Knowledge Workers' Preferences for Leadership: Reimagining a Follower-Trait Perspective

Abdallah Wumpini, Issahaka

Abstract

This dissertation contributes to the research on the leadership of knowledge workers. The dissertation comprises four articles and joins the discussion on why there is still little agreement among scholars as to how knowledge workers (KWs) should be effectively led, if at all. Article 1 provides a timely synthesis and identifies the research gaps at the root of the matter. One major root cause of this disagreement seems to be that the concept of who is a knowledge worker is ambiguous, and how they are different from other workers has not been conceptually grounded in the research on the leadership of KWs. Article 2 builds on research in educational psychology, proposing a theoretical perspective on how knowledge workers are different from other class of workers and how this difference forms a basis to speculate about their preferences for leadership; this theoretical perspective draws on theories of student development and posits that through education, students undergo psychosocial changes that over time crystalize into a very defining personality of highly educated individuals (i.e., knowledge workers). In Article 3, an empirical study to assess our theoretical perspective by using a multilevel sample of employees nested in workgroups in a work setting was undertaken. The empirical results supported the proposed theoretical perspective of knowledge workers. That is, there were statistically significant differences in workers' dispositional tendencies on need for closure, ambiguity tolerance, moral competence, dogmatism, authoritarianism, and cognitive ability between (highly) educated persons and persons with lower educational attainment. Yet it remains to be investigated empirically how these knowledge workers' dispositions shape behaviors and responses to leadership structures. This concern was addressed with Article 4. Using authentic leadership as an exemplar, I examined how knowledge workers' traits (i.e., ambiguity tolerance and dogmatism) shape their responses (creative behavior and charge taking via psychological empowerment) to authentic leadership, which was accomplished using a multilevel moderated mediation model. Overall, this study supports the notion that congruence

between organizational leadership structures and knowledge workers' preferences for leadership is pivotal to leadership effectiveness, an important point that I justify.

Dedication

Dedicated with love and affection to my family

for their advice, patience, and faith

because they always understood.

Acknowledgments

Foremost, I thank the Almighty for giving me the strength and ability to learn and complete this dissertation. I am most grateful to my supervisor, Dr. Rune Lines, whose expertise, understanding, and support made it possible for me to work on a research project that was of great interest to me. It was a pleasure working with him. I owe special thamks to professor Marcus Selart for co-authorship, valuable insights and motivation.

I am highly indebted to Tor, Irene, Paal Fennel, Elaine, and Herbjørn for being ever so kind to show interest in my research and facilitating access to organizations in Norway for my data collection. I am also thankful to Price Baah, Ibrahim Issahaka, and Malik Halidu for their immerse efforts in various capacities toward the data collection effort in Ghana.

I am highly indebted and thoroughly grateful to my colleagues and professors and the entire administration at the Department of Strategy and Management for their diverse social and professional roles in shaping my PhD journey.

I want to express my gratitude to my parents and lovely Zenab and Hajar, who put their faith in me and urged me to do better.

Table of Contents

List of Articles

Article 1

Issahaka, A. and Lines, R.
Images of Knowledge Workers in the Organizational and Leadership Research Literature:
Where are We, and Where Should We Be Heading?

Under review at *Journal of Intellectual Capital*

Article 2

Issahaka, A. and Lines, R.
On Knowledge Workers: How Education Shapes Preferences for Leadership

Under review at *Journal of Leadership and Organisational Studies*

Article 3

Issahaka, A. and Lines, R.
Knowledge Workers: How Are They Different? (And Why Does It Matter?)

Presented and published in the *Academy of Management Annual Meeting Proceedings, 2019*

Accepted and forthcoming in *Journal of Organisational Psychology,* 2019

Article 4

Issahaka, A., Lines, R., and Selart, M.
Authentic Leadership and Knowledge Worker Initiative: A Moderated Mediation Model of
Ambiguity Tolerance, Dogmatism, and Psychological Empowerment

Under review at *Journal of Organisational Behaviour*

Chapter 1. Introduction

The idea that knowledge workers, individuals who use their skills and knowledge for work, are assets to be valued, stimulated, and managed in an organization has long been recognized among researchers and practitioners alike (Bogdanowicz & Bailey, 2002; Davenport, 2005; Peter F. Drucker, 2002; Lewis, Agarwal, & Sambamurthy, 2003; Stewart & Ruckdeschel, 1998; Tampoe, 1993). More than ever, organizations are confronted with rapid changes and business restructuring away from the industrial economy (Blair, 1998; OECD, 2001, 2017; Reich, 1993); and the basis for competitiveness has changed toward intellectual capabilities to produce and distribute novel ideas (Andrews & Criscuolo, 2013; OECD, 2013) . Introduced in the early works of Peter F Drucker (1959) and Machlup (1962), the term knowledge economy is now increasingly characterized by the following:

- Emergence of the knowledge-based organization (Bolisani & Bratianu, 2018; Davenport & Prusak, 1998; Noyelle, 1990; Nurmi, 1998; Powell & Snellman, 2004; Raspe & Van Oort, 2006; Stanback, 1979; Zack, 2003);

- A vibrant innovation landscape (Peter F Drucker, 1993; Nonaka & Takeuchi, 1995; Prusak, 2009; Skrodzka, 2016; Von Nordenflycht, 2010; White, Gunasekaran, & Ariguzo, 2013); and

- An increasing class of highly skilled workers (Davenport, Thomas, & Cantrell, 2002; Peter F Drucker, 1959, 1992; Mandt, 1978; Shoham & Hasgall, 2005; Yigitcanlar, Baum, & Horton, 2007).

Indeed, the importance of knowledge workers to achieve the primary management task of value creation cannot be overemphasized. Yet the scholarly discourse on managing or leading knowledge workers has largely remained normative propositions and been quite divergent. There has been acknowledgment among scholars that knowledge workers require different types of leadership (Kelloway & Barling, 2000; Alvesson 2001; Walumbwa, Christens, &

Hailey, 2011), but the field has been plagued with a lack of theoretical and empirical evidence for how knowledge workers are different from other groups of workers and the implications of that difference on responses to leadership.

Given the current state of the field, some leadership scholars (e.g., Uhl-Bien, Marion, & McKelvey, 2007; Walumbwa, Christensen, & Hailey, 2011) and the author of the current dissertation are grappling with the thought of how knowledge workers should be led, if at all. This concern typifies Peter Drucker's assertion that leading knowledge workers will be the biggest management challenge of the twenty-first century. To this end, the overall purpose of the current dissertation was to contribute to the understanding of knowledge workers, their behavioral models, and preferences for leadership.

Chapter 2. Theoretical Positioning and Constituent Research Articles

2.1 Conceptualizing Knowledge Workers: An Existing Debate
The term "knowledge worker" was coined by Drucker (1959) to describe a segment of the workforce that is concerned primarily with knowledge and the handling of information. Scholars have since popularized this notion to include data analysts, product developers, planners, programmers, researchers, and consultants who are engaged primarily in acquisition, analysis, and the manipulation of information as opposed to the physical production of goods and services (Davenport, Jarvenpaa, & Beers, 1996; Dove, 1998; Kidd, 1994).

The term "knowledge worker" and its related concept "knowledge work" remain an unresolved issue dating back to the mid-1950s (Alvesson, 2001; Darr & Warhurst, 2008; Peter F Drucker, 1959, 1999; Kelloway & Barling, 2000). This divergence stems from theoretical divisions and ambiguity regarding the definition of the "concept of a knowledge work(er)" (Alvesson, 2001; Conner & Prahalad, 1996; Darr & Warhurst, 2008; Kelloway & Barling, 2000; Von Nordenflycht, 2010). The fragmented definitions make it difficult to categorize what (or who) knowledge work(er) is. Alvesson (2001) emphasized the slipperiness of the concept of knowledge work and its role in what is constructed as a knowledge worker. Rhetorically, this raises the following questions: What is knowledge work? Who is a knowledge worker? Are these two issues different? Analogous to studies on knowledge work, the definition of a knowledge worker is diverse and is not always definitive regarding to whom it refers. As such, the first research query aimed at obtaining a firmer theoretical background for understanding knowledge workers by taking stock of the relevant literature to form a timely synthesis of how knowledge workers have been defined and conceptualized.

Research Question1: Who is a knowledge worker (definition and concepts)?

2.2. Leadership Research in Context

The role of leadership in knowledge-oriented organizations cannot be overemphasized (Chuang, Jackson, & Jiang, 2016; Donate & de Pablo, 2015; Han, Seo, Yoon, & Yoon, 2016; Pearce, 2007; Pearce & Manz, 2005). The leadership of knowledge workers is attracting research attention and may necessitate a tailored leadership theory different from the "dominating" leadership structures of the past. Although it is widely acknowledged that traditional views on leadership might offer limited insights into how to lead in the knowledge economy, much of the leadership theories remain grounded in a bureaucratic setting (Gronn, 1999) and are deficient for the knowledge era (Uhl-Bien et al., 2007, p. 301). A shared idea of contemporary leadership theories is that the interactions between leaders and followers are fundamental. Terms such as leader-member exchange (LMX), dyadic relationships, and complex adaptive systems (CAS) are becoming a part of any effective leadership model (Blomme, 2012; Brouer, Douglas, Treadway, & Ferris, 2013; Epitropaki et al., 2016; Graen & Uhl-Bien, 1995; Lichtenstein et al., 2006; Marstand, Martin, & Epitropaki, 2017; Matta & Van Dyne, 2018; Newman, Schwarz, Cooper, & Sendjaya, 2017; Will, 2016). Interactions between leaders and followers unveil behaviors, attitudes, emotions, and values that will be otherwise lacking if studies concentrate only on leaders or followership. In the case of knowledge workers, interactions with leaders and the resulting behaviors and attitudes they demonstrate are critical for effective leadership (Bryman, 1992, 2007). However, capturing the interactions between the leader and followers (including knowledge workers) and the types of individual and group-level behaviors they exhibit reflects a plethora of existing taxonomies on leadership behaviors (see Bass & Stogdill, 1990; Yukl, Gordon, & Taber, 2002 for an overview). In keeping with recent studies advocating for the interactions between leaders and followers (e.g., Graen & Uhl-Bien, 1995; Lichtenstein et al., 2006; Uhl-Bien et al., 2007) and the calls for a tailored leadership model for the knowledge era, I sought to develop a theoretical perspective that can espouse knowledge workers' preferences for leader behaviors.

2.3 Workers' Preferences for *Ideal* Leadership: Review and Theoretical Extensions

The natures and personalities of individuals (leaders and nonleaders) are the root cause of their behavior. In organizational settings, employees' personalities are a necessary construct influencing success in the workplace (Yukl, 1971). That is, the work-related behavior of individuals in an organization in part stems from personality styles—cognitive ability and dominant socio-psychological characteristics. However, only a handful of studies have examined the ideal preferences of the employee, and fewer still have investigated the predictors of workers' ideal preferences (Boatwright & Forrest, 2000:19). Indeed, few leadership studies have addressed how knowledge workers are different from other groups of workers and what their preferences for leadership are. Therefore, the next research question was to conceptualize knowledge workers' preferences for leadership. As part of our attempts toward this goal, a query into what theoretical perspectives can form a basis for speculating knowledge workers' preferences for leadership was imperative. As such, I investigated two related research questions, as follows:

Research Question 2: How can knowledge workers be thought of differently from other workers? Does this difference(s) imply differences in the preferences for leadership?

Research Question 3: What leader behaviors do knowledge workers prefer?

As is detailed in the next chapter and in Articles 1 and 2, by conceptualizing knowledge workers as highly educated individuals, a new way to think about their behavioral models could be advanced. Two bodies of the literature in educational psychology and political psychology provide much in the way of research about the effects of education on students, which I have extended to develop a theoretical perspective about how knowledge workers are different. This theoretical perspective provides a basis for speculating about knowledge workers' preferences

for and responses to leadership structures. Explicitly, I draw upon the research on theories of student development and assert that one's educational attainment is associated with hormonal and neurodevelopmental changes (psychosocial changes) taking place in students in ways that distinguish highly educated individuals from persons with low levels of or without an education. Conceiving of knowledge workers as highly educated individuals, the psychosocial changes associated with education and increasing cognitive capacities define their personalities (including individual dispositions), which is the root cause of behavior in the workplace. to what degree the individual difference dispositions of knowledge workers are an outcome of educational amount remains an empirical matter, though. I therefore pursued an empirical assessment of a constellation of theoretically grounded psychosocial changes that distinguish knowledge workers from other workers. Hence, I came up with the following research question:

> **Research Question 4:** What is the impact of the amount of education on psychosocial changes (need for closure, ambiguity tolerance, moral competence, dogmatism, authoritarianism, and cognitive ability)?

2.2.3 An Interactionist Approach for Leadership Research

Originating in sociology, interactionism is a theoretical perspective that focuses on the interactions between individuals as a basis for the development of society, here viewing humans as social actors (Blumer, 1969). In organizational leadership circles, the right balance in interactions between leaders and followers can coconstruct or legitimize effective leadership. I argue, therefore, that reaching more precise findings and inferences about leadership effectiveness requires models that can integrate in theoretically meaningful ways both (i) followers' (workers) personalities and behaviors that then shape their workplace values and preferences for leadership and (ii) enacted leader behaviors or leadership styles.

Several leadership styles, including transformational leadership, servant leadership, and authentic leadership have been proposed for leading knowledge workers (see Article 1 for an overview) without any theoretically grounded basis about knowledge workers' preferences for any given leadership style. Accordingly, Article 4 makes a contribution to the field. Specifically, I demonstrate how knowledge workers' personality traits influence the a priori positive effects of authentic leadership to creative behavior and charge taking via psychological empowerment. Thus, our last research query is as follows:

> **Research Question 5:** How effective are leadership styles (i.e., authentic leadership style) in influencing the outcomes of creativity and proactive behavior in a knowledge worker (vs. non-knowledge worker) setting.

2.3 The Overall Research Model

Based on the critical review article (Article 1), which unpacked the diverse definitions, concepts, and empirical developments on knowledge worker concepts and the interrelationships between proposed leadership antecedents and follower outcomes, Figure 1 depicts a theoretical framework on which the following three articles in the current dissertation revolve. Article 2 conceptually explicates the link between educational attainment and psychosocial changes and develops a theoretical perspective to speculate about knowledge worlers preferences and responses to leadership. Article 3 tests the educational effects of the moderation variables (psychosocial changes) in a work setting. Article 4 then builds on Articles 2 and 3 to test the full model in a multilevel moderated mediation framework.

Figure 1: The Overall Research Model
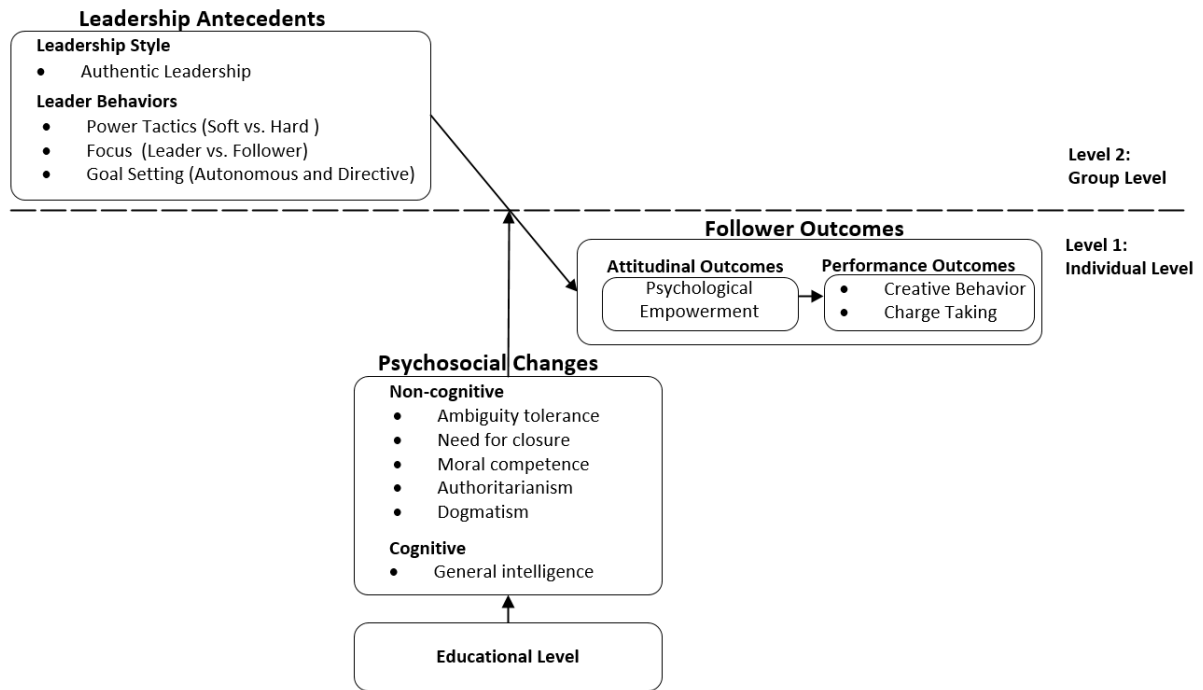
2.4 Summary of the Research Contribution

The present dissertation makes several theoretical contributions, directly or indirectly, to the literature. First, the literature on knowledge workers does not offer an exhaustive background of how knowledge workers are different from other workers. The present dissertation develops a theoretical perspective explicating a dispositional account of knowledge workers' attitudes, behaviors, and personality traits. I show that this perspective provides a firmer theoretical background for understanding knowledge workers. I further subjected our theoretical perspective to empirical scrutiny. Therefore, a novel contribution of our work is that I have introduced a theoretical model that permits us to specify how knowledge workers are different from other workers and why it matters for leadership research. Although I draw on the educational psychology literature, our perspective constitutes a new way of thinking about knowledge workers within the management and leadership field.

Second, I contribute to the leadership literature by offering a more balanced perspective that recognizes followers' preferences for leader behaviors in coconstructing leadership effectiveness. I do so by offering a guiding theoretical perspective for understanding the knowledge workers' preferences and responses to leadership. This serves as a guide for future leadership research toward appropriate modeling of leader–follower interactions in theoretically grounded and meaningful ways.

Finally, our research has managerial implications that can inform organizational practices. In the articles, I discussed some managerial implications for organizational leadership and recruitment strategy. With a deep understanding of knowledge workers' behavior and the inherent implications for the workplace, such as autonomy and self-actualization, recruiting employees who exhibit a low need for closure and who have a high ambiguity tolerance will fit job positions with poorly defined, uncertain, and cognitively challenging tasks. In addition, our research findings show that congruence between knowledge workers' preferences for leadership and enacted leader behaviors is strongly associated with the acceptance of leader influence. Therefore, organizational leadership ought to be situational and contingent on knowledge workers' preferences for leadership instead of imposing some generic leadership models on all employees in the workplace.

