

Reynolds, R. Nelson, C., & Brannick, M. T. (2004, April). *Paradigm Shifts and Age of Adopters*. Poster presented at the 19th Annual Conference of the Society for Industrial and Organizational Psychology, Chicago.

Poster

TITLE

Paradigm Shifts and Age of Adopters

ABSTRACT

This research uses citation analysis to test the hypothesis that there is a significant difference in age among those who adopt a new paradigm and those who do not. The results support this hypothesis.

PRESS PARAGRAPH

Thomas Kuhn wrote an influential book which addressed how an established scientific paradigm is replaced by a new paradigm. One of Kuhn's ideas was that those who adopt a new paradigm early on are more likely to be young, as resistance from those who have spent their entire careers committed to an older paradigm is part of the nature of scientific research. The research presented here tested Kuhn's proposition using citation analysis, and found that in the field of group development, those adopting a new paradigm do tend to be younger than those who do not.

Paradigm Shifts and Age of Adopters

The research described here focused on Kuhn's (1962) proposition that those who adopt a new paradigm early on are more likely to be young or new to the field. The paradigm used to test this proposition was group development, and the method was citation analysis. In the following sections, the proposition, the theory, and the method are briefly reviewed.

The Proposition - Kuhn's Work

This research was based on the concepts of scientific theory, revolutions, and paradigm shifts developed by Kuhn (1962). Kuhn defines "normal science" as "research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice (p.10)." Kuhn states that the aim of normal science is not to find new phenomena. In fact, facts and theories that don't fit the paradigm -- anomalies -- are not made common knowledge. While this may, in some ways be a defect, in other ways it allows the scientists to focus on a small range of problems in great depth. Eventually, however, through an accumulation of such anomalies, the scientific community becomes increasingly aware that a problem exists. "The extraordinary episodes in which the shift of professional commitments occur are the ones known in this essay as scientific revolutions (p. 5)."

Because of the totally different gestalts that proponents of opposing paradigms hold, rational discussion and reasonable arguments are often not possible, let alone sufficient; "In short, if a new candidate for paradigm had to be judged from the start by hardheaded people who examined only relative problem-solving ability, the sciences would experience very few major

revolutions. (p. 157).” Furthermore, he comments “The transfer of allegiance from paradigm to paradigm is a conversion experience that cannot be forced. Lifelong resistance, particularly from those whose productive careers have committed them to an older tradition of normal science, is not a violation of scientific standards but an index to the nature of scientific research itself (p. 151).” Gradually, however, as the puzzle solving value of the new paradigm becomes apparent, the new theory begins to supplant the old. This last assumption, that those who had an extensive commitment to an existing paradigm would resist conversion to a new paradigm, was the focus of this research.

The Theory - Group Development

In order to test Kuhn’s propositions regarding the adoption of a new paradigm, a theory undergoing a shift had to be found. Group development theory proved to be useful for this purpose.

A groundbreaking article by Bales and Strodtbeck (1951) suggested that groups went through predetermined and orderly stages in their development. In the 1950’s and 60’s, two other influential articles elaborated on and refined the idea of orderly stages (Bennis and Shepard, 1956; Tuckman, 1965). By the mid-to-late 1960’s, the concept of group development as a orderly process with fairly clearly defined stages was familiar to any reader of an introductory text on group behavior.

In 1988, Gersick published an article in the *Academy of Management Journal* that suggested that groups did not go through orderly stages in their development, but rather through a form of “punctuated equilibrium”. Punctuated equilibrium was characterized by an initial

period of stability which lasted until the midpoint of the group's existence, followed by a concentrated burst of changes, and concluding with another period of stability (Gersick, 1988).

The punctuated equilibrium model appears to have become a popular alternative paradigm, particularly in management journals (Reynolds, Nelson, and Brannick, 2003). Citation analysis was used to determine if there was a difference in age among those who adopted the punctuated equilibrium model versus those who did not.

Citation Analysis

Citation analysis has been used to identify most-cited authors, to determine high impact papers and journals, and to make national comparisons in scientific progress (Garfield and Welljams-Dorof, 1993). Johnson and Wolinsky (1990) used citation analysis to determine the relative impact of journals on a field, while Carley, Hummon, and Harty (1993) investigated the degree to which a field had an interdisciplinary focus by using citation analysis. This methodology has also been used to study the development of DNA theory (Hummon and Doreian, 1989), to determine influential papers in the child abuse field (Oates and Donnelly, 1997), to research "invisible colleges" (Chubin, 1983), and to investigate the impact of science and technology in developing countries (Hafferty, 1990).

In psychology, citation analysis has been used to identify prominence as defined by Social Science Citation Index scores versus prominence in textbooks (Perlman, 1980), to discover the most frequently cited authors in introductory textbooks (Gorenflo and McConnell, 1991; Kaess and Bousfield, 1954), and to identify eponyms (Roeklein, 1995). Citation analysis has also been used to specifically address the question of paradigm shifts in psychology; Friman, Allen, Kerwin, and Larzelere (1993) used citation analysis to investigate whether "... a Kuhnian

revolution occurred in psychology; specifically, is cognitive psychology displacing behavioral psychology and psychoanalysis? (p. 658)”

Despite this widespread use, criticisms of citation analysis are common. These criticisms include the fact that the Citation Indexes list cited items only by the first author, as well as the homograph problem of distinguishing between two or more people with the same last name. For both of these problems, Garfield (1979) suggests obtaining a complete bibliography of the person being evaluated, and a careful examination of the titles of the journals in which both the cited and the citing work were published. A final concern with the use of citation analysis is what Garfield and Welljams-Dorof (1993) call the “obliteration phenomenon.” This occurs when a breakthrough paper becomes so incorporated into scientific fact that it is no longer cited. This possibility was investigated for the current study, and was not found to be a concern, as all of the articles being investigated were still being cited.

