decisive period from 1956 to 2008 when OS evolved into an identifiable academic field. From 1956 to 1990, the use of concept-based language to communicate OS knowledge rose steadily and then turned downward and continued to decline to 2008. Using concept-based language as an indicator of secondary-process thinking, this pattern of results suggests that OS researchers engaged in more and more secondary-process thinking to produce knowledge during the field’s first three decades and then reduced such thinking during the last two decades. According to our study’s conceptual frame, these changes in OS researchers’ thought processes were in response to continuous pressure to increase the arousal potential of their work, so it is received positively by the scientific community. Generally, researchers must engage in more and more secondary-process thinking to produce knowledge with increasing arousal potential; this involves more and more conceptual, analytical, and deductive thinking. Over time, secondary-process thinking is likely to become increasingly difficult as a field’s knowledge matures and there are fewer problems to solve, less boundary and mediating conditions to discover, and more anomalies to explain. Thus, at some point, which appears to be around 1990 for the OS field, researchers can be expected to reduce secondary-process thinking temporarily and instead seek to increase the arousal potential of their work by changing the research traditions underlying it. For OS researchers, these two distinct strategies for increasing arousal potential seem to have occurred over two successive time periods, 1956 to 1990 when concept-based language was increasing and 1990 to 2008 when it declined. We will elaborate and discuss the results for each of these two time periods below.

During the years from 1956 to1990, contemporary OS became an identifiable academic field; by most accounts, it achieved this status by the late 1970’s (Augier et al., 2005; March, 2007; Whitley, 2003). This establishment period reflected profound changes in both the social-science disciplines that spawned OS and the business schools that became its primary home. The years immediately following the Second World War saw American social sciences become more analytical, quantitative, and scientifically rigorous (Leslie, 1993); OS followed its parent disciplines (economics, psychology, and sociology) on this path, initially drawing on them for personnel, intellectual stimulation, and research guidance (Augier et al., 2005; Marsh, 2007). This dependence on the disciplines was reinforced by significant changes in American business schools, which were steadily becoming the home of OS researchers (Perrow, 2000). Many university-based business schools underwent a major transformation from a vocational to a “disciplinary-like” research orientation (Schlossman, Sedlak, & Wechler, 1987). For the budding OS field that relied on the disciplines for successful start-up and business schools for a receptive home, modern scientific standards gradually shaped knowledge production, which over the following decades became more theory driven, methodologically rigorous, and quantitatively precise (Augier et al., 2005; March, 2007). These trends in OS research are reflected in the increase in concept-based language that occurred from 1956 to 1990. They are consistent with the notion that OS researchers engaged in more and more conceptual, analytical, and deductive thought to produce knowledge of increasing arousal potential to the scientific community.

This increase in secondary-process thinking also mirrored OS knowledge development during this time. The field’s founding ideas were created during a highly prolific period from roughly the late 1950’s to the late 1970’s (c.f. Cyert & March, 1963; Hackman & Lawler, 1971; Hannan & Freeman, 1977; Lawrence & Lorsch, 1967; Locke, 1968; March & Simon, 1958; Meyer & Rowan, 1977; Pfeffer & Salancik, 1978; Pugh, Hickson, Hinings, & Turner, 1968; Thompson, 1967; Vroom, 1964; Weick, 1969; Williamson, 1975). They helped to define the nascent OS field, providing a preliminary map of what topics to study, variables to measure, and causal relationships to explore. From the 1960’s through the 1980’s, OS knowledge development was aimed mainly at empirically testing, refining and codifying the field’s broad description (March, 2007; McKinley, 2010; Whitley, 2003). By the end of this period, OS knowledge had become progressively more specialized and complex as prior theory was empirically assessed and more explanatory variables and boundary conditions were discovered. Because knowledge development was directed largely at testing, refining, and extending existing ideas not building new theory, gradually more analytical and deductive thinking were required to produce successive contributions to knowledge as suggested by the steady rise in concept-based language during this time period.

Over the following years from around 1990 to 2008, however, the use of concept-based language turned decidedly downward. Apparently OS researchers, faced with mounting difficulties in increasing the arousal potential of their work through more and more secondary-process thought, gradually reduced those cognitions and turned to changing the field’s research traditions to increase the arousal potential of OS knowledge. This shift in strategies for enhancing arousal potential was in part a natural outgrowth of the field’s focus on testing and refining existing ideas. Eventually, the returns from producing successive increments of knowledge in a particular stream of research, such as goal setting, organization structure, and job motivation, unlikely offset the escalating effort in analytical and deductive thinking needed to produce those additions to knowledge. OS researchers then sought more fertile research directions where, at least temporarily, new knowledge could be created with less demands on secondary-process thought.

This shift in strategies for increasing arousal potential is reflected in significant changes that occurred in OS during this period. The field’s conceptual and research boundaries became broader, more abstruse, and more contested. Rather than converge on a unified theory, cumulative set of findings, or common approach for doing research, OS became more differentiated, some might say fragmented, with growing numbers of subfields and schools of thought, often with differing epistemological assumptions, research methods, and intellectual purposes (c.f., Davis & Marquis, 2005; Fabian, 2000; McKelvey, 1997; Pfeffer, 1993; Whitley, 2003). Thus, during the period from 1990 to 2008, OS researchers introduced new topics, alternative theories, and nontraditional methods to the field, while adhering less strictly to the traditions of the scientific method that had guided OS during its establishment years (McKinley, 2010; Palmer, 2006). Loosening the field’s theoretical and methodological boundaries provided increasing novelty and variation in the knowledge elements that researchers could use to enhance the arousal potential of their work. Increasingly, attention turned to research that was interesting, innovative, and unique (Bartunek, Rynes, & Ireland, 2006; Colquitt & Zapata-Phelan, 2007; McKinley, Mone, & Moon, 1999; Mone & McKinley, 1993).

Our study has certain limitations that should be considered in interpreting the findings and conducting future research. We focused on how OS knowledge changed in North America. This was the major context for the field’s growth after the Second World War and shaped how the majority of OS scholars produced knowledge (Augier et al., 2005). In the 1970s and 1980s, however, a distinct yet separate branch of OS grew in Europe, facilitated by the exceptional increase of business education in European universities. European OS, having emerged after the protest and counterculture movements of the 1960s and 1970s, employed a more radical and social constructionist perspective than its North America counterpart (March, 2007). It was more intellectually pluralistic and less committed to a common research approach than North American OS (Whitley, 2003). More recently, the OS field has seen distinct developments in Asia and South America, although it is premature to know what approach their research is taking. These regional differences in OS might extend to the cognitive processes that researchers use to increase the arousal potential of their knowledge. Future research comparing researchers’ thought processes across different regional approaches to OS would help to determine the cross-cultural applicability of our findings, and perhaps lead to a richer perspective that accounts for cultural differences in OS knowledge production and content.

Another limitation of our study is the relatively small sample of OS journals that we examined, *AMJ*, *AMR*, and *ASQ*. Although these journals are mainstream outlets for the field’s research knowledge with relatively long publication histories and broad focus, they may not be representative of OS’s growing diversity of topics, ideas, methods, and publication standards.

**REFERENCES AVAILABLE FROM THE AUTHORS**