Chapter 3. A (Brief) Overview of the Constituent Articles

In this section, I furnish a synopsis of the current four-article dissertation. The articles take the following sequence: critical review paper, conceptual paper, and two empirical papers. In the review paper (Article 1), I identify streams of research and research gaps that elucidate the root cause of divergence within the literature on the leadership of knowledge workers. Article 1 concludes with a discussion that addresses the identified gaps and suggests future research directions. This concerted effort inspired the focus of Article 2, which is to develop a firmer theoretical background for understanding knowledge workers and how they differ from other workers. Specifically, I build on the research in theories of student development and psychosocial changes to develop a theoretical perspective that education shapes some "constellation" of individual difference dispositions that can crystalize into the very defining personality of highly educated individuals (i.e., knowledge workers). In addition, Article 2 extends the insights from the theoretical perspective as a way to speculate on knowledge workers preferences for leadership behaviors. Article 3 is the first empirical study and was intended to empirically examine our theoretical perspective on knowledge workers based on nested survey data from employees. In addition, I conducted assessments for the stability of these traits in the context of organizational structures and other individual difference characteristics. At this point, I had support for our theoretical perspective of knowledge workers. It remained, though, to be investigated how these knowledge workers' dispositions shape behaviors and responses to leadership structures. Therefore, in Article 4, I considered authentic leadership, a leadership style that has gained attention in leadership research in the wake of ethics, scandals, and the need for leader authenticity to drive creativity and performance. Explicitly, I examined how knowledge worker traits (ambiguity tolerance and dogmatism) shape their responses (creative behavior and charge taking via psychological empowerment) toward an authentic leadership style.

3.1 Synopsis of Article 1

Images of Knowledge Workers in the Organizational and Leadership Research Literature:
Where Are We, and Where Should We Be Heading?

The purpose of Article 1 was to understand who is a knowledge worker within the leadership literature. Accordingly, this study takes stock of the relevant existing literature on the leadership of knowledge workers, engages in gap identification, and is grounded in the available evidence and nomological network of the leadership of knowledge worker research (i.e., leadership antecedents, workplace outcomes, mediators, and contextual factors). To reflect on the breadth and depth of this critical review, I searched for and identified 53 articles (empirical 36, conceptual 17; period 1990–2018) from appropriate academic journals through electronic databases using the author's university library system.

Utilizing the matrix method (Garrard, 1999) to organize and abstract pertinent information from the included studies, Article 1 provides a timely synthesis of the leadership of knowledge worker literature and sheds light on the gaps in previous leadership research, its consequences, and the outlook for future theory development. Specifically, I abstracted from each article the following information: (a) How are knowledge workers understood and defined? (b) What do I know about how knowledge workers and how they are different from other workers through the existing theoretical and empirical research? (c) What are the leadership structures proposed and examined for managing knowledge workers? (d) What are the theoretical perspectives utilized in speculating knowledge workers' preferences and responses to the proposed leadership structures? (e) In what contexts are the proposed leadership structures empirically investigated? And (f) What are the results of the examination?

I found the literature to date is deficient in terms of (1) theory and evidence for how knowledge workers are understood and defined and (2) in the theoretical foundations for how knowledge workers are different, especially in their preferences and responses to leadership. These research gaps reflect very little convergence among scholars on how to lead knowledge workers,despite

the proliferation of leadership research to meet the challenges of the knowledge economy. As part of an attempt to address these identified gaps, I extended the discussion on establishing a "knowledge worker" as a clear, independent construct and how the nomological network of research on leadership of knowledge workers is situated (i.e., leadership antecedents, mediators, workplace outcomes, and moderators) may be elucidated, extended, and researched. In particular, I suggested that relevant theorizing can be drawn from the literature in educational psychology, a field that has partly focused on the global effects of (higher) education in shaping students' psychosocial changes (see Pascarella & Terenzini, 1991, 2005). I encouraged a more follower-centered approach in the study of leadership in a knowledge worker setting, but I also argued that a focus on their preferences for *ideal* leader behaviors is fundamental.

3.2 Synopsis of Article 2
On Knowledge Workers: How Education shapes Preference for Leadership

In this article, a theoretical perspective on how knowledge workers are different and how this difference forms a basis to speculate their preferences and responses to leadership is proposed. Building on two bodies of research—educational psychology and political psychology—this study offers new insights for future research and practice on effective leadership in a knowledge worker context.

At the most general level, one might ask how likely it is that experiences such as attending a higher education program would lead to changes in personality traits that are often seen as crystalized and nonchangeable—or the very defining properties of the individual. I present the dimensions on which persons with higher education are thought to differ, along with reviews of the research supporting these theories. Grounded in the available evidence for how education affects students, our conceptual article identifies the cognitive and noncognitive psychosocial dispositional dimensions on which persons with a higher education are different. The

noncognitive individual difference dispositions of the (highly) educated individuals identified in our theoretical perspective include (low) authoritarianism, (high) ambiguity tolerance, (high) moral competence, (low) need for closure, and (low) dogmatism. For completeness, the incontrovertible cognitive dimension of general intelligence—sometimes called general cognitive ability—was also studied. I argued that these psychosocial changes crystalize into knowledge workers' personalities, the root cause of their behavior. Next, what these individual difference dispositions imply for the type of leaders who are preferred by members of this group was conceptualized. Revolving on the idea that work-related behavior of individuals in an organization in part stems from personality styles—cognitive ability and dominant socio-psychological characteristics—I asserted that knowledge workers will earnestly desire leadership behaviors that endorse follower consideration and involvement; soft power tactics; stimulate, empower, and motivate; and grant task autonomy and independence in the workplace. These findings highlight that the personality of knowledge workers is a necessary construct influencing valued workplace outcomes and success in the workplace. This is especially true if leadership effectiveness is conceived of as mediated by followers' positive reactions to leadership behaviors.

3.3 Synopsis of Article 3
Knowledge Workers: How Are They Different? (And Why Does It Matter?)

Article 3 sought to empirically assess the theoretical perspective from Article 2 regarding the relationship between identified individual difference dispositions (i.e., psychosocial changes, cognitive ability, ambiguity tolerance, need for closure, dogmatism, and authoritarianism) and educational level among employees. I further investigated the contextual role of aging and organizational structure (i.e., degree of centralization) in shaping these identified individual difference dispositions. Previous research on personality and aging (Caspi & Roberts, 2001; McCrae & Costa Jr, 1994; Roberts, Walton, & Viechtbauer, 2006) has shown that student

development tends to progress with age. In addition, in workplace settings, organizational structures form a basis when designing units that group individuals, their reporting relationships, and coordinate mechanisms that integrate a unit's activities and resources (Huber, 1991; Niehoff & Moorman, 1993). Accordingly, I separately investigated the interaction of the effects of age and organizational structure (i.e., degree of centralization) on the association between the amount of education and cognitive ability, ambiguity tolerance, need for closure, dogmatism, and authoritarianism.

Based on a nested sample of 351 employees in 54 workgroups, a multilevel random coefficient modeling (RCM) supports a statistically significant positive association between education level and ambiguity tolerance and cognitive ability and a significant negative association between education level and dogmatism, authoritarianism, and the need for closure. This finding supports our proposition that highly educated individuals (i.e., knowledge workers) exhibit traits that, on average, are different from those without higher education. This contributes to the literature by presenting initial evidence for conceptualizing knowledge workers as highly educated individuals and by showing their associated idiosyncratic dispositional trait tendencies that distinguish them from non-knowledge workers.

The findings on the interaction effects support the moderating role of age in the relationship between education and ambiguity tolerance, need for closure, and authoritarianism. Here, age reinforces the association between the amount of education level and employees' trait tendencies. However, the moderating role of centralized organizational structure on the relationship between education and each identified individual-level personality difference was not found to be not significant. The findings on age and centralization suggest that I cannot expect the constellation of nurtured personality traits associated with knowledge workers to change. Hence, this study provides evidence that fortifies a certain level of stability in acquired traits.

3.4 Synopsis of Article 4

Authentic Leadership and Knowledge Worker Initiative: A Moderated Mediation Model of Ambiguity Tolerance, Dogmatism, and Psychological Empowerment

In this fourth and final article, we adopted a followership view of leadership processes (cf Uhl-Bien, Riggio, Lowe, & Carsten, 2014) to examine how knowledge workers view and follow leadership structures. Focusing on two knowledge worker traits—ambiguity tolerance and dogmatism—we developed and tested an interactionist model that explicates knowledge workers' responses to authentic leadership behaviors. I conceived that the decision to follow a leader might be a more active process that depends on the extent to which the leader is perceived as representing their values and identity (Felfe & Schyns, 2006; Howell & Shamir, 2005; Schyns & Felfe, 2006), self-conceptions (Keller, 1999), and perceived similarity (Felfe & Heinitz, 2008; Felfe & Schyns, 2006). Therefore, the contingencies under which authentic leadership stimulates or distracts from followers' creative behaviors and extra-role behaviors (i.e., charge taking)—directly and indirectly via psychological empowerment—were modeled and tested.

Utilizing a nested sample of 396 employees in 71 leaders from two organizations (one public enterprise and one large private multinational) in a medium-sized country, I analyzed the group of knowledge workers using multilevel random intercept model (RIM). Following the moderated mediation method and path analysis of simple effects (direct, indirect, and total effects) suggested by Edwards and Lambert (2007), we found that authentic leadership influences follower charge taking and creative behavior via psychological empowerment, but this process depends on knowledge workers' dogmatism and ambiguity tolerance. Among ambiguity tolerant and less dogmatic employees, the positive effect of authentic leadership on creative behavior and charge taking is stronger both directly and indirectly via psychological empowerment. For persons with low tolerance for ambiguity and high dogmatism tendencies, the positive effect of authentic leadership is lower and even negative for some paths. Hence,

the results support the proposition that workers' preferences for leadership behaviors ought to

be central in the research on leadership effectiveness in a knowledge worker setting.

Chapter 4. Methodology and Ethics Issues

4.1 Methodology

In this section, I discuss both the complexity and nuances of individual results in light of methodical, scientific theory, and theoretical issues. I draw attention specifically to the theoretical and methodical evaluations undertaken but that are not outlined and discussed in the respective articles in the current dissertation. In chronological order, I present the methods issues in the review, conceptual and empirical studies.

4.1.1 Methods Issues in the Review and Conceptual Papers

In Article 2, our theoretical framework is grounded in the available evidence. The sourcing of studies did not follow any systematic process in the strictest sense of the term. As such, I did not make any claims that certain studies that served as support in building our theoretical perspective are exhaustive and representative of the current state of the literature in their respective fields. However, I would like to downplay this methodical issue because I subjected our theoretical perspective to empirical investigation in Article 3.

4.1.2 Measurement Models and Aggregation Justification

Articles 3 and 4 are empirical studies utilizing a two-level nested survey dataset. The choice of appropriate measurement models that take into account the multilevel nature of the data was addressed thoroughly in the respective articles. I used multilevel exploratory structural equation modeling (ESEM) to assess the factor structure of our established scales. Multilevel validity testing of $ICC(1)$, $ICC(2)$, and $r_{wg(j)}$ was used to justify the aggregation of individual ratings of authentic leadership to a group-level variable.

In addition, concerns about confounding issues, common method bias, and endogeneity were considered in the measurement models and subsequent analysis although I did not discuss this in detail in the articles.

4.1.3 Omitted Variable Bias and Endogeneity

In the case of omitted variable bias, it was impractical to collect all the necessary data about leaders, followers, and the organizational context. The omission of a relevant predictor variable can induce correlations between the error term and the explanatory variables. This correlation may arise because of measurement errors in the explanatory variables, simultaneity, or self-selection. Each of these situations can be motivated as an omitted variable problem (see Ebbes, Böckenholt, & Wedel, 2004; Wooldridge, 2010). Nested data contain rich information and the possibility to test for the severity of bias because of omitted variable bias and to inform the use of appropriate estimation techniques that minimize its consequences.

Endogeneity, on the other hand, is difficult to detect and even more difficult to correct. For the two empirical studies, a complex assumption about multilevel model errors was given considerable attention. The assumption of exogeneity (at level 1 and level 2) is crucial for the correct specification of the regression function (say, the mean of Y_{ij} given X_{ij}): when the errors are correlated with the covariates, the exogeneity assumption is violated, and the estimators of the regression coefficients are then biased. Differently stated, any unobservable level 1 (employee) characteristics relegated to the error term should not be correlated with the observable level 2 (in our case, group level or leader) characteristics. Similarly, any unobserved level 2 (group level or leader) characteristic relegated to the error terms should not be correlated with the observable level 1 (employee) characteristics.

Suppose that the model to be estimated is $Y_{ij} = \beta_{0j} + \beta X_{ij} + \gamma_1 \overline{X}_{.j} + \gamma_2 K_j + \varepsilon_{ij}$ with $\beta_{0j} = c + V_j$

Substituting out β_{0j}; $Y_{ij} = c + \beta X_{ij} + \gamma_1 \overline{X}_{.j} + \gamma_2 K_j + V_j + \varepsilon_{ij}$

where
X_{ij} : is a vector of employee characteristics for employee i in workgroup/leader j
$\overline{X}_{.j}$: is a vector of peer effects
K_j : is a vector of pure group-level or leader characteristics

$V_j + \varepsilon_{ij}$: is the error term of the model and $\varepsilon_{ij} \sim N(0, \partial^2)$

Main assumption: $cov(X_{ij}, V_j) = 0$; $cov(\overline{X}_{.j}, \varepsilon_{ij}) = 0$; $cov(K_j, \varepsilon_{ij}) = 0$

I dealt with a specific endogeneity problem called the level 2 endogeneity problem (Grilli & Rampichini, 2006). This is because the aim of our analysis was the estimation of the within-group effect. Therefore, the main concern was to test the cross-level assumption, where the random effects on the intercept could be correlated with a level 1 independent variable (X_{ij}) (i.e., $cov(X_{ij}, V_j) = 0$ is violated) and where some unobservable group-level or leader characteristics relegated to the error terms could be correlated with the observable employee characteristics X_{ij}. I follow Grilli and Rampichini (2006) procedure to remedy level 2 endogeneity: "centering a covariate on the cluster mean yields an sealing instrument that has the virtues of being internal and uncorrelated with the error term under consideration" (p. 10). When interest lies in the within effect, a RIM with only the centered X_{ij} variable can be used. This partly motivated the choice to use a RIM in Article 4. For Article 3, I utilized an RCM because the variables of interest were all at level 1.

The other assumptions of the multilevel model are not needed for consistent estimation of the regression coefficients: a violation yields biased standard errors (which then tests the wrong size), but valid standard errors can be obtained with robust methods implemented in statistical software.

4.1.4 First-Stage and Direct Effect Moderated Mediation

In Article 4, I modeled a first-stage and direct effect moderated mediation (Edwards & Lambert, 2007). There are theoretically meaningful reasons to have included a second-stage moderation, but I ignored doing so on substantive grounds: it was not relevant to the research focus. I was concerned about the interaction effect of knowledge workers' personality traits and enacted leader behaviors in predicting their workplace outcomes. A second-stage moderation increases

the complexity of the model to be estimated and does not produce any results that are directly related to the leadership influence. I followed the procedure of Edwards and Lamberts (2007, p. 10) to generate and plot the path analysis of simple effects (direct, indirect, and total effects) based on a multilevel regression (and bootstrap estimates). I next expressed the regression equations (econometric model) for the simple paths of the direct, indirect, and total effects of the first-stage and direct effect moderated mediation model being utilized. Figure 2 depicts the model estimated in Article 4.

Figure 2: First-stage and Direct Effect Moderation Model
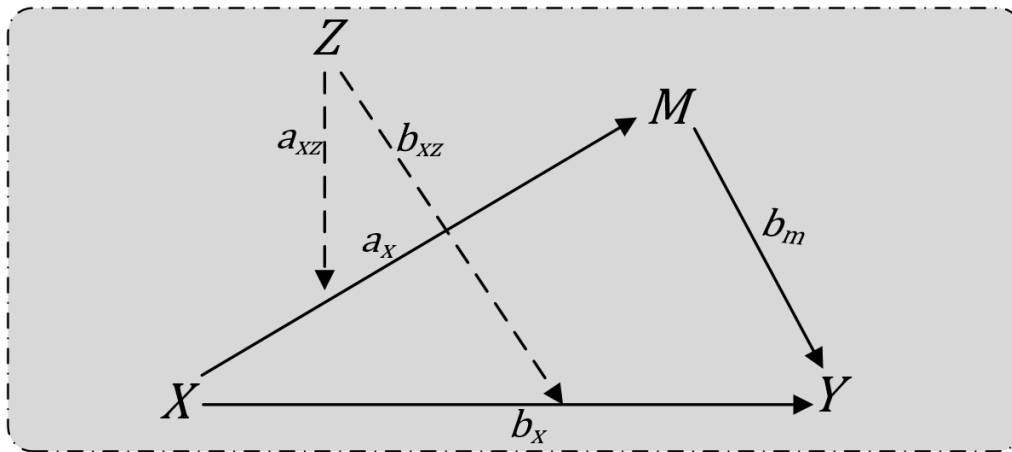
Econometric Model for the Moderated Path Analysis

The regression equation for Y:

$$Y = b_0 + b_x X + b_z Z + b_{xz} XZ + b_m M + e_\gamma \quad (1)$$

Regression equation for M:

$$M = a_0 + a_x X + a_z Z + a_{xz} XZ + e_m \quad (2)$$

Substituting (2) into (1) and expressed in reduced form yields equation (3):

$$Y = b_0 + a_0 b_m + (b_x + a_x b_m)X + (b_z + a_z b_m)Z + (b_{xz} + a_{xz} b_m)XZ + e_\gamma + b_m e_m \quad (3)$$

Now, I can express in simple paths the moderating effect of Z for the first-stage and direct effect moderation. That is, equation (3) is rewritten as follows:

$$Y = [b_0 + b_z Z + (a_0 + a_z Z)b_m] + [(b_x + b_{xz}Z) + (a_x + a_{xz}Z)b_m]X + e_Y + b_m e_m \quad (4)$$

Equation (4) shows the following:

i.   The first stage of the indirect effect of X on Y varies as a function of Z. This is captured by the term $(a_x + a_{xz}Z)b_m$

ii. The direct effect of X on Y varies as a function of Z and is captured by the term $(b_x + b_{xz}Z)$

iii. The intercept also varies as a function of Z, given the terms $b_z Z$ and $a_z Z$

Calculating simple path analysis effects produces the following:

i.   Substituting values of Z ($\pm 1\, s.d$) into equation (4) yields the simple paths and effects that were analyzed (and plotted) to determine the form of the moderating effect of Z on the direct, indirect, and total effect of X on Y.

ii. Testing for the differences for the first stage and direct effects sufficed for testing a_{xz} and b_{xz}, respectively.

iii. Tests for the difference for the indirect effect and total effect were based on bias-corrected confidence intervals derived from a 10,000 sample bootstrap estimates.