Method

Based on the preceding discussion, the first hypothesis investigated in this research stated that there would be a significant difference in amount of time in the field among those who adopt the punctuated equilibrium model and those who do not. A second hypothesis suggested that those newer to the field more likely to adopt the paradigm early in the paradigm’s emergence, while the differences in length of time in the field would diminish as the new paradigm became more universally accepted.

Length of time in the field, rather than chronological age, was chosen because the commitment to the dominant paradigm is not based on age, but rather on the emotional attachment, or intellectual investment, to the existing paradigm.

Citation counts were collected for the three stage articles: Bales and Strodtbeck, (1951); Bennis and Shepard, (1956); and Tuckman, (1965). The citations were gathered from the Web of Science Citation Database for 1984 to 1999, in order to include a five-year period prior to the publication of Gersick's model, thus giving a baseline.

For the Gersick model, the issue arose as to which Gersick article to include in the citation analysis. The earliest article (Gersick, 1988) proposed the punctuated equilibrium, however, later articles elaborated on or extended the model. It was therefore decided that a citation to any of the Gersick articles (Gersick, 1988; Gersick, 1989; Gersick, 1990; Gersick, 1991; Gersick, 1992; and Gersick, 1994) would be counted as a citation to the punctuated equilibrium model.

A stratified random sample of five authors was taken from each group (those who cited Gersick, and those who cited the any of the stage models) for each year from 1988 to 1998, for a sample of 100 articles. Length of time in the field was operationalized as length of time from first publication as senior author until publication of the article being examined. Authors in the sample were tracked through the Web of Science Citation Database, which covers the Social Sciences Citation Index from 1977 until the present. For authors whose publications predated 1977, the tracking continued through the use of the PsychInfo Database or university web pages, which often contain faculty biographies and lists of publications.

Institutional affiliations, co-authors, and research topics were used to differentiate authors with the same last name and initials. With the exception of three out of 100 authors, this was sufficient. In those three situations where the researchers could not be confident that they were in fact tracking the same author, and not an author with the same name, substitutes were

randomly selected from the population.

Analysis and Results

Two length of time in the field comparisons were performed. For Hypothesis 1, the length of time in the field of those citing Gersick and those citing the stage models across all years was compared. The second comparison, for Hypothesis 2, focused on the difference in length of time in the field between those who cited in the early years (1989 to 1993) as opposed to the later years (1994 to 1998). These comparisons were done using independent-sample t-tests (2-tailed).

Results for all years. For this first analysis, a comparison was made between the date of first publication for those who cited Gersick and those who cited the stage models across all years between 1989 and 1998. An independent-sample t-test (2-tailed) revealed a significant difference between the two groups, $t(98) = -2.21$; $p < .05$. In the years from 1989-1998, authors who cited Gersick tended to have a mean date of first publication in 1986 ($M = 1986.32$, $SD = 8.86$), while those who cited the stage models had a mean date of first publication in 1982 ($M = 1982.16$, $SD = 9.92$).

Results for early versus later years. A second test was computed to determine if there was a difference in length of time in the field for those citing the Gersick model in the early years after the original publication of the Gersick model (1989 to 1993) as opposed to the later years (1994 to 1998). This comparison was done because it was suggested that in the early years after publication, Kuhn's hypothesis that those young or new to the field were more likely to adopt a new paradigm would hold, however, as the new paradigm became more widely established, it seemed likely that even those who were older to the field would begin to adopt it.

An independent-sample t-test revealed a significant difference between the two groups in the early years, $t(48) = -2.3405$; $p < .02$, with those citing the stage models having a mean date of first publication of 1978.64, while those citing Gersick had a mean of 1984.36. This difference disappeared in the later years, $t(48) = -.5833$; $p < .58$, where the means were 1985.68 and 1988.28 respectively.

Discussion

Two authors – at opposing ends of the spectrum regarding the creation of a sub discipline known as Theoretical Psychology - noted the importance of theory and theory development. Gantt who recommended the forming of the sub discipline, suggested it “...would be principally devoted to a careful and sustained theoretical examination and philosophical evaluation of the discipline of psychology (Gantt, 1998, p. 65).” Brand, while disagreeing with the formation of a new sub discipline, agreed that “...metaexamination of psychology’s assumptions - both at the global disciplinary level and at the level of microtheories and specific models - must remain an important part of theoretical development within the discipline (Brand, 1998, p. 67).”

While the intent of this paper was not to clarify the role of theory in psychology, it did attempt to test one proposition regarding theory development; the adoption of paradigm shifts. Specifically, the research addressed the issue of whether there was a significant difference in length of time in the field among those adopting the punctuated equilibrium model of group development and those who did not.

The comparison of dates of first publication for those citing the stage models and those citing the punctuated equilibrium model revealed a significant difference between the two

groups; authors in the punctuated equilibrium group had significantly later dates of first publication than authors in the stage group, indicating less time in the field. A second analysis indicated that this gap decreased over time. As the new paradigm became more widely accepted, those who had been in the field longer began to adopt it as well.

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