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Motivational recipes and research performance: A fuzzy set analysis of the motivational profile of high performing research scientists☆,☆☆

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ABSTRACT

Recent research identifies internal self-concept motivation and instrumental motivation as having positive and negative effects, respectively, on the performance of research scientists. However, the majority of research examining the work motivations of research scientists employs bad research practices. The current study presents an alternative view of the relations between work motivations and research performance through the examination of causal recipes of research performance. Qualitative comparative analysis (QCA) of a random sample of 300 UK scientists identifies recipes of work motivations that effectively foster high levels of research performance. Contrary to prior liner examinations of the relations between motivation and performance, results show that no unique combination of antecedent work motivations yield higher levels of research performance. This finding suggests that several combinations of work motivations can successfully drive high levels of research performance.

1. Introduction

Scientific research makes an unquestionable contribution to social and economic advancement. Public basic scientific research is an essential contributor to industrial innovations and the development of the international competitiveness of nations in technology and science fields (Toole, 2012). University spin-offs and university–industry collaborations create employment and wealth in their locales and serve to attract further intellectual and financial capital inflows (Abel & Deitz, 2011).

Although modern science requires significant technological and infrastructural resources, the essential elements of success or failure rest with the capabilities of the human capital using such resources (Hurley, 2003). Consequently, understanding the social and organizational environment of scientific research is important to maximize the effectiveness of scientific researchers. Many organizational and individual level variables relate to research productivity and performance, including leadership and supervision (Baumgartel, 1956), teamwork (Beaver, 2013), planning and decision making (Chawla & Singh, 1998), organizational culture (Edgar & Geare, 2013), age (Simonton, 1988), gender (van Arensbergen, van der Weijden, & Van den Besselaar, 2012), personality (Jauk, Benedek, & Neubauer, 2014), and even birth order (Sulloway, 1996).

As a product of the interactions between individual drives and environmental conditions, workplace motivation lies at the interface of the many organizational and individual characteristics that relate to scientific research productivity and performance. The general concept of work motivation receives extensive research attention (Latham & Pinder, 2005). However, relatively little research on the work motivation of scientists exists (Ryan, 2014), and much of the research that does exist employs what Woodside (2016) describes as bad research practices.

The current study represents a seminal use of fuzzy set qualitative comparative analysis (fsQCA) for the examination of scientists work motivation and research productivity. This research contributes valuably to understanding the complexity of human motivation in this work domain and helps overcome the simplistic narrative of linear relations between motives and performance that dominate the literature. The structure of the study is as follows: Section 2, theoretical background; Section 3, sample and method; Section 4, results; Section 5, conclusions; and Section 6, concluding remarks.

2. Theoretical background

The majority of existing research on work motivation seeks to explain the motivational concepts and processes from a needs perspective or a process perspective. Leading process perspectives include equity theory (Adams, 1963), expectancy theory (Porter & Lawler, 1968; Vroom, 1964), goal setting (Locke, 1968), and work design

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(Hackman & Oldham, 1976). Seminal needs theories include the hierarchy of needs theory (Maslow, 1943), affiliation, achievement and power needs theory (McClelland, 1961), the two factor hygiene-motivators theory (Herzberg, 1968) and the existence, relatedness and growth needs theory (Alderfer, 1972). In addition, continuing calls for integration of theory (O'Reilly, 1991; Steel & Konig, 2006), result in new advances in the field of motivation research such as the meta-theory of motivation (Leonard, Beauvais, & Scholl, 1999). Despite this level of maturity of work motivation research and conceptualization, much of the research on the work motivation of scientists lacks a substantive theoretical foundation (Ryan, 2014).

2.1. Motivation of research scientists

Baumgartel's (1956) work on leadership and motivation offers an early example of attempts to understand the importance of contextual factors on the motivation towards scientific performance. The research links leadership style to the satisfaction and motivation of employees, particularly highlighting the importance of employee/scientists active participation in the research process. Baumgartel's (1956) study is noteworthy but focuses more on leadership than on work motivation.

Although the influence of peer recognition is insufficient to explain wide variation in scientific productivity (Gustin, 1973), early research does identify the importance of influential "others/peers" on the motivation of research scientists (Glaser, 1965). The significance of recognition is also evident in findings identifying reputation as a driver to high science performance (Jones, 1996).

Lawler and Hall (1970) offer early evidence of the link between performance and intrinsic work motivations, independent of job characteristics. The sample of scientists in the study also relates work satisfaction but not performance to a number of job characteristics, suggesting a strong internal motivation towards scientific endeavors. Such findings are not to suggest that external variables, including social and organizational conditions are irrelevant. A large body of evidence confirms the vital role that organizational conditions play in supporting research performance (Bland & Ruffin, 1992; Hurley, 2003; Ryan & Hurley, 2007). Identifying the importance of intrinsic work motivations positions organizational characteristics as necessary conditions for scientific productivity but insufficient in and off themselves to motivate scientists to higher levels of research performance. More recently, Horodnic and Zaiţ (2015) research further supports the positive relation between intrinsic workplace motives and research productivity.