4.2 Ethics
I handled respondent confidentiality appropriately. I generated unique IDs to match employees to their respective leaders. The issuing authority (Mind Garden) for the use of the Authentic Leadership Questionnaire (ALQ) within a paper-and-pencil approach granted us access to this questionnaire.

Chapter 5. General Discussion, Limitations, and Future Research Directions

Overall, the purpose of the current dissertation was to investigate leadership effectiveness in a knowledge worker context. Our answer to this research inquiry is that congruence between knowledge workers' preferences for leadership and organizational leadership structures is the pivot on which the whole leadership process revolves. The academically supported findings would be validating for many practitioners, including leaders and managers in the industry, many of whom have long suspected these relationships based on their observations and experience with knowledge workers.

Our evidence-based answer is the outcome of four stand-alone yet interdependent articles. Article 1 took stock of the relevant literature on the leadership of knowledge workers. Following a critical assessment of the knowledge worker and proposed leadership structures in a knowledge worker setting, I provided a timely synthesis that identified a gap in the field. The identified gaps included conceptual and operational ambiguity of the term knowledge worker, and the proposed leadership structures in a knowledge worker context were found to be primarily normative. Article 1 concluded that the literature is deficient in terms of theory and evidence for how knowledge workers are understood and defined, and a solid foundation for a firmer theoretical background about knowledge workers is needed if future studies are to speculate on and examine leadership effectiveness. This suggests that the existing practice of leading knowledge workers is not an evidence-based outcome, which may reflect good or bad judgment.

Article 2 put forward a theoretical perspective that was developed with a solid basis in the literature, explicating how knowledge workers are different from other workers. Conceiving knowledge workers as highly educated individuals, I drew on the theories of student development within the broader educational psychology literature and showed that deep psychosocial changes associated with higher education provide much in the way of theory.

Grounded in the available evidence, I asserted that the identified psychosocial changes associated with one's educational level are often seen as crystalized and unchangeable—or the very defining properties of the individual. The theoretical perspective, therefore, espouses a dispositional individual difference in the concept of knowledge workers and extends this insight to speculate about their preferences for leadership. Article 3 gave an empirical assessment that complemented our dispositional perspective of knowledge workers. I found that one's educational level resulted in statistically significant differences in dispositional tendencies on the need for closure, ambiguity tolerance, moral competence, dogmatism, authoritarianism, and cognitive ability between (highly) educated persons and persons with a low educational attainment. Article 4 showed empirically that knowledge workers' dispositions shape their preferences for leadership in ways significantly different from non-knowledge workers, here by using a nested sample of employees in a medium-sized country. Using authentic leadership as an exemplar, I found that knowledge worker traits (i.e., ambiguity tolerance and dogmatism) shaped their responses (creative behavior and charge taking via psychological empowerment) toward authentic leadership style. Differently stated, authentic leadership can influence follower charge taking and creative behavior via psychological empowerment, but this process depends on knowledge workers' dogmatism and ambiguity tolerance. For employees exhibiting tendencies of ambiguity tolerance and less dogmatic, the positive effect of authentic leadership on creative behavior and charge taking was found to be stronger both directly and indirectly via psychological empowerment. On the other hand, for employees exhibiting tendencies of low ambiguity tolerance and high dogmatism, the positive effect of authentic leadership was found to be lower and even negative for some paths.

5.1 Implications for Theory and Practice

First, the current dissertation outlines two broad conceptualizations of knowledge workers—the job-content approach and personage perspective—to classify the diffuse and fragmented

concepts. Toward a more integrative approach, I have defined knowledge workers as agents of technocratic transformation propagated by expert knowledge acquired through higher education. Our study also has provided a conceptual individual difference dispositional framework to position a behavioral account of knowledge workers. I demonstrated how the theoretical perspective provides a firmer theoretical foundation for understanding knowledge workers' behaviors, personalities, and workplace values.

Second, I identified and demonstrated that leader behaviors that emphasize consideration and involvement of subordinates; soft power tactics; stimulate, empower, and motivate; and grant task autonomy and independence in the workplace are at the core of knowledge workers' preferences. For instance, ambiguity tolerance and low dispositional need for closure can influence knowledge workers to seek leaders who empower, grant autonomy, and enact soft power tactics to influence work-related results. This represents a viewpoint with substantial promise for advancing leaders' understanding of the functional importance of workers' personality differences in shaping their preferences for relational behaviors (Gabriel, Carvallo, Dean, Tippin, & Renaud, 2005; Lopez & Brennan, 2000). However, the type of ideal behaviors that knowledge workers would like their ideal leader to exhibit in the workplace seem to be at the junction of several leadership styles, including the followership theory, path-goal theory, transformational leadership, servant leadership, authentic leadership, leadership styles based on the use of authority, and managerial (leadership) styles and the leadership grid theory. Conceivably, generalizing about follower-focused or relational leadership styles seems suitable, though, will require addressing a dilemma of leadership styles and performance appraisal in a knowledge worker setting.

Third, I made a novel contribution with the introduction of a theoretical model that elucidates the psychosocial changes inherent in knowledge workers and distinguishes these workers from other groups. Although I drew on the educational psychology literature, a field that has partly

focused on the global effects of education, this dissertation (Articles 2 and 3) constitutes a new way of thinking about knowledge workers within the management field; and has the potential to guide future management scholarship to develop more complex leadership models in a knowledge worker setting. More precise predictions can be achieved by accounting for the values, personality, abilities, and willingness (performance readiness) of knowledge workers on the follower side of the leadership framework.

Fourth, I have shown that knowledge workers respond differently than non-knowledge workers to authentic leadership. The dissertation (Article 4) is one of the few studies to show a more positive effect of authentic leadership in a knowledge worker (versus a non-knowledge worker) setting. Specifically, knowledge worker personality of ambiguity tolerance and (low) dogmatic tendencies fosters the direct influence of authentic leadership on knowledge workers' creative behavior and charge-taking behavior and indirectly via felt psychological empowerment. Our finding is consistent with the followership theory, which suggests that followers' personalities inherently shape their preferences (or lack thereof) and responses to leadership (see Avolio, 2007; Uhl-Bien et al., 2014).

5.2 Implications for Management Practices

The findings from the present dissertation have practical implications for management, especially in knowledge-based organizations. With an increased reliance on a highly educated workforce to achieve the primary management task of value creation to sustain a competitive advantage, what motivates knowledge workers should be the heart of an organization's leadership. As I have suggested in the current dissertation, the personality traits that characterize knowledge workers can have strong action consequences on their valued workplace outcomes. Amidst the war for talent, retaining knowledge workers will require organizations to heed their dispositional trait tendencies to keep their workers motivated.

There are also implications for organizations' recruitment strategies. Organizations seeking to onboard knowledge workers need to be aware of their dispositional tendencies and ensure that organizational structures and leadership structures align to workers' preferences.

5.3 Limitations and Suggestions for Future Research

The current dissertation is not without its limitations. Therefore, the study findings should be interpreted in light of these limitations. I summarize the main conceptual and empirical limitations and the suggestions for future research discussed in the articles below.

5.3.1 Conceptual Issues

First, I focused on followers' preferences for leadership because more is known about leader behaviors from leadership research. However, our research efforts do not provide an all-encompassing set of dispositions associated with knowledge workers' personalities and behaviors. Besides, the theoretical perspectives put forward about knowledge workers' preferences for leadership were based on a unidimensional perspective in which the identified personality traits were considered individually. More realistic situations will mirror conceptual accounts that integrate the various traits simultaneously and in more meaningful ways.

Second, although our theoretical perspective provides a basis to speculate on knowledge workers' preferences for leadership, our research did not capture the potential effect of other workplace antecedent conditions that might influence or even neutralize the preferences for particular leader behaviors. For instance, in organizations engaged in standardized productions and services, a high degree of formalization in work routines might conflict and neutralize the positive effects of empowering and autonomy-granting leader behaviors. This suggests that the situation and boundary conditions in which leader and knowledge workers interact and coconstruct leadership effectiveness is an avenue for future research.

5.3.2 Empirical Issues

I next discuss the empirical issues pertaining to Articles 3 and 4. First, I employed a primarily cross-sectional design (i.e., correlational study); thus, the interpretations of causality are based on the evidence of covariation and author's confidence in the proposed theoretical connections. As with many deductive studies, I did not operationalize the mechanisms nor directly measure this. Instead, our deductive approach developed hypotheses based on existing theory and tested with an appropriately designed research strategy (i.e., survey approach). I measured the variables of interest via survey instruments, not the relationship itself. That correlation does not imply causation remains a drawback in correlational studies. With no random assignment to conditions, our study cannot rule out the likelihood that there is a third variable affecting the association between the two variables that were measured. Away from correlational samples, a more direct measurement of these mechanisms through experiments and qualitative in-depth interviews to explain and predict behavior about how psychosocial changes (e.g., ambiguity tolerance and dogmatism) can be tied to the preference for and responses to leadership would be a useful avenue of future research. Experiments and repeated measures designs are generally the most precise research designs that can infer causality and that have the most conclusive power.

In terms of analysis, I assessed the contextual roles of two traits (ambiguity tolerance and dogmatism) separately in Article 4 because of the limited sample size for the study. To attain more precise predictions, I encourage future studies to integrate and examine the traits simultaneously in the same model. Future research should consider other contemporary leadership styles, such as transformational leadership, servant leadership, and self- and shared leadership, to assess whether authentic leadership uniquely contributes positively to workplace outcomes in a knowledge worker setting.

Finally, future research should extend our model to explore the leadership of knowledge worker teams. Our study focused on outcomes at the individual level and in one country. Examining this at the team level and extending our model to other societal cultures will contribute to assessing the stability of the universality of our proposed perspective when it comes to conceptualizing and understanding who is a knowledge worker.

References

Alvesson, M. (2001). Knowledge Work: Ambiguity, Image and Identity. *Human Relations, 54*(7), 863-886. doi:10.1177/0018726701547004

Andrews, D., & Criscuolo, C. (2013). *Knowledge-based capital, innovation and resource allocation* (Vol. 1046): OECD Publishing.

Avolio, B. J. (2007). Promoting more integrative strategies for leadership theory-building. *American Psychologist, 62*(1), 25.

Bass, B. M., & Stogdill, R. M. (1990). *Bass & Stogdill's handbook of leadership: Theory, research, and managerial applications*: Simon and Schuster.

Blair, T. (1998). *The third way: new politics for the new century* (Vol. 7): Fabian Society London.

Blomme, R. J. (2012). Leadership, complex adaptive systems, and equivocality: The role of managers in emergent change. *Organization Management Journal, 9*(1), 4-19.

Blumer, H. (1969). *Symbolic interactionism: Perspective and method. Berkeley*. Berkeley and Los Angeles, CA: University of California Press.

Boatwright, K. J., & Forrest, L. (2000). Leadership preferences: The influence of gender and needs for connection on workers' ideal preferences for leadership behaviors. *Journal of Leadership Studies, 7*(2), 18-34.

Bogdanowicz, M. S., & Bailey, E. K. (2002). The value of knowledge and the values of the new knowledge worker: generation X in the new economy. *Journal of European industrial training, 26*(2/3/4), 125-129.

Bolisani, E., & Bratianu, C. (2018). The emergence of knowledge management. In *Emergent knowledge strategies: : Strategic thinking in knowledge managemen* (pp. 23-47). Cham: Springer International Publishing.

Brouer, R. L., Douglas, C., Treadway, D. C., & Ferris, G. R. (2013). Leader political skill, relationship quality, and leadership effectiveness: A two-study model test and constructive replication. *Journal of Leadership & Organizational Studies, 20*(2), 185-198.

Bryman, A. (1992). *Charisma and leadership in organizations*. London: Sage Publications.

Bryman, A. (2007). Effective leadership in higher education: A literature review. *Studies in higher education, 32*(6), 693-710.

Caspi, A., & Roberts, B. W. (2001). Personality development across the life course: The argument for change and continuity. *Psychological Inquiry, 12*(2), 49-66.

Chuang, C.-H., Jackson, S. E., & Jiang, Y. (2016). Can knowledge-intensive teamwork be managed? Examining the roles of HRM systems, leadership, and tacit knowledge. *Journal of management, 42*(2), 524-554.

Conner, K. R., & Prahalad, C. K. (1996). A resource-based theory of the firm: Knowledge versus opportunism. *Organization science, 7*(5), 477-501.

Darr, A., & Warhurst, C. (2008). Assumptions, Assertions and the Need for Evidence Debugging Debates about Knowledge Workers. *Current sociology, 56*(1), 25-45.

Davenport, T. H. (2005). *Thinking for a living: how to get better performances and results from knowledge workers*: Harvard Business Press.

Davenport, T. H., Jarvenpaa, S. L., & Beers, M. C. (1996). Improving knowledge work processes. *Sloan management review, 37*, 53-66.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How Organizations Manage What They Know*. Boston MA: Harvard Business School Press.

Davenport, T. H., Thomas, R. J., & Cantrell, S. (2002). The mysterious art and science of knowledge worker performance. *MIT-Sloan-Management-Review, 44*(1), 23-30.

Donate, M. J., & de Pablo, J. D. S. (2015). The role of knowledge-oriented leadership in knowledge management practices and innovation. *Journal of Business Research, 68*(2), 360-370.

Dove, R. (1998). The knowledge worker. *Automotive Manufacturing & Production, 110*(6), 26-28.

Drucker, P. F. (1959). *The Landmarks of Tomorrow*. New york: Harper & Row.

Drucker, P. F. (1992). *The age of discontinuity: Guidelines to our changing society* (2nd ed.). New Brunswick: Transaction Publishers.

Drucker, P. F. (1993). *Post-capital society*. New York: Harper& Collins.

Drucker, P. F. (1999). Management challenges for the twenty-first century. *Oxford, UK: Butterworth-Heinemann, 999*, 1.

Drucker, P. F. (2002). The discipline of innovation. *Harvard business review, 80*, 95-104.

Ebbes, P., Böckenholt, U., & Wedel, M. (2004). Regressor and random-effects dependencies in multilevel models. *Statistica Neerlandica, 58*(2), 161-178.

Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: a general analytical framework using moderated path analysis. *Psychological methods, 12*(1), 1.

Epitropaki, O., Kapoutsis, I., Ellen III, B. P., Ferris, G. R., Drivas, K., & Ntotsi, A. (2016). Navigating uneven terrain: The roles of political skill and LMX differentiation in prediction of work relationship quality and work outcomes. *Journal of Organizational Behavior, 37*(7), 1078-1103.

Felfe, J., & Heinitz, K. (2008). The impact of followers' and leaders' personality and perceived similarity on followers' perceptions of transformational leadership and leader acceptance. *Personality and work*, 197-217.

Felfe, J., & Schyns, B. (2006). Personality and the Perception of Transformational Leadership: The Impact of Extraversion, Neuroticism, Personal Need for Structure, and Occupational Self-Efficacy 1. *Journal of Applied Social Psychology, 36*(3), 708-739.

Gabriel, S., Carvallo, M., Dean, K. K., Tippin, B., & Renaud, J. (2005). How I see me depends on how I see we: The role of attachment style in social comparison. *Personality and Social Psychology Bulletin, 31*(11), 1561-1572.

Garrard, J. (1999). *Health sciences review made easy: The Matrix Method*. Sadbury, MA: Jones and Barlett Publishers.

Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. *The leadership quarterly, 6*(2), 219-247.

Grilli, L., & Rampichini, C. (2006). *Model building issues in multilevel linear models with endogenous covariates.* Paper presented at the Proceeding of IASC-INTERFACE-IFCS Workshop, http://www. iascisi. org/Proceedings/2006/COMPSTAT_Satellites/KNEMO.

Gronn, P. (1999). Substituting for leadership: The neglected role of the leadership couple. *The leadership quarterly, 10*(1), 41-62.

Han, S. H., Seo, G., Yoon, S. W., & Yoon, D.-Y. (2016). Transformational leadership and knowledge sharing: Mediating roles of employee's empowerment, commitment, and citizenship behaviors. *Journal of Workplace Learning, 28*(3), 130-149.

Howell, J. M., & Shamir, B. (2005). The role of followers in the charismatic leadership process: Relationships and their consequences. *Academy of Management Review, 30*(1), 96-112.

Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. *Organization science, 2*(1), 88-115.

Keller, T. (1999). Images of the familiar: Individual differences and implicit leadership theories. *The leadership quarterly, 10*(4), 589-607.

Kelloway, E. K., & Barling, J. (2000). Knowledge work as organizational behavior. *International journal of management reviews, 2*(3), 287-304.

Kidd, A. (1994). *The marks are on the knowledge worker.* Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems.

Lewis, W., Agarwal, R., & Sambamurthy, V. (2003). Sources of influence on beliefs about information technology use: An empirical study of knowledge workers. *MIS quarterly*, 657-678.

Lichtenstein, B. B., Uhl-Bien, M., Marion, R., Seers, A., Orton, J. D., & Schreiber, C. (2006). Complexity leadership theory: An interactive perspective on leading in complex adaptive systems. *Emergence: Complexity and Organization, 8*(4), 2-12.

Lopez, F. G., & Brennan, K. A. (2000). Dynamic processes underlying adult attachment organization: Toward an attachment theoretical perspective on the healthy and effective self. *Journal of Counseling Psychology, 47*(3), 283.

Machlup, F. (1962). *The production and distribution of knowledge in the United States* (Vol. 278): Princeton university press.

Mandt, E. (1978). Managing the Knowledge Worker of the Future. *Personnel Journal, 57*(3), 138-143,162.

Marstand, A. F., Martin, R., & Epitropaki, O. (2017). Complementary person-supervisor fit: An investigation of supplies-values (SV) fit, leader-member exchange (LMX) and work outcomes. *The leadership quarterly, 28*(3), 418-437.

Matta, F. K., & Van Dyne, L. (2018). Understanding the Disparate Behavioral Consequences of LMX Differentiation: The Role of Social Comparison Emotions. *Academy of Management Review*(ja).

McCrae, R. R., & Costa Jr, P. T. (1994). The stability of personality: Observations and evaluations. *Current directions in psychological science, 3*(6), 173-175.

Newman, A., Schwarz, G., Cooper, B., & Sendjaya, S. (2017). How servant leadership influences organizational citizenship behavior: The roles of LMX, empowerment, and proactive personality. *Journal of business ethics, 145*(1), 49-62.

Niehoff, B. P., & Moorman, R. H. (1993). Justice as a mediator of the relationship between methods of monitoring and organizational citizenship behavior. *Academy of Management Journal, 36*(3), 527-556.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*: Oxford university press.

Noyelle, T. (1990). Toward a new labor market segmentation. *Skills, wages and productivity in the service sector*, 212-224.

Nurmi, R. (1998). Knowledge-intensive firms. *Business Horizons, 41*(3), 26-33.