Badawy (1971) offers an explanation of work motivation in science that is consistent with the two-factor theory (Herzberg, 1968). The findings distinguish work characteristics necessary for normal performance from those that serve to motivate. Badawy (1971) identifies internalization of goals, autonomy, and recognition as important components in the motivational landscape of research scientists. More recently, Dhawan, Roy, and Kumar's (2002) pseudo-Herzbergian analysis identifies challenging work, skill development, and leadership encouragement as important motivators for scientists. Additional research confirms the intrinsic motive of intellectual challenge in scientific problems as an important motivator (Lam, 2011; Sauermann & Cohen, 2008). Such intrinsic motives are also evident in the selection of scientific research as a career choice (Roach & Sauermann, 2010).

Lounsbury et al. (2012) support the consistency of findings highlighting intrinsic motivation over extrinsic motivation as a driver of scientific research activities. Lam (2015) suggests that, even when the subject of the activity is the commercialization of research, the motivations for engaging in such activities are still largely non-financial/reputational rewards and intrinsic motivations.

2.2. Bad research and the motivation of research scientists

Recent research calls into question the validity of modern organizational research and the weaknesses that have become endemic in the research process. Woodside (2016) identifies a host of weaknesses that permeate publications in the business and management domains, including preferences for overly simplistic linear models of relations between select variables, exclusive reliance on Likert-type survey responses, low response rates, common method bias, ignoring contrarian or paradoxical findings, no reporting on the predictive validation of models, and a lack of consideration for the role of complexity theory in empirical research. Such weaknesses are likely contributors to the lack of reproducibility of findings evident in other disciplines that share the methodological procedures of business research, namely the psychological sciences (Open Science Collaboration, 2015).

Woodside (2016) argues that most researchers automatically and unconsciously switch from theory building at the case-identification level to the empirical testing of two-directional relationships and additive net-effect influences of variables. Much research on work motivations follows a similar structure where case-level theories of work motivation are subject to empirical testing of a symmetric (two-directional) variable hypotheses nature, resulting in shallow data analysis and possibly inaccurate contributions to theory. Research on work motivation of scientists is not immune to the many bad research practices prevalent in leading business journals. Examples of low rates of usable responses, common method bias, exclusive use of Likert-type survey data, insufficient model fit, single respondents representing higher order units (e.g. research teams, science centers, departments), and overly simplistic linear/mediating/moderating causal models are among some of the bad research practices that are evident in existing studies on motivation in science (Baumgartel, 1956; Dhawan et al., 2002; Jindal-Snape & Snape, 2006; Kamalanabhan, Uma, & Vasanthi, 1999; Lam, 2011; Pelz & Andrews, 1976; Ryan, 2014). In essence, the nature of existing research on work motivation in science offers an overly simplistic picture. Findings from existing research largely fall into an intrinsic motivation-good/extrinsic motivation-bad categorization that overemphasizes mean responses and statistically significant variable correlations of questionable importance.

The current study adds value to the understanding of work motivation in science through a fuzzy set qualitative comparative analysis (fsQCA) of data from a prior study (see Ryan, 2014). This alternative analysis of data from a prior study does not remove the weaknesses of the original study. However, the approach does offer an improvement in the analysis of motivational causes of research performance and an improvement in theoretical interpretation of results through the recognition of complexity theory. The research also offers an interesting case for the comparison of results employing the currently dominant methods of linear statistical analysis against results employing a more nuanced analytical technique allowing for the identification of counter-intuitive and multi-dimensional causal recipes of research performance, namely fsQCA.

2.3. A theoretical framework for work motivation

Organizational research continues to call for the thoughtful integration of the host of competing and complementary theories of work motivation (O'Reilly, 1991; Steel & Konig, 2006). One such useful attempt at integration is the meta-theory of motivation, which incorporates the idea of the self-concept with a wide range of existing motivational theories (Leonard et al., 1999). The meta-theory's incorporation of the self-concept is particularly relevant to researching motivation in science as early research on scientists work behaviors highlights its relevance in understanding scientists' motivations (Lee, 1969).

The current study examines work motivations through the conceptual lens of Leonard et al.'s (1999) meta-theory of work motivation. The meta-theory describes an individual's motivation profile through a description of five underlying motives. These motives include instrumental motivation (motivation through tangible outcomes and rewards such as pay, bonuses, stock-options, etc.); intrinsic motivation (motivation through

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