OECD. (2001). *OECD Science, Technology and Industry Scoreboard 2001: Towards a Knowledge-based Economy*: Organisation for Economic Co-operation and Development.

OECD. (2013). *OECD Skills Outlook 2013: First Results from the Survey of Adult Skills*: OECD Publishing.

OECD. (2017). *The Next Production Revolution: Implications for Governments and Business*: OECD Publishing.

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students* (Vol. 1991): Jossey-Bass San Francisco.

Pascarella, E. T., & Terenzini, P. T. (2005). How college affects students: A third decade of research (Vol. 2). In: San Francisco: Jossey-Bass.

Pearce, C. L. (2007). The future of leadership development: The importance of identity, multi-level approaches, self-leadership, physical fitness, shared leadership, networking, creativity, emotions, spirituality and on-boarding processes. *Human Resource Management Review, 17*(4), 355-359.

Pearce, C. L., & Manz, C. C. (2005). The new silver bullets of leadership: The importance of self-and shared leadership in knowledge work. *Organizational dynamics, 34*(2), 130-140.

Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology*, 199-220.

Prusak, L. (2009). *Knowledge in organisations*: Routledge.

Raspe, O., & Van Oort, F. (2006). The knowledge economy and urban economic growth. *European Planning Studies, 14*(9), 1209-1234.

Reich, R. B. (1993). *The Work of Nations: Preparing Ourselves for 21st Century Capitalism*. New York: Simon & Schuster.

Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies. *Psychological Bulletin, 132*(1), 1.

Schyns, B., & Felfe, J. (2006). The personality of followers and its effect on the perception of leadership: An overview, a study, and a research agenda. *Small Group Research, 37*(5), 522-539.

Shoham, S., & Hasgall, A. (2005). Knowledge workers as fractals in a complex adaptive organization. *Knowledge and Process Management, 12*(3), 225-236.

Skrodzka, I. (2016). Knowledge-based economy in the European Union–Cross-country analysis. *Statistics in Transition. New Series, 17*(2), 281-294.

Stanback, T. M. (1979). *Understanding the service economy: Employment, productivity, location*: Baltimore: Johns Hopkins University Press.

Stewart, T., & Ruckdeschel, C. (1998). Intellectual capital: The new wealth of organizations. *Performance Improvement, 37*(7), 56-59.

Tampoe, M. (1993). Motivating knowledge workers—The challenge for the 1990s. *Long Range Planning, 26*(3), 49-55. doi:http://dx.doi.org/10.1016/0024-6301(93)90006-2

Uhl-Bien, M., Marion, R., & McKelvey, B. (2007). Complexity leadership theory: Shifting leadership from the industrial age to the knowledge era. *The leadership quarterly, 18*(4), 298-318.

Uhl-Bien, M., Riggio, R. E., Lowe, K. B., & Carsten, M. K. (2014). Followership theory: A review and research agenda. *The leadership quarterly, 25*(1), 83-104.

Von Nordenflycht, A. (2010). What is a professional service firm? Toward a theory and taxonomy of knowledge-intensive firms. *Academy of Management Review, 35*(1), 155-174.

Walumbwa, F. O., Christensen, A. L., & Hailey, F. (2011). Authentic leadership and the knowledge economy: Sustaining motivation and trust among knowledge workers. *Organizational dynamics, 40*(2), 110-118. doi:http://dx.doi.org/10.1016/j.orgdyn.2011.01.005

White, D. S., Gunasekaran, A., & Ariguzo, G. C. (2013). The structural components of a knowledge-based economy. *International Journal of Business Innovation and Research, 7*(4), 504-518.

Will, T. E. (2016). Flock leadership: Understanding and influencing emergent collective behavior. *The leadership quarterly, 27*(2), 261-279.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*: MIT press.

Yigitcanlar, T., Baum, S., & Horton, S. (2007). Attracting and retaining knowledge workers in knowledge cities. *Journal of Knowledge Management, 11*(5), 6-17. doi:DOI 10.1108/13673270710819762

Yukl, G. (1971). Toward a behavioral theory of leadership. *Organizational behavior and human performance, 6*(4), 414-440.

Yukl, G., Gordon, A., & Taber, T. (2002). A hierarchical taxonomy of leadership behavior: Integrating a half century of behavior research. *Journal of Leadership & Organizational Studies, 9*(1), 15-32.

Zack, M. H. (2003). Rethinking the knowledge-based organization. *MIT Sloan Management Review, 44*(4), 67-72.

Article 1:

Research Literature on Leadership of Knowledge Workers: Where are We, and Where Should We Be Heading?

Issahaka A. W. and Lines, R.
Norwegian school of economics

Research Literature on Leadership of Knowledge Workers: Where are We, and Where Should We Be Heading?

Abstract

Purpose
With the transition into a knowledge economy, the concept of leading knowledge workers (KWs) has gained an increasing amount of attention in organisational studies and among practitioners. The emerging literature on the leadership of KW addresses an important phenomenon, but theoretical underpinnings and empirical inquiry into leadership effectiveness in a KW context do not agree on a common conceptualisation of KWs. Thus, a concerted research effort seems warranted.

Design/methodology/approach
The purpose of this study is to take stock of the existing literature on the leadership of KW. Based on a critical literature review, this paper provides a timely synthesis of the diffuse literature and identifies research gaps facing the leadership of KW field.

Findings
This paper suggests that the literature to date is deficient in terms of theory and evidence for how KWs are different from other classes of workers and argues that this deficiency stands in the way of developing ideas about how KWs could be effectively led.

Research limitations/implications
This paper extends a discussion on establishing 'KW' as a clear, independent construct and how the nomological network in which the leadership of KW research is situated (i.e., leadership antecedents, and workplace outcomes) may be elucidated, extended, and researched.

Originality/value
This paper extends beyond the identified research gaps and findings to present an agenda for future research. Specifically, we propose that insights from research in educational psychology should be used as a platform for theorising about how to lead in a KW context.

Keywords: knowledge worker, leadership

Paper type: *Literature review*

Introduction

The notion that knowledge workers (KW) are assets to be valued, stimulated, and managed in organizations (Osborn et al. 2002, Davenport et al. 1996, Uhl-Bien et al. 2007, Amar and Hlupic 2016, Drucker 1999) has for a long time received attention among management scholars and practitioners. However, despite the proliferation of investigations into leadership in organisational studies (Yukl 2012), little explicit attention has been paid to the KW setting in leadership research (Paton 2013, Uhl-Bien et al. 2007). The question of how KW should be managed effectively if at all has become a significant and inevitable concern for both research and practice, but so far, suggestions have not been based on an explicit theory of how KWs are different.

The purpose of this review is threefold. First, we provide a timely synthesis of the literature on the leadership of KW and shed light on research gaps facing the field. Through this, we achieve a deeper understanding of the nomological framework of leading KW beyond the simple relationship with KW outcomes to understand the leadership antecedents, mediating mechanisms and boundary conditions. Second, we explore the theories utilised in the leadership of KW research. Specifically, the focus is on how KWs are understood and defined, existing theoretical lenses for how KWs are thought to be different from other workers and examine the theoretical bases for speculating or investigating KW preferences for and responses to proposed leadership structures. Third, we extend beyond the identified research gaps and findings and propose an agenda for future research. Specifically, we suggest how a theoretical perspective for how the KW is different from other workers and a basis to speculate about their preferences for and responses to leadership can be developed from research in educational psychology. Overall, our effort will afford the management field and practice a firmer background to better understand and respond to KWs.

The emergence of the field

The evolution of the KW literature has been broadly categorised into two waves of research (cf. Darr and Warhurst 2008). The first wave, from the late 1950s to the mid-1990s mainly features sociological literature expounding the rise of a "new working class" and the transition towards a knowledge-intensive society (Mills 1951, Bell 1979, Brint 1984, Gouldner 1979, Ehrenreich and Ehrenreich 1979). Sociologists assert that with expanded education, a new middle class has emerged in the later of the 20th century that is composed of professional and technical workers (Darr and Warhurst 2008). The second, which dates from the mid-1990s onwards, features mainly the business literature with a focus on managing KWs (Reich 1993, Drucker 1998, Drucker 1999, Despres and Hiltrop 1995, Davenport et al. 2002, Davenport 2002, Uhl-Bien et al. 2007, Horwitz et al. 2003). With this managerial turn, the research attention on KWs is growing alongside the rhetoric of 'leadership', 'knowledge management', 'human resource management' and 'organizational structures'.

Method

Inclusion and exclusion criteria.

We set three inclusion/exclusion criteria that guide the literature search. First, we focus on articles published from 1990 to 2018 (to reflect the second wave of research focused on managing KW). Second, included articles contain the words "knowledge worker" in the title or abstract and the topic of leading knowledge workers is dealt with in an essential way. As such, we exclude studies focused on knowledge workers but fail to explain or emphasise any leadership antecedent. Third, using database filters, we only included articles that are published in the English language, peer-reviewed and excluded book reviews and interviews.

Literature search

We search for academic articles containing the terms "leadership" and "knowledge worker" from the EBSCO Business Source Complete and Science Direct databases through the authors' university library system. Using the Boolean phrase with keywords in quotation marks we

arrive at the following initial hits: leader*/leadership AND "knowledge worker" (65hits), and "manage*/managing" AND "knowledge worker" (151 hits) for the EBSCO database. The second search for articles containing leader* AND "knowledge worker" in the title, abstract and keywords in the Direct Science database resulted in 8 hits. A manual check in the reference lists of retrieved studies augmented the database searches. The combination of search results filtered by the outlined inclusion and exclusion criteria and elimination of duplicates yielded 51 unique articles (36 empirical, 15 conceptual). All articles in our final sample were coded according to the proposed leadership structures, KW outcomes (including mediators), contingency factors and boundary conditions and theories utilised to explain relationships. Hence, we review and synthesise identified factors into a nomological network for the leadership of knowledge workers.

The leadership of KW Research: A Nomological Network, Gaps and Challenges

Identification and Congruence of Leadership antecedents and KW Outcomes
Clear identification of causal mechanisms is a precondition to cumulative theorising and successful empiricism. Unpacking the causal mechanisms that define a cause-effect relationship necessarily involves specifying the antecedents and consequences of the focal phenomena (Fry and Smith 1987). Hence, we reviewed the proposed leadership structures and associated KW outcomes as summarised in Figure 1.

Proposed leadership structures
Our review identified conceptual and empirical studies that have proposed and examined leadership structures that enhance KW's outcomes. In examining these issues, studies have mostly drawn upon relations-based and follower-focused leadership perspectives. Empirical work supports positive leadership styles including transformational leadership (Berson and Avolio 2004, Walumbwa et al. 2005, George et al. 2017, Jiang and Chen 2016, Edgar et al. 2015, Jayasingam et al. 2010, Keller 1992, Leuteritz et al. 2017, Sandvik et al. 2018, Xiaojun 2017), transactional leadership (George et al. 2017, Politis 2001, Politis 2002),

empowering leadership (Lee et al. 2014), shared leadership (Fausing et al. 2013, Hensel and Visser 2018), authentic leadership (Edú-Valsania et al. 2016), self-leadership (Pihl-Thingvad 2014, Politis 2001, Palvalin et al. 2017, Bäcklander et al. 2018), supportive leader behaviour (Bäcklander et al. 2018, Edgar et al. 2015, Islam et al. 2013, Prasad et al. 2013), and leader-member exchange (LMX) (Joo 2010). Conceptual studies that propose leadership structures in a knowledge worker context were servant leadership (Pepper 2002, Correia de Sousa and van Dierendonck 2010, Balda and Mora 2011), self-, and shared leadership (Roche 2007, Bligh et al. 2006), transformational leadership (Kelloway and Barling 2000), and leader behaviors (Mayfield and Mayfield 2008). Studies also point to the effect of substitutes for leadership including, work autonomy, organisational structure, job enrichment (Horwitz et al. 2003, Kehoe and Collins 2017, Yan et al. 2011) on KW outcomes.

One congruence among identified leadership antecedents in a KW context is the recognition of the KW role in the leadership process and the need for appropriate partnerships between leader/supervisor and KWs, rather than the traditional leader-focused approach. Seemingly, the identified leadership structures proposed for managing KW parallel contemporary leadership approaches.

Gaps 1: Although leadership structures have been proposed and examined for the KW context, our knowledge of the antecedent conditions of leader behaviours in this context is limited. None of the empirical studies suggests nor test these assumptions. Also, the proposed and examined leadership structures have primarily evolved in relatively isolated 'silos' and do not seem to build on one another. To create a more holistic picture of leader behaviours for managing KW, we call upon future research to investigate leadership antecedents, which generally have taken account of the organisational environment and culture, team culture, policies, leader personality and demographics of the leader.

Moderators

Organizational Level
- Absorptive capacity
- Intercultural difference
- Ownership type(public, private)
- Organizational justice
- Job security

Team Level
- Team function
- Team autonomy
- Team-based incentives

Job-Related Characteristics
- Task non-routines
- Task uncertainty
- Type of work
- Job nature (task significance)

Individual Level
- Employee expectation
- Employee commitment

Proposed Leadership Structures
- Transformational leadership
- Transactional leadership
- Shared leadership
- Authentic leadership
- Self-leadership
- Servant leadership
- Leader-member exchange
- Supportive leader behaviour
- Substitutes for leadership

Mediators

Organizational Level
- Knowledge management practice (+)

Job-Related Characteristics
- Task uncertainty (+)

Team Level
- Workgroup identification (+)
- Group innovation climate (+)

Individual Level
- Organizational commitment (+)
- Affective commitment (+)
- Psychological empowerment (+)
- Leader communication style (+)

Outcomes

Performance Outcomes
- Creativity (+)
- Innovation (+)
- Knowledge production (+)
- Knowledge sharing (+)
- Productivity (+)
- Job performance (+)
- Team performance (+)
- Team effectiveness (+)
- Organizational performance (+)
- Organizational turnover (+)
- Knowledge management practices (+)

Attitudinal and Behavioral Outcomes
- Psychological empowerment (+)
- Psychological well-being (+)
- Employee awareness (+)
- Work commitment (+)
- Affective commitment (+)
- Organizational commitment (+)
- Job satisfaction (+)
- Presentism (-)
- Problem understanding (+)
- Job stress (-)
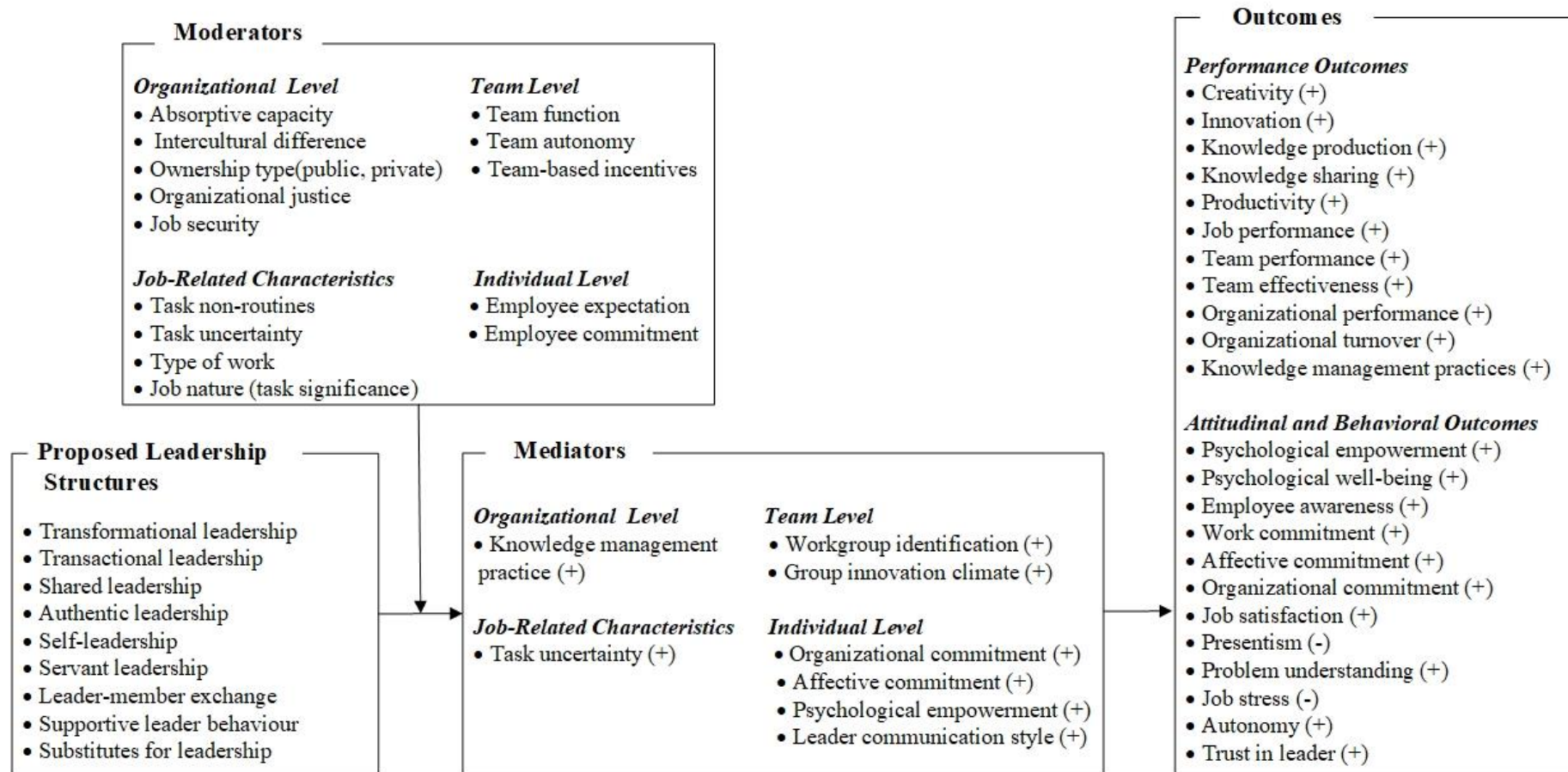- Autonomy (+)
- Trust in leader (+)

Figure 1: A nomological network of leadership of knowledge workers

KW Workplace Outcomes

Attaining leadership effectiveness will require that subordinates find purpose in their work and to achieve purposeful workplace outcomes. KW outcomes increasingly in focus in the leadership literature encompass attitudinal, behavioural and performance outcomes studied at multiple levels. Although there is a promising start to research studied at the team and organisational level, most empirical studies we reviewed have focused on KW-level outcomes. In terms performance outcomes, there is an emphasis on the ways that KWs create value and the most commonly examined KW outcomes involves creativity and innovation (Maruta 2012, Byrne et al. 2009, Dekas et al. 2013, Donate and de Pablo 2015, Sandvik et al. 2018), knowledge production, re-production, sharing(Edú-Valsania et al. 2016, Lee et al. 2014), productivity (West et al. 2013), and job performance(Xiaojun 2017). At the team level, positive effects of proposed leadership structures have been demonstrated through team performance (Lee et al. 2014, Sandvik et al. 2018), team effectiveness (Leuteritz et al. 2017) and project quality and performance (Keller 1992). At the organisational level, effective leadership in a KW context impacts organisational performance (Kehoe and Collins 2017), turnover (Joo 2010) and knowledge management (Xiaojun 2017).

Attitudinal and behavioural outcomes linked to leadership of KW include psychological empowerment (Bäcklander et al. 2018), psychological well-being (Joo et al. 2016), employee awareness(Berson and Avolio 2004), work commitment (Pihl-Thingvad 2014), affective commitment(Thompson and Heron 2005, Jayasingam and Yong 2013), organizational commitment and job satisfaction (Jayasingam and Yong 2013, Walumbwa et al. 2005), presenteeism (George et al. 2017), problem understanding (Politis 2001), job stress (Hadadian and Zarei 2016), autonomy and trust (Robert Jr and You 2018).

Theories Utilised in Leadership of KW Research (Diverging)

If research on leadership of KWs is to become integrative and cumulative, the utilised theories ought to revolve around a conceptual clarity of the focal object (i.e., KW) and extend the scope (e.g., context) and depth of knowledge (e.g., empirical knowledge, analytical generalisation or methodological pluralism) for understanding the network of causal linkages in the field. As such, we review the dimensions of KW conceptualisation in leadership research and the theoretical frameworks utilised to explicate and analyse proposed leadership-to-KW outcomes relationships.

Dimensions of KW conceptualisation in leadership research

The issue of conceptual clarity is essential in management research (e.g., Suddaby 2010) and to further cumulativeness. More compactly, robust classifications that distil phenomena into sharp distinctions that are understandable to communities of research and practice characterise a clear construct. One fundamental essence of construct clarity is, therefore, the specification of the construct–clear definition and demarcation.

Our review reveals an ambiguity of the central term: knowledge worker. The definitions of a KW differ markedly and are not always definitive in whom it refers. Some empirical studies have focused on a minimum meaningful definition to operationalise KWs; whiles other studies have drawn upon definitions by Drucker (1994) and Davenport (2005) to operationalise KW. Drucker defines KW as an individual who uses knowledge and information in a primary role in the workplace whiles Davenport defines KWs as having a high degree of education, experience, or skills and their jobs primarily involves the creation, distribution, or application of knowledge.

As shown in Table 1, our review identifies and distinguishes between two broadly observed conceptualisations of KW in leadership research. The first is from studies that identify with a 'job-content' approach, in which KW are identified based on specific professional groups, workplace or job characteristics. Most articles we reviewed conceptualised KWs based

Table 1: Selected Definitions of Knowledge Worker (Ordered Chronologically)

Authors	Definitions
Horwitz, Heng and Quazi (2003: 31)	"as working with both ambiguity-intensive information or knowledge, as well as an extant scientific body of knowledge and being required to share and deploy personal knowledge for organisational purposes"
Bryant (2003:7)	"more expertise than their supervisors and self-motivated and require less direct supervision"
Sveiby (2007: 1611)	"people, who use IT, have minimum intermediate vocational training and/or education and they are allowed independent design of important aspects of their job"
Balda and Mora (2011: 16)	as individuals who "add value through their ideas, their analyses, their judgment, their syntheses, and their designs."
Walumbwa, Christensen and Hailey (2011: 113)	"independent thinkers who perform with almost no supervision" and "want to be part of an organisation rather than working for the organisation. Expect alignment of organisation vision and mission with their personal interest and values."
Islam, Khan, Ahmad and Ahmad (2013: 323)	"apply analytical and theoretical knowledge to develop innovative products and services through formal education"
Sørensen and Holman (2014: 69)	"cognitively demanding jobs involving knowledge, such as IT engineers, academics and accountants"
Pihl-Thingvad (2014: 104)	"highly skilled professional employees who cannot be managed in the traditional way through standardization and control"
Edgar, Geare and O'kane (2015:489)	"any worker whose job involves a significant amount of gathering, creating and dissemination of knowledge"
Kach, Azadegan and Wagner (2015: 2491)	With "the capability to create, communicate and facilitate new ideas"
Haddadian and Zarei (2016: 85)	"employees who are well educated and experienced"
Sandvik, Croucher, Espedal and Selart (2017: 43)	"knowledge workers are often autonomy-seeking and identify more with their profession than with specific companies"
George, Chiba and Scheepers (2017: 2)	"apply theoretical and analytical knowledge that is acquired through formal education in developing new products or service"
Bäcklander, Rosengren and Kaulio (2018: 3)	"typically, highly educated, and the input and output of their work are concerned mainly with the handling and production of information"

on some dimensions of job content. Some authors emphasise a group-level identification of KW based on professional occupations and a shared ideology is the high-level cognitive demands and, knowledge intensity associated with the job. Examples of such professions include management consultants (Bäcklander et al. 2018, Joo et al. 2016, Pepper 2002) scientists and biotechnology engineers (Finegold and Frenkel 2006), software designers and information technology (Bartol et al. 2009, Analoui et al. 2013, Prasad et al. 2013, Yan et al. 2011, Kehoe and Collins 2017), R&D workers (Thompson and Heron 2005, Sørensen and Holman 2014), and financial analysts (Islam et al. 2013, Walumbwa et al. 2005). In terms of workplace and job characteristics, task autonomy, flexible work structure, task complexity, non-routine, problem-solving, creativity, and innovation have been emphasised.

The second conceptualisation of KW espoused among empirical studies identified was a 'personage' view that took a dispositional stance and focused on the personal characteristics including personality, workplace values, behaviours and attitudes associated with KWs (e.g., Pihl-Thingvad 2014, Pearce 2004, Bryant 2003). Within this conceptual perspective, high levels of skills, professional expertise, education (e.g., Fausing et al. 2013, Joo 2010, Pihl-Thingvad 2014) and behavioural models were the defining factors of a KW. The behavioural models identify KW as individuals who resist standardisation and control, identify with their profession, expect alignment of organisational visions and missions to personal interest and values, pursue self-actualisation and work autonomy, self-control, and self-motivated (Bryant 2003, Pihl-Thingvad 2014, Sandvik et al. 2018, Walumbwa et al. 2011)

Gap 2a: Although a minimum meaningful definition of a KW eases operationalisation and measurement that in turn makes theory testing easy, the pronounced diversity plaguing existing definitions of the focal subject (i.e., KW) points to a lack of clarity in the leadership literature about the nature of KWs. The partial views taken by most of the studies and emphasising aspects of the KW may hinder research cumulativeness.

Gap 2b: Unlike the job-content approach that has consistently predicted the nature of work of KWs and developed frameworks to measure knowledge work (e.g., Heidary Dahooie et al. 2018, Ramirez and Steudel 2008) the behavioural and dispositional tendencies associated with KW (e.g., identity, values, behaviours, and attitudes) remain largely understudied in leadership research.

Theoretical frameworks in research on leadership of KW
Our review identified theoretical frameworks that have been utilised to speculate or explain proposed leadership-to-KW outcomes relationships. Predominantly, studies draw upon the implicit theories that embed in the conceptualisation of the proposed leadership structure and a literature review to lend themselves to behavioural theories that transform followers (including KWs) attitudes and behaviours in long-lasting ways towards purposeful workplace outcomes (e.g.,Bryant 2003, Keller 1992, Politis 2002, Walumbwa et al. 2005). Other theoretical frameworks utilised in the research on leadership of knowledge workers include social exchange theory (Robert Jr and You 2018), complexity leadership theory (Pepper 2002), leader-member exchange (Islam et al. 2013), contingency and dynamic congruence theory (Courtney et al. 2007), and self-management theory (Palvalin et al. 2017).

Gap and Challenge 3: Although the identified studies have widely acknowledged that KWs are a unique group of workers, how they are different from other groups of workers and the implications of that difference on responses to leadership have not been explicitly studied in their empirical works. Besides, our review reveals that studies that have proposed or tested leadership structures for KW do not offer a theoretical basis for speculating about KWs preferences for or responses to leadership. Hence, a gap still exists in the literature on the concepts proposed for effective leadership in a KW context. To the extent that this gap exists, the research field faces a conceptual limitation that weakens the strength of the evidence base and consequently rendering recommendations for their widespread adoption to lead or manage KWs problematic.

Contingency factors in the leadership of KW research (moderators)

Boundary conditions are an essential element in developing and advancing theory (cf. Busse et al. 2017) and describe the limits of generalizability of a theory (Whetten 1989). Understanding the situational constraints or opportunities enables capturing theory-relevant conditions (Bamberger 2008, Johns and Woolf 2006). The identified empirical studies proposing leadership structures point to the role of employee (KW) characteristics, work-related characteristics, team characteristics and organisational factors in bringing about effective leadership of KW.

At the organisational level, organisational size (Jayasingam et al. 2010), absorptive capacity (Leuteritz et al. 2017), intercultural differences (West et al. 2013), organisational ownership type (public, private) (Horwitz et al. 2003), organisational justice (Thompson and Heron 2005), and job security (Bartol et al. 2009) influence the effectiveness of transformational leadership, supportive leader behaviour and substitutes for leadership (i.e., perceived organisational support, psychological contract and human resource support practices) on KW outcomes of motivation, job performance, productivity, knowledge acquisition and dissemination. At the workgroup/team level, moderators that have been studied are teamwork function and team autonomy (Fausing et al. 2013) and team-based incentives (Pearce and Manz 2005).

At the individual level, work characteristics including task non-routines, task uncertainty (Leuteritz et al. 2017), type of work (Keller 1992), job nature (i.e., skill variety, task identity, task significance, autonomy and feedback) (Yan et al. 2011) have been analysed as moderators of the relationship between transformational leadership, substitutes for leadership (i.e., job enrichment) leadership structures and workplace outcomes of team effectiveness, and job performance. Employee expectation (Bäcklander et al. 2018) and employee commitment (Sørensen and Holman 2014) are employee characteristics that have been studied to affect the effectiveness of self-leadership on KW's work intensity burnout and relationships with their

colleagues and supervisor. In one study, transformational leadership has been analysed as a moderator. Xiaojun (2017) found that transformational leadership strengthened the relationship between knowledge management system (i.e., cognitive absorption and deep structure use) and increased job performance.

> *Gap 4*: Other variables are left out of the literature. While the adaptation of leadership to followers is emphasised and encouraged among the empirical studies identified, the contextual role of KWs characteristics and dispositional tendencies in shaping their preferences and response to leadership is amiss mainly in the leadership literature. Also, the contingency factors that bound many of the proposed leadership structures we identify have not been studied, except for transformational, self-leadership and substitute for leadership.

Research Design Utilized in Leadership of KW research (Level of evidence)

Among the 36 published empirical studies identified over the period 1992-2018, the majority has been quantitative (n = 28), with a fewer number of qualitative (n= 5) and three studies utilising a mixed method. In terms of scope, samples used to conduct empirical studies span across 21 countries, with the majority (47%) coming from North America (n = 6) and Western Europe (n = 11). The other empirical studies utilised samples from Asia (China (n = 2), Singapore (n = 2), Malaysia (n = 1), South Korea (n = 3), India (n = 1)) and Africa (Kenya (n=1) and South Africa (n =1)), which assist with the generalizability of leadership of KW across geographical and cultural boundaries. Four empirical studies drew samples from multiple countries. Also, a contextual analysis of the sample revealed that leadership of KW is being applied in the following organisational settings: financial sector (n= 4), high-technology manufacturing (n = 11), information technology and telecommunication (n = 6), academic and research institutions (n = 4), management consulting and service (n = 3), business management (n = 2), multimedia and mass communication (n = 2), public sector (n = 1), multiple industries (n = 2) and others unspecified (n = 1).

The qualitative studies on leadership of KW has tended to focus on phenomenological and single case studies, utilizing interviews (e.g.,Edgar et al. 2015), content analysis of secondary data (archival records) (e.g., Erik Sveiby 2007), focus groups and observations (e.g., Bäcklander et al. 2018). One qualitative study on the leadership of KW has been informed by theory (West et al. 2013), whereas the other four qualitative studies have sought to understand how the proposed leadership structure for KW has emerged within an organisation (Hempsall 2014, Bäcklander et al. 2018, Edgar et al. 2015, Erik Sveiby 2007). The three mixed-method published research on leadership of KW typically pairs an organisational survey with interviews to have a greater understanding of why the phenomena have occurred (Berson and Avolio 2004, Sørensen and Holman 2014, Xiaojun 2017)

On the other hand, the quantitative research on leadership of KW were predominantly correlational field studies (n = 27), with 20 studies analysed at the single/individual level and seven studies based on multilevel/nested data. None of the multilevel data sought responses both leaders and followers in measuring the proposed leadership structure examined. Among the seven studies that sought nested sample of employees paired with the same supervisor, single-level factor analysis or structural equation models was utilised to assess measurement models; analytical methods not appropriate for nested data due to the non-independence of observations (Preacher et al. 2010). For individual-level studies, sample size ranged from 44 to 2201 employees. For multilevel samples, the individual level ranged from 66 to 998 whereas level 2 (i.e., leader, team or organisational level) sample ranged from 6 to 107.

Almost all the correlational field studies used cross-sectional data, with one study utilising temporal separation to propose or infer causation in their models. Also, only one quantitative study utilised a quasi-experimental design (Yan et al. 2011). In one study, a longitudinal design was used, but these studies only separated the measurement of the variables, rather than applying a repeated measures design (Robert Jr and You 2018). Overall, the extant

quantitative models on the leadership of KW are prone to endogeneity problems and not capable of making causal inferences (see, Antonakis et al. 2014). As such, we would encourage future research on leadership of KW to utilise repeated measure designs and experimental designs.

> *Gap 5*: Despite the promising number of empirical studies that have sought to show that KW requires different leadership models in comparison to other groups of workers, our review reveals none comparative studies compare the effects of proposed leadership structure on KW versus non-KW.

Advancing Leadership of KW Research
In this section, we discuss establishing KWs as a clear, independent construct as well as how the nomological network in which KWs are situated (i.e., leadership antecedents, and outcomes) may be elucidated, extended, and researched. This agenda forms part of our discussion to addressing identified gaps in the leadership of KW research. We suggest relevant theorising, drawn from literature in educational psychology, a field that has partly focused on the global effects of (higher) education in shaping students' psychosocial changes (see Pascarella and Terenzini 1991, Pascarella and Terenzini 2005, for a comprehensive review).

Addressing Gap 1: Antecedent conditions of the leadership of KW
Our review revealed that antecedent conditions for leadership structures in a KW context is largely amiss. Nevertheless, antecedents of the leadership of KW may be many, placed at multiple levels of the organisation, and can be external or internal to the organisation. The literature on leadership for the knowledge economy highlight changes in the external environment, such as the radical pace of digitalisation (Abdelgawad, Zahra, Svejenova, & Sapienza, 2013). Ultimately, the relevance and relative importance of these external antecedents to the leadership structures for enhancing KW's valued outcomes form an empirical question.

The literature on knowledge management, creativity and innovation, and human capital development help develop new insights into the internal drivers of enacted leadership structures

appropriate in a KW context. The ability of organisational leadership to acquire, exchange and share knowledge, drive creative and innovative solutions in response to radically changing technologies, may require an appropriate partnership that inspires and empower KW to perform beyond expectations. Within the literature on innovation, knowledge management, there is often a link between human capabilities on the one hand, and open innovation, knowledge generation, and sharing, on the other hand.

Addressing Gap2a, Gap 2b, Gap 3 and Gap 4: Definition and Theoretical advancement

Defining and operationalising KW construct.
In reviewing the leadership of KW literature, existing theory and prior research exist to suggest that conceptual clarity of the core construct is incomplete and would benefit from further description. Towards an effort to establish KW as a clear and independent construct, we discuss a directed content analysis (see, Hsieh and Shannon 2005) of definitions and concepts to conceptually validate or extend a theoretical perspective of KW. Our literature review concluded that KWs had been conceptualised in at least two broad schemas: job-content approach and a personage perspective. However, both conceptual understandings are meaningful and complementary. Accordingly, we define KWs as "agents of technocratic transformation propagated by expert knowledge acquired through higher education." We impose the requirement of higher formal education to avoid including or excluding workers solely based on 'elitist' professions, knowledge work-centred characteristics, or requisite individual qualities, expertise skills and capabilities that limit existing conceptualisations of KW. Our definition is grounded in human capital theory.

The idea that employees can be characterised as organisational assets can be conceptualised as "human capital". Human capital theory (Becker 1964 . , Mincer 1958) is considered a relevant economic theory of education and predicts that individuals possessing higher levels of knowledge, skills, expertise, and other competencies will achieve more

exceptional performance outcomes than those who possess lower levels (Ployhart and Moliterno 2011). Investment in human capital rests on the assumption that formal education is highly necessary to improve productive capacity, embeds knowledge resources in individuals (Becker 1964 . , Lucas Jr 1988, Mankiw et al. 1992, Mincer 1958), facilitate the sharing and transmission of knowledge (Benhabib and Spiegel 2005, Nelson and Phelps 1966). Thus, the human capital theory emphasises the essential role of education to enhance workers efficiency and productivity through an increased level of cognitive stock of human capability.

Dispositional tendencies of KW.
In today's knowledge economy, the opportunities and challenges of leadership have moved from formal pedestal management to understanding and adapting to the individual employees (Bergmann et al. 1999). The personality of followers has, for a long time, been considered a necessary construct influencing success in the workplace (Yukl 1971). However, only a few studies have examined the ideal preferences of the worker (e.g., Wilkes, 1992) and fewer still have investigated predictors of workers' ideal preferences (Boatwright and Forrest 2000). In the process of discussing how the gap regarding how KWs are different from other groups of workers and their preference for leadership, we identify relevant theorising from acceptance theory of authority and research in educational psychology, a field that has partly focused on the global effects of higher education.

Acceptance theory of authority explicates an understanding of organisations and human relations based on individuals' full range of the hierarchy of needs as well as their expressive and coping behaviour. The theory underlies much of modern management and organisation theory and views authority as the character of communication in a formal organisation by virtue of which a member of the organisation as governing the action, they contribute accepts it (Barnard, 1938). This definition of authority recognises both a subjective role of the individual to accept the communication as authoritative and an objective part reflecting the character in

the communication by virtue of which it is accepted. Accordingly, the individual can be seen to either reject (coping behaviour), passively accept (indifferent) or willingly accept (expressive behaviour) communication or orders from another individual or group. Thus, an individual will engage in expressive behaviour and coping behaviour to adjust herself/himself and his/her environment to a stable state. Acceptance theory, therefore, is a synthesis of the leader, follower, and the situation in a dynamic relation (Van Fleet, 1973). Drawing upon the acceptance theory to understand how leaders can relate to KWs and motivate them, an understanding of the need-hierarchy and related internal processes that shape KWs rejection, indifference or willing acceptance of the leader is needed.

Research on the impact of college on students provides much in the way of theory and empirical findings on how highly educated individuals differ from persons that may be similar in other respects but have not attended higher education. This body of knowledge suggests that higher education not only transfer knowledge and professional skill to students, the educational experience also lead to deep level changes that are less related to the content of the curricula. These changes in traits can better be understood as the outcomes of a personal growth process, which involves the dual outcomes of maturing and growing as an individual. The traits such as values, beliefs, and personalities are often seen as crystallised and non-changeable – or the very defining properties of the individual. For example, authoritarianism, a phenomenon rooted in political psychology, is negatively associated with education. Although authoritarianism was for long explained by interindividual differences, education is an antecedent to reducing or alleviating such tendencies (Dekker and Ester 1987, Kohn and Schooler 1969, Lipsitz 1965). Extending into a workplace setting employees with low (vs high) authoritarian tendencies exhibit submissive tendencies, prefer structured and well-outlined tasks, and defer to authority figures. Other education effects on psychosocial changes supported in past research include ambiguity tolerance (Bobo and Licari 1989, Davis 1975, Moore and Ovadia 2006), need for

closure , moral competence (Duriez and Soenens 2006, Rest et al. 1999, Thorne 1999), dogmatism (Pascarella et al. 1996, Schommer 1990, Close and Bergmann 1979) and general intelligence (Falch and Sandgren Massih 2011, Bartels et al. 2002, Ceci 1991). Conceivable speculation, therefore, is that highly educated persons exhibit dispositional tendencies that are different from individuals without (or with low) educational level and that these individual difference dispositions characterise their behaviour and values at the workplace. Future research should extend our insights to develop this theoretical perspective.

What do these traits imply for the type of leaders who are preferred by members of this group? Future leadership studies should consider the impact of higher education on the classical leadership-outcomes relationship. Differently stated, studies should investigate how deep level personality changes associated with increasing levels of education is shaping both preferences and response to leadership structures or styles, as illustrated in Figure 2.
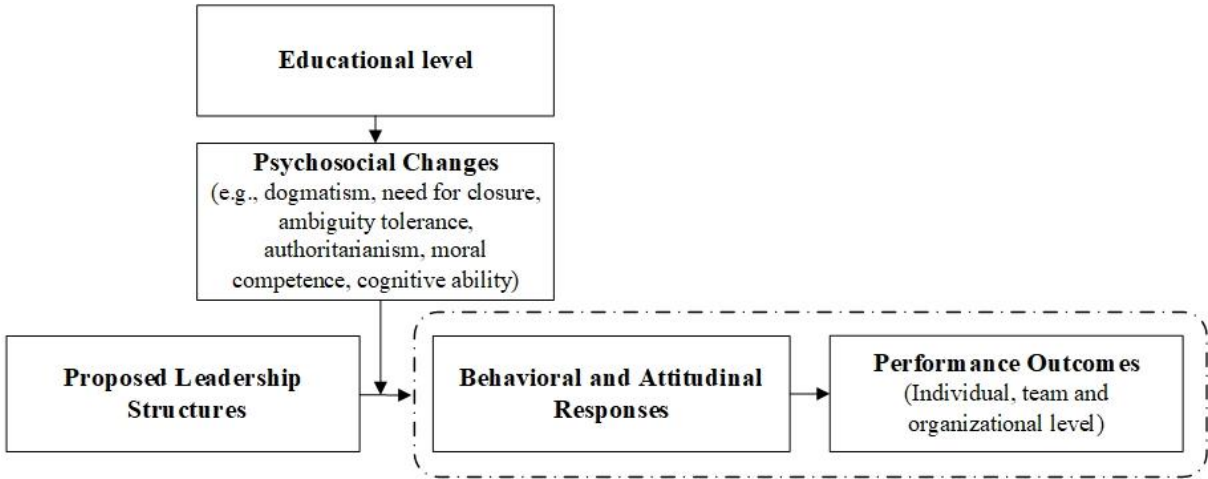
Figure 2: A theoretical model to speculate about kw preferences and response to leadership

For instance, in the case of the authoritarian personality, directive leadership may be preferred by authoritarian followers, but the benefits reduce and may even be negative for low authoritarian followers (e.g., Timming and Johnstone 2015, Vroom 1959). Hence, we believe that a research inquiry into the interaction mechanisms can provide a well-grounded perspective

for leadership in a knowledge worker setting. In the light of evidence-based management, rooting our theoretical ideas and decisions in solid evidence is essential to connect and critically appraise the normative propositions about effective leadership structures to achieve KWs' valued outcomes.

Addressing Gap 5: Research design and analysis advancement
First, a big issue has to do with the fact that among the reviewed studies, models and estimators are not causally identified. There is an over-reliance on follower or leader self-report about their leaders measured at a single-time point within the leadership of KW field. The independent variables (which mostly comprise a leadership construct) are measured and not manipulated; there are potentially many omitted variables, at several levels of analysis that could correlate with the independent variables and outcomes, and hence explain their findings. The exogeneity of the independent variables must be assured, so that model estimates are consistent (i.e., asymptotically converge to the true values with increasing sample size). These issues have been discussed at depth in many different sources and across many social sciences fields over the last couple of decades (Adams 2017, Angrist and Krueger 2001, Bascle 2008, Duncan et al. 2004, Foster and McLanahan 1996, Gennetian et al. 2008, Hamilton and Nickerson 2003, Ketokivi and McIntosh 2017, Larcker and Rusticus 2010, Roberts and Whited 2013).

Unfortunately, studies have not undertaken the needed corrective procedures to eliminate possible endogeneity threats via experimental or statistical control, instrumental-variable estimation or by other means. Issues concerning endogeneity are now very prevalent in management research (Anderson et al. 2019, Bettis et al. 2014, Guide Jr and Ketokivi 2015, Reeb et al. 2012, Shaver 2019). It is thus important to consider these issues in design and estimation. Indeed, endogeneity bias is a matter of degree; thus, it is essential to limit the bias. Thus, future research should aim to collect data from multiple raters at multiple time points to create temporal separation and to limit common method bias. Inclusion of competing variables

and instrumental variables within the research design is encouraged to deal with the potential that a proposed leadership structure is an endogenous independent variable.

Second, multilevel analytic techniques and appropriate nested data are encouraged to investigate the interactive effects of KW's personality in shaping responses to proposed leadership antecedents and structures.

Limitations

The synthesis, thematic conclusions, and findings above should be interpreted in the light of this review's potential limitations. Our analysis is limited to peer-reviewed scholarly articles in the English language through the author's university library system. Thus, non-peer reviewed articles or unpublished dissertations were excluded. Therefore, conclusions based on the results of our review and synthesis of identified empirical and conceptual studies may be complemented or contradicted by excluded studies.

Conclusions

In response to increased interest in the leadership of KW, our review accomplishes two main goals: gap identification and a basis for theory development regarding the nomological framework. We reveal that the literature to date is deficient in terms of (1) theory and evidence for how KWs are understood and defined within leadership research; and (2) a solid theoretical foundation to speculate and investigate KWs preference and response to leadership. These research gaps reflect the little convergence among scholars on how to lead KWs, albeit the proliferation of leadership research to meet challenges in the knowledge economy.

Although this review has highlighted the importance of relations-based, and follower-focused leadership structures for enhancing KWs valued outcomes, the issue is when should the identified leadership structures that are proposed be encouraged and how it can be developed. Advancing more precise and cumulative research on leadership of KWs, we discuss how the

inherent higher educational levels associated with KW and research from educational psychology provides a basis for future research to investigate KW personality and to speculate about how it shapes their preferences and responses to leadership. We hope that our review has laid out feasible research avenues to scholars interested in the leadership of KW.

References

Adams, R.B. (2017), "The ABCs of empirical corporate (governance) research", *Corporate Governance: An International Review,* Vol. 25 No. 6, pp. 461-64.

Amar, A. and Hlupic, V. (2016), "Leadership for knowledge organizations", *European Journal of innovation management,* Vol. 19 No. 2, pp. 239-60.

Analoui, B.D., Doloriert, C.H. and Sambrook, S. (2013), "Leadership and knowledge management in UK ICT organisations", *Journal of Management Development*.

Anderson, B.S., Wennberg, K. and McMullen, J.S. (2019), "Enhancing quantitative theory-testing entrepreneurship research", *Journal of Business Venturing*.

Angrist, J.D. and Krueger, A.B. (2001), "Instrumental variables and the search for identification: From supply and demand to natural experiments", *Journal of Economic perspectives,* Vol. 15 No. 4, pp. 69-85.

Antonakis, J., Bendahan, S., Jacquart, P. and Lalive, R. (2014), "And solutions", *The Oxford handbook of leadership and organizations*, pp. 93.

Bäcklander, G., Rosengren, C. and Kaulio, M. (2018), "Managing intensity in knowledge work: Self-leadership practices among Danish management consultants", *Journal of Management & Organization*, pp. 1-19.

Balda, J.B. and Mora, F. (2011), "Adapting leadership theory and practice for the networked, millennial generation", *Journal of Leadership Studies,* Vol. 5 No. 3, pp. 13-24.

Bamberger, P. (2008), "From the editors beyond contextualization: Using context theories to narrow the micro-macro gap in management research", in, Academy of Management Briarcliff Manor, NY.

Bartels, M., Rietveld, M.J., Van Baal, G.C.M. and Boomsma, D.I. (2002), "Heritability of educational achievement in 12-year-olds and the overlap with cognitive ability", *Twin Research and Human Genetics,* Vol. 5 No. 6, pp. 544-53.

Bartol, K.M., Liu, W., Zeng, X. and Wu, K. (2009), "Social exchange and knowledge sharing among knowledge workers: The moderating role of perceived job security", *Management and Organization Review,* Vol. 5 No. 2, pp. 223-40.

Bascle, G. (2008), "Controlling for endogeneity with instrumental variables in strategic management research", *Strategic organization,* Vol. 6 No. 3, pp. 285-327.

Becker, G.S.G.S., 1930-2014. (1964 .), *Human capital; a theoretical and empirical analysis, with special reference to education,* Columbia University Press,, New York :National Bureau of Economic Research; .

Bell, D. (1979), "The new class: a muddled concept", *Society,* Vol. 16 No. 2, pp. 15-23.

Benhabib, J. and Spiegel, M.M. (2005), "Human capital and technology diffusion", *Handbook of economic growth,* Vol. 1, pp. 935-66.

Bergmann, H., Hurson, K. and Russ-Eft, D. (1999), "Introducing a grass-roots model leadership", *Strategy & Leadership,* Vol. 27 No. 6, pp. 15-20.

Berson, Y. and Avolio, B.J. (2004), "Transformational leadership and the dissemination of organizational goals: A case study of a telecommunication firm", *The leadership quarterly,* Vol. 15 No. 5, pp. 625-46.

Bettis, R., Gambardella, A., Helfat, C. and Mitchell, W. (2014), "Quantitative empirical analysis in strategic management", *Strategic management journal,* Vol. 35 No. 7, pp. 949-53.

Bligh, M.C., Pearce, C.L. and Kohles, J.C. (2006), "The importance of self-and shared leadership in team based knowledge work", *Journal of managerial Psychology,* Vol. 21 No. 4, pp. 296-318.

Boatwright, K.J. and Forrest, L. (2000), "Leadership preferences: The influence of gender and needs for connection on workers' ideal preferences for leadership behaviors", *Journal of Leadership Studies,* Vol. 7 No. 2, pp. 18-34.

Bobo, L. and Licari, F.C. (1989), "Education and political tolerance testing the effects of cognitive sophistication and target group affect", *Public Opinion Quarterly,* Vol. 53 No. 3, pp. 285-308.

Brint, S. (1984), "" New-Class" and Cumulative Trend Explanations of the Liberal Political Attitudes of Professionals", *American journal of sociology*, pp. 30-71.

Bryant, S.E. (2003), "The role of transformational and transactional leadership in creating, sharing and exploiting organizational knowledge", *Journal of Leadership & Organizational Studies,* Vol. 9 No. 4, pp. 32-44.

Busse, C., Kach, A.P. and Wagner, S.M. (2017), "Boundary conditions: What they are, how to explore them, why we need them, and when to consider them", *Organizational Research Methods,* Vol. 20 No. 4, pp. 574-609.

Byrne, C.L., Mumford, M.D., Barrett, J.D. and Vessey, W.B. (2009), "Examining the leaders of creative efforts: What do they do, and what do they think about?", *Creativity and innovation management,* Vol. 18 No. 4, pp. 256-68.

Ceci, S.J. (1991), "How much does schooling influence general intelligence and its cognitive components? A reassessment of the evidence", *Developmental psychology,* Vol. 27 No. 5, pp. 703.

Close, M.J. and Bergmann, T.J. (1979), "Dogmatism and attained educational level: A field study", *Psychological Reports,* Vol. 44 No. 2, pp. 671-73.

Correia de Sousa, M. and van Dierendonck, D. (2010), "Knowledge workers, servant leadership and the search for meaning in knowledge-driven organizations", *On the Horizon,* Vol. 18 No. 3, pp. 230-39.

Courtney, H.S., Navarro, E. and O'Hare, C.A. (2007), "The Dynamic Organic Transformational (DOT) team model for high-performance knowledge-worker teams", *Team Performance Management: An International Journal,* Vol. 13 No. 1/2, pp. 34-46.

Darr, A. and Warhurst, C. (2008), "Assumptions, Assertions and the Need for Evidence Debugging Debates about Knowledge Workers", *Current sociology,* Vol. 56 No. 1, pp. 25-45.

Davenport, T.H. (2002), "Can you boost knowledge work's impact on the bottom line?", *Harvard Management Update,* Vol. 7 No. 12, pp. 3-4.

Davenport, T.H., Jarvenpaa, S.L. and Beers, M.C. (1996), "Improving knowledge work processes", *Sloan management review,* Vol. 37, pp. 53-66.

Davenport, T.H., Thomas, R.J. and Cantrell, S. (2002), "The mysterious art and science of knowledge worker performance", *MIT-Sloan-Management-Review,* Vol. 44 No. 1, pp. 23-30.

Davis, J.A. (1975), "Communism, conformity, cohorts, and categories: American tolerance in 1954 and 1972-73", *American journal of sociology,* Vol. 81 No. 3, pp. 491-513.

Dekas, K.H., Bauer, T.N., Welle, B., Kurkoski, J. and Sullivan, S. (2013), "Organizational citizenship behavior, version 2.0: A review and qualitative investigation of OCBs for knowledge workers at Google and beyond", *Academy of Management Perspectives,* Vol. 27 No. 3, pp. 219-37.

Dekker, P. and Ester, P. (1987), "Working-class authoritarianism: a re-examination of the Lipset thesis", *European Journal of Political Research,* Vol. 15 No. 4, pp. 395-415.

Despres, C. and Hiltrop, J.-M. (1995), "Human resource management in the knowledge age: current practice and perspectives on the future", *Employee Relations,* Vol. 17 No. 1, pp. 9-23.

Donate, M.J. and de Pablo, J.D.S. (2015), "The role of knowledge-oriented leadership in knowledge management practices and innovation", *Journal of Business Research,* Vol. 68 No. 2, pp. 360-70.

Drucker, P.F. (1998), *Peter Drucker on the profession of management,* Harvard Business Press.

Drucker, P.F. (1999), "Management challenges for the twenty-first century", *Oxford, UK: Butterworth-Heinemann,* Vol. 999, pp. 1.

Duncan, G.J., Magnuson, K.A. and Ludwig, J. (2004), "The endogeneity problem in developmental studies", *Research in human development,* Vol. 1 No. 1-2, pp. 59-80.

Duriez, B. and Soenens, B. (2006), "Personality, identity styles and authoritarianism: An integrative study among late adolescents", *European Journal of Personality: Published for the European Association of Personality Psychology,* Vol. 20 No. 5, pp. 397-417.

Edgar, F., Geare, A. and O'Kane, P. (2015), "The changing dynamic of leading knowledge workers: The importance of skilled front-line managers", *Employee Relations,* Vol. 37 No. 4, pp. 487-503.

Edú-Valsania, S., Moriano, J.A. and Molero, F. (2016), "Authentic leadership and employee knowledge sharing behavior: Mediation of the innovation climate and workgroup identification", *Leadership & Organization Development Journal,* Vol. 37 No. 4, pp. 487-506.

Ehrenreich, B. and Ehrenreich, J. (1979), "The professional-managerial class", *Between labor and capital*, pp. 5-45.

Erik Sveiby, K. (2007), "Disabling the context for knowledge work: the role of managers' behaviours", *Management Decision,* Vol. 45 No. 10, pp. 1636-55.

Falch, T. and Sandgren Massih, S. (2011), "The effect of education on cognitive ability", *Economic Inquiry,* Vol. 49 No. 3, pp. 838-56.

Fausing, M.S., Jeppe Jeppesen, H., Jønsson, T.S., Lewandowski, J. and Bligh, M.C. (2013), "Moderators of shared leadership: work function and team autonomy", *Team Performance Management: An International Journal,* Vol. 19 No. 5/6, pp. 244-62.

Finegold, D. and Frenkel, S. (2006), "Managing people where people really matter: the management of human resources in biotech companies", *The International Journal of Human Resource Management,* Vol. 17 No. 1, pp. 1-24.

Foster, E.M. and McLanahan, S. (1996), "An illustration of the use of instrumental variables: Do neighborhood conditions affect a young person's chance of finishing high school?", *Psychological methods,* Vol. 1 No. 3, pp. 249.

Fry, L.W. and Smith, D.A. (1987), "Congruence, contingency, and theory building", *Academy of Management Review,* Vol. 12 No. 1, pp. 117-32.

Gennetian, L.A., Magnuson, K. and Morris, P.A. (2008), "From statistical associations to causation: what developmentalists can learn from instrumental variables techniques coupled with experimental data", *Developmental psychology,* Vol. 44 No. 2, pp. 381.

George, R., Chiba, M. and Scheepers, C.B. (2017), "An investigation into the effect of leadership style on stress-related presenteeism in South African knowledge workers", *SA Journal of Human Resource Management,* Vol. 15 No. 1, pp. 1-13.

Gouldner, A.W. (1979), *The Future of Intellectuals and the Rise of the New Class: A frame of reference, theses, conjectures, arguments, and an historical perspective on the role of intellectuals and intelligentsia in the international class contest of the modern era,* Seabury Pr.

Guide Jr, V.D.R. and Ketokivi, M. (2015), "Notes from the Editors: Redefining some methodological criteria for the journal★", *Journal of Operations Management,* Vol. 37 No. 1, pp. v-viii.

Hadadian, Z. and Zarei, J. (2016), "Relationship between toxic leadership and job stress of knowledge workers", *Studies in Business and Economics,* Vol. 11 No. 3, pp. 84-89.

Hamilton, B.H. and Nickerson, J.A. (2003), "Correcting for endogeneity in strategic management research", *Strategic organization,* Vol. 1 No. 1, pp. 51-78.

Heidary Dahooie, J., Ghezel Arsalan, M.R. and Zolghadr Shojai, A. (2018), "A valid and applicable measurement method for knowledge worker productivity", *International Journal of Productivity and Performance Management,* Vol. 67 No. 9, pp. 1764-91.

Hempsall, K. (2014), "Developing leadership in higher education: Perspectives from the USA, the UK and Australia", *Journal of Higher Education Policy and Management,* Vol. 36 No. 4, pp. 383-94.

Hensel, R. and Visser, R. (2018), "Shared leadership in entrepreneurial teams: the impact of personality", *International Journal of Entrepreneurial Behavior & Research,* Vol. 24 No. 6, pp. 1104-19.

Horwitz, F.M., Heng, C.T. and Quazi, H.A. (2003), "Finders, keepers? Attracting, motivating and retaining knowledge workers", *Human Resource Management Journal,* Vol. 13 No. 4, pp. 23-44.

Hsieh, H.-F. and Shannon, S.E. (2005), "Three approaches to qualitative content analysis", *Qualitative health research,* Vol. 15 No. 9, pp. 1277-88.

Islam, T., ur Rehman Khan, S., Norulkamar Ungku Bt. Ahmad, U. and Ahmed, I. (2013), "Organizational learning culture and leader-member exchange quality: The way to enhance organizational commitment and reduce turnover intentions", *The Learning Organization,* Vol. 20 No. 4/5, pp. 322-37.

67

Jayasingam, S., Ansari, M.A. and Jantan, M. (2010), "Influencing knowledge workers: the power of top management", *Industrial Management & Data Systems,* Vol. 110 No. 1, pp. 134-51.

Jayasingam, S. and Yong, J.R. (2013), "Affective commitment among knowledge workers: The role of pay satisfaction and organization career management", *The International Journal of Human Resource Management,* Vol. 24 No. 20, pp. 3903-20.

Jiang, Y. and Chen, C.C. (2016), "Integrating Knowledge Activities for Team Innovation Effects of Transformational Leadership", *Journal of management*, pp. 0149206316628641.

Johns, J. and Woolf, B. (2006), "A dynamic mixture model to detect student motivation and proficiency", in *Proceedings of the national conference on artificial intelligence*, Menlo Park, CA; Cambridge, MA; London; AAAI Press; MIT Press; 1999, pp. 163.

Joo, B.-K. (2010), "Organizational commitment for knowledge workers: The roles of perceived organizational learning culture, leader–member exchange quality, and turnover intention", *Human Resource Development Quarterly,* Vol. 21 No. 1, pp. 69-85.

Joo, B.-K., Park, J.G. and Lim, T. (2016), "Structural determinants of psychological well-being for knowledge workers in South Korea", *Personnel Review,* Vol. 45 No. 5, pp. 1069-86.

Kehoe, R.R. and Collins, C.J. (2017), "Human resource management and unit performance in knowledge-intensive work", *Journal of Applied Psychology,* Vol. 102 No. 8, pp. 1222.

Keller, R.T. (1992), "Transformational leadership and the performance of research and development project groups", *Journal of management,* Vol. 18 No. 3, pp. 489-501.

Kelloway, E.K. and Barling, J. (2000), "Knowledge work as organizational behavior", *International journal of management reviews,* Vol. 2 No. 3, pp. 287-304.

Ketokivi, M. and McIntosh, C.N. (2017), "Addressing the endogeneity dilemma in operations management research: Theoretical, empirical, and pragmatic considerations", *Journal of Operations Management,* Vol. 52, pp. 1-14.

Kohn, M.L. and Schooler, C. (1969), "Class, occupation, and orientation", *American Sociological Review*, pp. 659-78.

Larcker, D.F. and Rusticus, T.O. (2010), "On the use of instrumental variables in accounting research", *Journal of accounting and economics,* Vol. 49 No. 3, pp. 186-205.

Lee, J., Lee, H. and Park, J.-G. (2014), "Exploring the impact of empowering leadership on knowledge sharing, absorptive capacity and team performance in IT service", *Information Technology & People,* Vol. 27 No. 3, pp. 366-86.

Leuteritz, J.-P., Navarro, J. and Berger, R. (2017), "How knowledge worker teams deal effectively with task uncertainty: the impact of transformational leadership and group development", *Frontiers in psychology,* Vol. 8, pp. 1339.

Lipsitz, L. (1965), "Working-class authoritarianism: A re-evaluation", *American Sociological Review,* Vol. 30 No. 1, pp. 103-09.

Lucas Jr, R.E. (1988), "On the mechanics of economic development", *Journal of monetary economics,* Vol. 22 No. 1, pp. 3-42.

Mankiw, N.G., Romer, D. and Weil, D.N. (1992), "A contribution to the empirics of economic growth", *The quarterly journal of economics,* Vol. 107 No. 2, pp. 407-37.

Maruta, R. (2012), "Transforming knowledge workers into innovation workers to improve corporate productivity", *Knowledge-Based Systems,* Vol. 30, pp. 35-47.

Mayfield, M. and Mayfield, J. (2008), "Leadership techniques for nurturing worker garden variety creativity", *Journal of Management Development,* Vol. 27 No. 9, pp. 976-86.

Mills, C.W. (1951), *White collar: The American middle classes,* Oxford University Press on Demand.

Mincer, J. (1958), "Investment in human capital and personal income distribution", *Journal of political economy,* Vol. 66 No. 4, pp. 281-302.

Moore, L.M. and Ovadia, S. (2006), "Accounting for spatial variation in tolerance: The effects of education and religion", *Social Forces,* Vol. 84 No. 4, pp. 2205-22.

Nelson, R.R. and Phelps, E.S. (1966), "Investment in humans, technological diffusion, and economic growth", *The American economic review,* Vol. 56 No. 1/2, pp. 69-75.

Osborn, R.N., Hunt, J.G. and Jauch, L.R. (2002), "Toward a contextual theory of leadership", *The leadership quarterly,* Vol. 13 No. 6, pp. 797-837.

Palvalin, M., van der Voordt, T. and Jylhä, T. (2017), "The impact of workplaces and self-management practices on the productivity of knowledge workers", *Journal of Facilities Management,* Vol. 15 No. 4, pp. 423-38.

Pascarella, E.T., Edison, M., Nora, A., Hagedorn, L.S. and Terenzini, P.T. (1996), "Influences on students' openness to diversity and challenge in the first year of college", *The Journal of Higher Education,* Vol. 67 No. 2, pp. 174-95.

Pascarella, E.T. and Terenzini, P.T. (1991), *How college affects students: Findings and insights from twenty years of research,* ERIC.

Pascarella, E.T. and Terenzini, P.T. (2005), *How College Affects Students: A Third Decade of Research. Volume 2,* ERIC.

Paton, S. (2013), "Introducing Taylor to the knowledge economy", *Employee Relations*.

Pearce, C.L. (2004), "The future of leadership: Combining vertical and shared leadership to transform knowledge work", *Academy of Management Perspectives,* Vol. 18 No. 1, pp. 47-57.

Pearce, C.L. and Manz, C.C. (2005), "The new silver bullets of leadership: The importance of self-and shared leadership in knowledge work".

Pepper, A. (2002), "Leading professionals: A science, a philosophy and a way of working", *Journal of Change Management,* Vol. 3 No. 4, pp. 349-60.

Pihl-Thingvad, S. (2014), "Is self-leadership the new silver bullet of leadership? An empirical test of the relationship between self-leadership and organizational commitment", *management revue*, pp. 103-24.

Ployhart, R.E. and Moliterno, T.P. (2011), "Emergence of the human capital resource: A multilevel model", *Academy of Management Review,* Vol. 36 No. 1, pp. 127-50.

Politis, J.D. (2001), "The relationship of various leadership styles to knowledge management", *Leadership & Organization Development Journal,* Vol. 22 No. 8, pp. 354-64.

Politis, J.D. (2002), "Transformational and transactional leadership enabling (disabling) knowledge acquisition of self-managed teams: the consequences for performance", *Leadership & Organization Development Journal,* Vol. 23 No. 4, pp. 186-97.

Prasad, L., Sinha, D.K. and Prakhya, S. (2013), "Exploring the relationship between top management's peripheral vision, their leadership orientations, and employees' organizational identification as perceived by knowledge workers: An empirical analysis", *ASCI Journal of Management,* Vol. 42 No. 2, pp. 1-25.

Preacher, K.J., Zyphur, M.J. and Zhang, Z. (2010), "A general multilevel SEM framework for assessing multilevel mediation", *Psychological methods,* Vol. 15 No. 3, pp. 209.

Ramirez, Y.W. and Steudel, H.J. (2008), "Measuring knowledge work: the knowledge work quantification framework", *Journal of Intellectual Capital,* Vol. 9 No. 4, pp. 564-84.

Reeb, D., Sakakibara, M. and Mahmood, I.P. (2012), "From the editors: Endogeneity in international business research", in, Springer.

Reich, R.B. (1993), *The work of nations : preparing ourselves for 21st century capitalism. ,* Vintage Books,, New York

Rest, J.R., Narvaez, D., Thoma, S.J. and Bebeau, M.J. (1999), "DIT2: Devising and testing a revised instrument of moral judgment", *Journal of educational psychology,* Vol. 91 No. 4, pp. 644.

Robert Jr, L.P. and You, S. (2018), "Are you satisfied yet? Shared leadership, individual trust, autonomy, and satisfaction in virtual teams", *Journal of the Association for Information Science and Technology,* Vol. 69 No. 4, pp. 503-13.

Roberts, M.R. and Whited, T.M. (2013), "Endogeneity in empirical corporate finance1", in *Handbook of the Economics of Finance*, Elsevier, pp. 493-572.

Roche, M. (2007), "Towards an understanding of leading knowledge work and the knowledge worker: What the literature tells us", *New Zealand Journal of Applied Business Research,* Vol. 6 No. 1, pp. 33-46.

Sandvik, A.M., Croucher, R., Espedal, B. and Selart, M. (2018), "Intellectual stimulation and team creative climate in a professional service firm", in *Evidence-based HRM: a Global Forum for Empirical Scholarship*, Emerald Publishing Limited, pp. 39-53.

Schommer, M. (1990), "Effects of beliefs about the nature of knowledge on comprehension", *Journal of educational psychology,* Vol. 82 No. 3, pp. 498.

Shaver, J.M. (2019), "Causal Identification Through a Cumulative Body of Research in the Study of Strategy and Organizations", *Journal of management*, pp. 0149206319846272.

Sørensen, O.H. and Holman, D. (2014), "A participative intervention to improve employee well-being in knowledge work jobs: A mixed-methods evaluation study", *Work & Stress,* Vol. 28 No. 1, pp. 67-86.

Suddaby, R. (2010), "Editor's Comments: Construct Clarity in Theories of Management and Organization", *The Academy of Management Review,* Vol. 35 No. 3, pp. 346-57.

Thompson, M. and Heron, P. (2005), "The difference a manager can make: organizational justice and knowledge worker commitment", *The International Journal of Human Resource Management,* Vol. 16 No. 3, pp. 383-404.

Thorne, L. (1999), "An analysis of the association of demographic variables with the cognitive moral development of Canadian accounting students: An examination of the applicability of American-based findings to the Canadian context", *Journal of Accounting Education,* Vol. 17 No. 2-3, pp. 157-74.

Timming, A.R. and Johnstone, S. (2015), "Employee silence and the authoritarian personality: A political psychology of workplace democracy", *International Journal of Organizational Analysis,* Vol. 23 No. 1, pp. 154-71.

Uhl-Bien, M., Marion, R. and McKelvey, B. (2007), "Complexity leadership theory: Shifting leadership from the industrial age to the knowledge era", *The leadership quarterly,* Vol. 18 No. 4, pp. 298-318.

Vroom, V.H. (1959), "Some personality determinants of the effects of participation", *The Journal of Abnormal and Social Psychology,* Vol. 59 No. 3, pp. 322.

Walumbwa, F.O., Christensen, A.L. and Hailey, F. (2011), "Authentic leadership and the knowledge economy: Sustaining motivation and trust among knowledge workers", *Organizational dynamics,* Vol. 40 No. 2, pp. 110-18.

Walumbwa, F.O., Orwa, B., Wang, P. and Lawler, J.J. (2005), "Transformational leadership, organizational commitment, and job satisfaction: A comparative study of Kenyan and US financial firms", *Human Resource Development Quarterly,* Vol. 16 No. 2, pp. 235-56.

West, G.P., Bildstein, I., Gueldenberg, S. and Tjitra, H. (2013), "Effective leadership of knowledge workers: Results of an intercultural business study", *Management Research Review*.

Whetten, D.A. (1989), "What constitutes a theoretical contribution?", *Academy of Management Review,* Vol. 14 No. 4, pp. 490-95.

Xiaojun, Z. (2017), "Knowledge Management System Use and Job Performance: A Multilevel Contingency Model", *MIS quarterly,* Vol. 41 No. 3.

Yan, M., Peng, K.Z. and Francesco, A.M. (2011), "The differential effects of job design on knowledge workers and manual workers: A quasi-experimental field study in China", *Human Resource Management,* Vol. 50 No. 3, pp. 407-24.

Yukl, G. (1971), "Toward a behavioral theory of leadership", *Organizational behavior and human performance,* Vol. 6 No. 4, pp. 414-40.

Yukl, G. (2012), "Effective leadership behavior: What we know and what questions need more attention", *Academy of Management Perspectives,* Vol. 26 No. 4, pp. 66-85.

Article 2

On Knowledge Workers: How Education Shapes Preferences for Leadership

Issahaka, A. W., and Lines, R.
Norwegian School of Economics

On Knowledge Workers: How Education Shapes Preferences for Leadership

Abstract

The role of education in predicting knowledge workers' ideal preferences for leadership behaviors in workplace settings is conceptualized. Defining knowledge workers as highly educated individuals, we draw on relevant literature in educational and political psychology– fields that have partly focused on the global effects of education on psychosocial changes– to propose a theoretical perspective about how knowledge workers are different from other class of workers and how this difference forms a basis to speculate about their preferences for, and responses to leadership. We deduce that deep-level changes resulting from higher education including, authoritarianism, moral competence, tolerance for ambiguity, dogmatism, need for cognitive closure, and cognitive ability drive and shape knowledge workers' (vs. non-knowledge workers) preferences for and responses to leadership styles and behaviors.

Paper type: *Conceptual*

On Knowledge Workers: How Education Shapes Preferences for Leadership

Introduction

The benefits of adapting leadership styles-insofar-as possible to deep-level follower traits such as values, beliefs, and personalities are well known in the literature (see Crossman & Crossman, 2011; Uhl-Bien, Riggio, Lowe, & Carsten, 2014 for an overview). The fast-growing field of followership studies is primarily concerned with how leadership effectiveness is emerging from an adaptation of leadership behaviors to followers rather than the more traditional view that followers adapt to their leaders. In cross-cultural leadership research, cultural adaptation of leadership to follower cultural values is also a central issue that is theoretically and empirically related to leadership effectiveness (Farh, Hackett, & Liang, 2007; Nahum-Shani & Somech, 2011; Fred Ochieng Walumbwa & Lawler, 2003; Fred O Walumbwa, Lawler, & Avolio, 2007). This is especially true if leadership effectiveness is conceived as mediated by followers' positive reactions to leadership behaviors.

The nature and personality of individuals (leaders and non-leaders) is a root cause of behavior. In organizational settings, the personality of the employees is an important construct influencing success in the workplace (Yukl, 1971). That is, work-related behavior of individuals in an organization, in part, stems from their personality, cognitive ability, and dominant socio-psychological characteristics. However, only a handful of studies have examined the ideal preferences of the worker (e.g., Wilkes, 1992), and fewer still have investigated predictors of workers' ideal preferences (Boatwright & Forrest, 2000:19). Indeed, few leadership studies have addressed how knowledge workers are different from other groups of workers and their preference for leadership. Inferences about the causal effects of leadership styles are not appropriate under these conditions. Building on two bodies of research -educational psychology and political psychology- the present study proposes a theoretical perspective on how knowledge workers are different and how it forms a basis to speculate their preference for, and

response to leadership. We believe this study offers new insight for future research and practice on effective leadership in a knowledge worker context.

Deep Level Changes Resulting from Higher Education?

To ground our arguments in available research, we mainly draw on two bodies of knowledge. First, we found that research on the effects of college on students provide much in the way of theory and empirical findings on how highly educated individuals differ from persons that may be similar in other respects but have not attended higher education (see Pascarella & Terenzini, 1991, 2005). Second, we build on a segment of research from political psychology, which has its origin in the observation that highly educated individuals (e.g., university professors), tend to be more politically liberal than comparable individuals without higher education (e.g., Bobo & Licari, 1989; Brint, 1984; K. A. Feldman & Newcomb, 1969; Gerteis, 1998; Gross & Fosse, 2012; Jost, Glaser, Kruglanski, & Sulloway, 2003). This research provides us partly with indirect evidence on the deep level effects of higher education as political liberalism (and conservatism) is associated with certain personality traits. Hence, it is proposed that differences in political preferences also could be partly explained in terms of differences in personality traits, and associated beliefs and values. Fortunately, the research also includes direct evidence, as political psychologists too have been interested in understanding the causes and correlates of traits, which in turn are related to liberalism and conservatism. In this research, level of education has emerged as a factor that is associated with many of the determinants of political preferences on the liberal-conservative dimension. For example, some studies have examined the role of education in shaping individual differences such as authoritarianism, tolerance of ambiguity and moral reasoning (Chatard & Selimbegovic, 2007; Duriez & Soenens, 2006; Kohn & Schooler, 1969; Moore & Ovadia, 2006), and their association with political-ideological orientation and behavior (Bobo & Licari, 1989; Chatard & Selimbegovic, 2007; S. Feldman & Johnston, 2014). In sum, these two bodies of knowledge suggest that higher

education not only transfer knowledge and professional skill to students, the educational experience also lead to deep level changes that are less related to the content of the curricula. These changes can better be understood as the outcomes of a personal growth process in the classical sense, which involves the dual outcomes of maturing and growing as an individual so as to become capable of realizing one's full potential at the same time as one becomes a fully competent participant in society with the goal of contributing to a larger social context. This has been an idea, and an ideal held by philosophers such as Herder, Hegel, and even Aristotle and reflected in the university design ideas by Humboldt.

At the most general level, one might ask how likely is it that experiences such as attending a higher education program would lead to changes in traits that often are seen as crystalized and non-changeable – or the very defining properties of the individual?

Deep level personality changes in adulthood were, for a long time, a controversial issue among psychologists. The classical view held by psychoanalysts (Freud, 1923; Sapir, 1934) was up until recently that personalities were formed in early years and remained virtually unchanged throughout the subsequent life span. For example, Sapir (1934) explicitly claimed that personality was formed by the age two or three. Freud (1923) argued that identity, ego, and superego were fully developed around age five. Bloom (1964) argued that there was "rapid personality development in the early years of infancy and childhood, the possibility of marked changes in the adolescent period, and the likelihood of small changes during adulthood and maturity" (pp. 132-133). However, these earlier students of personality development have little empirical evidence to back up their claims, as very few longitudinal studies had been carried out. Now, and partly based on longitudinal evidence, one consensus is that personality is developing until the age of 30, coinciding with the current view on when the developmental stage of adulthood begins (McCrae & Costa Jr, 1994). In a more recent review of the research evidence, Caspi and Roberts (2001) concluded, "evidence indicates that personality appears to

grow increasingly consistent with age to reach a plateau later in life than originally thought (e.g. Age 50). Furthermore, life experiences appear to be related to individual differences in personality change well into the 4th decade of life" (p. 51). Their conclusion is also supported by meta-analyses of more than 90 longitudinal studies of how changes in mean scores on the "Big five" personality traits are related to age (Roberts, Walton, & Viechtbauer, 2006). Hence, available evidence does not contradict the idea that higher education is a personal growth experience leading to deep level changes in addition to the less controversial impact of education on student knowledge and skills.

The observation that individuals with higher education differ from persons without higher education does not prove that the differences are due to changes that occur a consequence of the educational experience per se. It is well known that self-selection can produce this result, perhaps in concert with deep level changes that are direct results of the educational experience. Below, we present evidence that the outcomes are most likely associated with the effects of both change and selection. It should be noted that for our purpose, the relative importance of selection versus change is less crucial than it might be for other researchers, especially to psychologists of education interested in providing a knowledge platform for evidence-based design of educational institutions. We are interested in establishing how persons with higher education may differ from those without higher education, and the process underlying any differences are of less import.

How are persons with higher education different?
In this section of the paper, we present the dimensions on which persons with higher education are thought to differ, along with reviews of the research evidence supporting these theories. When available, we present evidence from both educational psychology and political psychology for each of the dimensions. The amount of evidence in this section forms our theory

of how knowledge workers are different and provide a basis for speculating about how these differences may translate into preferences for leadership.

Authoritarianism.

Authoritarianism (Altemeyer, 1998) is a personal disposition conceptualized as a syndrome composed of three interrelated attitude clusters: authoritarian submission (a tendency towards uncritical submission to authorities), authoritarian conventionalism (strict adherence to conventional norms and values), and authoritarian aggression (feelings of aggression towards norm violators) (Rattazzi, Bobbio, & Canova, 2007). According to Adorno et al. (1950), authoritarians even derive pleasure from subordination and obedience, tendencies that are not found in non-authoritarians. In the same vein, authoritarians seem to value self-direction and personal freedom less than non-authoritarians (Duckitt, 2001; Duriez & Van Hiel, 2002), and they tend to describe themselves as more dutiful and to conform (Duckitt, 2001; Heaven & Bucci, 2001). Moreover, some research has shown that they are more likely to obey authorities than non-authoritarians (Petetsen & Dietz, 2000).

Although there is a long tradition of explaining authoritarianism by interindividual differences (Adorno et al., 1950; Allport, Clark, & Pettigrew, 1954; Rokeach, 1954; Wilson, 1973), a long history of research in political psychology has focused on better understanding the antecedents and consequences of authoritarianism. From its early days, this research has explored the role played by education in reducing the tendency towards authoritarianism. The early studies of this issue consistently reported a negative relationship between the level of education and authoritarianism (Kohn & Schooler, 1969; Lipsitz, 1965; Williams, 1966). It seems that any authoritarian tendencies in an individual were reduced or alleviated as a consequence of attending higher education (e.g. a college). Although subsequent research has shown that the strength of the level of education effect seems to depend on factor such as the content of the educational program (e.g. which subject major), and national culture (Dekker & Ester, 1987),

the majority of the evidence still supports the existence of a direct negative relationship between level of education and authoritarianism.

Dispositional authoritarianism was initially conceived of in order to explain and predict political attitudes and behaviors. Much of the research on authoritarianism has therefore been focused on political issues rather than organizational issues. However, authoritarianism has also been linked to parts of the leadership research agenda and is a central element in theories of paternalistic leadership and directive leadership. Paternalistic leaders exhibit two sets of conceptually distinct orientations in their behavior towards their followers: benevolence and authoritarianism. Generally, more is known about the origins and effects of authoritarianism in leaders than in followers. In one of the few studies focusing on follower-level authoritarianism in a leadership context, Son Hing, Bobocel, Zanna, and McBride (2007) found that authoritarian followers were more acquiescent and supportive of a leader making unethical decisions and reported higher levels of liking the leader than did non-authoritarian followers. Partly building on these findings, Thoroughgood, Padilla, Hunter, and Tate (2012) theorized, but did not provide evidence that authoritarian followers create a context in which the likelihood of the emergence of destructive leadership is particularly high (pp. 905-906).

Moral Competence.

In line with the ideals presented by philosophers of education, research has also supported a positive relationship between education and moral competence. Kohlberg (1969) proposed that an individual's level of moral competence can be placed at one of six levels (3 stages), and as the individual grows and matures, she or he may move from a lower level to a higher level. The pre-conventional level has been described as a self-perspective.

> "Social norms are either not comprehended or ignored, and hence fail to enter into the process of moral reasoning. The guiding moral principle is to avoid punishment (stage 1) and to satisfy one's needs (stage 2). At the conventional level, social norms guide the moral reasoning process. Of central importance are being a nice person (stage 3) and conforming to as well as trying to maintain the social order (stage 4). Finally, in the post-conventional level, one no longer relies upon the social norms, but rather on the

moral principles upon which these norms are based. There is a focus on the legal viewpoint, including the possibility to change the law when at odds with rational considerations of social utility (stage 5) and on abstract ethical principles, such as equality and respect for the dignity of human beings (stage 6)" 8(Duriez & Soenens, 2006, p. 78).

Research has examined the relationship between level of education and moral judgment competence and found support for the hypothesis that (higher) education strengthens the competence for sophisticated moral judgment (e.g., Duriez & Soenens, 2006; Eynon, Hills, & Stevens, 1997; Thorne, 1999). According to at least one study, it seems that the relationship is curvilinear, exhibiting a steeper, positive relationship for post-graduate education than for lower levels of education (Rest, Narvaez, Thoma, & Bebeau, 1999).

Tolerance for Ambiguity.

Budner (1962) defines tolerance for ambiguity as the tendency to "perceive ambiguous situations as desirable" and intolerance for ambiguity as "the tendency to perceive ambiguous situations as a source of threat." As a personality variable, ambiguity has been associated with positive traits, such as openness to new ideas and originality (Tatzel, 1980). On the other hand, ambiguity intolerance is associated with lower mental flexibility and negative personality traits, such as conformity, mental rigidity, and ethnic prejudice (Weissenstein, Ligges, Brouwer, Marschall, & Friederichs, 2014, p. 1). It suggests that individual-level traits, such as uncertainty orientation, complexity, unfamiliarity and a predisposition to risk-taking are correlates of ambiguity tolerance. In the context of educational psychology, meaningful learning empowers students to gain problem-solving skills (Mayer, 2002; McKeough & Sanderson, 1996; Phye, 1997) and be capable of solving new and ambiguous problems (Shuell, 1990) which conceivably can result in a state of tolerance and confidence in the face of ambiguous situations. Indeed, research evidence supports the association between education and an individual's willingness or ability to tolerate the existence of opinions or behavior that one dislikes or disagrees has been associated.

According to Hauser (1970), less education and fundamentalist religious affiliations are part of individual characteristics associated with lower tolerance (Moore & Ovadia, 2006, p. 2206). In terms of evidence, there is a consistent positive relationship between an individual's education level and tolerance (Bobo & Licari, 1989; Davis, 1975; Dynes, 1967; Hyman & Wright, 1979; McCutcheon, 1985; Stouffer, 1963; Weil, 1985; Williams Jr, Nunn, & Peter, 1976). The positive relationship between an individual's education level and tolerance is one of the most consistently documented results in the empirical research (Bobo & Licari, 1989; Davis, 1975; Dynes, 1967; Hyman & Wright, 1979; McCutcheon, 1985; Stouffer, 1963; Weil, 1985; Williams Jr et al., 1976). Through education, a tolerance-producing setting is created as individuals are exposed to values and ideas that may differ from those they uphold (Stouffer, 1963, p. 127). Thus, (higher) education increases one's knowledge of diverse cultures, openness to novel ideas, and willingness to risk uncertainty and ambiguity (Moore & Ovadia, 2006, p. 2209).

Dogmatism.

Dogmatism is a stable personal trait defined as a relative unchangeable unjustified certainty (Altemeyer, 2002). In The Open and Closed Mind, Rokeach (1960) suggested that dogmatism reflects a deficit in integrating information that threatens multiple prior beliefs into a new belief system. Derived from social psychological theory, dogmatism is mentioned as an important determinant of closed-mindedness, conformity, myopia, and self-righteousness. Research has shown that more dogmatic individuals show greater persistence of a belief after the evidence that formed the belief has been discredited (Davies, 1993), and they tend to ignore information that does not support their prior beliefs (Davies, 1998). Other studies have suggested an association between dogmatism and rigid problem-solving behavior and high resistance to change over short-term and the long-term (Ehrlich & Bauer, 1966, p. 253).

Educational experiences can broaden an individual's experience base, which encourages an open-minded personality to new experiences and a consideration of alternative viewpoints and new experiences (Pascarella, Edison, Nora, Hagedorn, & Terenzini, 1996; Vogt, 1997). As students progress in education, their beliefs towards learning become more sophisticated, and they develop a mind richly grounded in intellectual virtues. According to Schommer (1990), university students tend to have more sophisticated beliefs than junior college students. An earlier study by Lehmann (1963) reported significant decreases in dogmatism for male and female students from first year to senior years attributed to the college experiences. Close and Bergmann (1979) also found a significant inverse relationship between educational attainment and dogmatism, after controlling for possible effects of age, organizational level, function, years in present position, years with present company, years as a manager, years of full-time work experience, staff-line role, span of control, order of birth, and family size. Hence, research evidence supports a negative relationship between education and dogmatism as a personality variable.

Need for Cognitive Closure.
Need for cognitive closure, or simply need for closure (NFC), is defined as a preference for "an answer to a given topic, any answer compared to confusion and ambiguity" (Kruglanski, 1990, p. 337). Individuals with high levels of NFC are characterized by strong preferences for order and predictability afforded by stable secure knowledge that unaffected by circumstances and not challenged by expectations. NFC is associated with a wish to reach firm and swift decisions, a need for decisiveness, and a feeling of discomfort with ambiguity. High NFC individuals also experience solutions with lack of closure as aversive.

Theory and evidence support that NFC is a desire for established knowledge (Kruglanski & Webster, 1996). Both as a disposition or situational variable, high NFC reflects a greater desire for consensus or shared reality within a group (Kruglanski, Webster, & Klem, 1993; Antonio

Pierro, Mannetti, De Grada, Livi, & Kruglanski, 2003). Accordingly, Antonio Pierro et al. (2003) note that high (*vs.* low) NFC encourages the emergence of autocratic leadership or hierarchical leadership as opposed to participatory or egalitarian leadership structures. The authors argue that the quest for consensus under heightened NFC implies acceptance of the leader's views and that everyone is entitled to the boss's opinion (p. 406). Any leadership structure that encourages hearing and reconciling divergent views may be relatively tortuous and laborious to individuals dispositioned as high in NFC. Conversely, as the level of follower NFC reduces, the acceptance of, and even preference for, participative leadership and leader fairness intensifies. Hence, the benefits of participative leadership will be higher in environments with low NFC followers.

General intelligence/cognitive abilities.
General intelligence, sometimes referred to as Spearman's g, general cognitive ability (GCA) or general mental ability, has been defined as:

> "a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, and learn from experience." (Gottfredson, 1997, p. 13)

Gottfredson adds: "It (intelligence) is not merely book learning, a narrow academic skill, or test-taking smarts. Rather it reflects a broader and deeper capability for comprehending our surroundings – "catching on," "making sense" of things, or "figuring out" what to do. (1997, p. 13).

The superior cognitive functioning resulting from higher levels of general intelligence is associated with performance and success across virtually all-important life arenas, including achieved socioeconomic status, creativity, health risk behavior, quality of life, and longevity (Lubinski, 2004). The importance of general intelligence for understanding work-related phenomena has also been firmly established. For example, Campbell (1990) concluded that

"General mental ability is a substantively significant determinant of individual differences in job performance for any job that includes information-processing tasks" (p. 56).

Measures of intelligence are consistently related to human performance in a broad array of important arenas; among these is performance in work settings. The relationship between intelligence and performance seems – at a general level – to be mediated by better cognitive functioning. The better cognitive functioning, in turn, can be explained by superior cognitive structures (e.g. short-term memory capacity) and better basic (e.g. perceptual discrimination, processing speed) as well as more complex (e.g. reasoning ability, problem solving – especially complex problem solving, learning) cognitive processes of those with higher intelligence scores compared to those with lower scores (see Schubert, Hagemann, & Frischkorn, 2017 for a discussion of the link between intelligence and processing speed; Stadler, Becker, Gödker, Leutner, & Greiff, 2015 for a meta-analysis of the effect of intelligence on complex problem solving skills).

The early view of the sources of between-individual differences in intelligence held genetic differences to be the main cause of observed variation. For some time, the consensus was that intelligence is innate, and remains largely stable over the course of a person's life (Marks, 1982; Spearman, 1904). Although there still is agreement that intelligence is partly and significantly hereditary, intelligence research has accumulated much evidence for biological and social environmental influences as well (see Nisbett et al., 2012 for a review of environmental correlates of intelligence). Among the environmental factors shown to influence a person's intelligence, is level of education or years at school. Generally, it has been established that an individual's level of intelligence is increasing with her or his amount of schooling. The relationship between level of education and intelligence is two-way or – as stated by Deary and Johnson (2010, p. 1362): "Brighter people tend to get more schooling, and longer-schooled people tend to be brighter." First, more intelligent individuals are more likely to pursue formal

education beyond minimum levels set by authorities than less intelligent individuals. For example, Jencks et al. (1972) report on six longitudinal studies that estimate the correlations between pre-entry psychometric intelligence and amount of education obtained ranging from 0.40 to 0.63. Similar results have been reported in more recent overviews (e.g., Bartels, Rietveld, Van Baal, & Boomsma, 2002; Neisser et al., 1996). Because more intelligent individuals choose to stay longer at school the observed correlation between measures of intelligence and level of education is partly the result of initial differences in intelligence and not entirely caused by the educational experience as such. However, evidence to date also suggests that schooling has a positive influence on intelligence, i.e. that an individual's measured level of intelligence increases with time at school. For example, in his comprehensive review Ceci (1991) presents eight types of empirical evidence, which all point to the same conclusion that there is a causal effect of schooling on intelligence. Gustafsson (2001) estimated that there is an effect of around 2 IQ points per year of additional schooling. Even more recently, Falch and Sandgren Massih (2011) used a data set with measures of IQ at ages 10 and 20 (the Malmö Longitudinal Dataset) and estimated that one year of schooling increases IQ by 2.9-3.5 points. The mechanisms underlying school-related sources of variance in IQ have not been fully mapped, but those that have been proposed include the following: First, it is possible that the observed links partly reflect that IQ test relevant information is transmitted at school, and more so than in alternative non-school environments. In other words, students directly learn the correct answers to questions that appear in IQ tests (Ceci, 1991 reminds us that the question "Who wrote Hamlet" appear in the popular WISC-R test). However, most accounts of causal mechanisms are more substantive and point to the possibility that education fosters cognitive development in basic areas such as memory, perceptual ability, and concept formation; and higher order processes including abstraction, probabilistic reasoning, problem solving and deduction (e.g., Brown, 1978).

Knowledge Workers and Preferences For Leadership

In this section, we build on insights from the identified dimensions on which highly educated individuals differ from Individuals with low (or without) education as a basis to speculate about knowledge workers' preferences for, and response to leadership.

Authoritarianism

Above, we argued that knowledge workers are less authoritarian than other classes of workers (i.e., workers without higher education). What does this difference imply for the type of leaders who are preferred by members of this group? Several authors have argued that authoritarianism implies the acceptance of, and even preference for, status and power differences among members (e.g. leaders and non-leaders) of a group (e.g. an organization). An authoritarian, it is often argued, will prefer that leaders set goals, define how tasks should be performed, and makes decisions with minimal inputs from non-leaders. The opposite is held to be true for persons score low on this dimension (e.g., Timming & Johnstone, 2015). An early study by Vroom (1959) also found that non-authoritarians (persons with stronger preference for independence) responded more positively to participative leadership than authoritarians. Authoritarians are, in part characterized by their submissiveness, i.e. their relatively uncritical acceptance of leaders and other authorities. Accordingly, authoritarians will tend to more quickly respond positively to influence attempts based on institutional power or power that is rooted in the leaders' position in formal hierarchies. Non-authoritarians are less prone to accept this link between formal position and the legitimacy of influence attempts. Hence, the leadership role is likely to become more challenging - and interesting – as the level of follower authoritarianism is reduced. While influence tactics such as direct request might function effectively in an environment with high-authoritarian followers, any positive effects of these tactics are likely to diminish as follower authoritarianism is reduced.

> *Proposition 1: Positive effects of directive leadership are lower for knowledge workers than for non-knowledge workers.*

Nevertheless, giving some form of direction is a crucial part of leadership in any setting, and seemingly a requirement for creating value through leadership regardless of follower characteristics. The leadership literature has also proposed numerous ways in which leaders can set direction for their followers that rely less on institutional power or formal authority.

Moral Competence

Moral competence is "the capacity to make decisions and judgments which are moral (i.e., based on internal principles) and to act in accordance with such judgments" (Kohlberg, 1964, p. 425). Consistent with Kohlberg's theory, several authors (Catalano, Berglund, Ryan, Lonczak, & Hawkins, 2004, p. 105; Colby et al., 1987; Lennick & Kiel, 2005) have argued that moral competence is the ability to make an ethical decision and that it is influenced positively by higher education. Moral competence, thus, describes an individual's moral identity and willingness to take a stand based on principle (Lennick & Kiel, 2005). In work settings, moral competence is suggested as a distinguishing quality of exemplary or proactive employees (Kelley, 1988, 1992) especially in increasingly competitive organizational environments with increasingly complex demands on employees. An individual's level of moral competence is often argued to affect their justice perceptions, orientation to take the initiative, perform altruistic behavior and ability to judge moral issues logically, consistently at an advanced level of development (Catalano et al., 2004; Colby et al., 1987; Folger, 1998; Podolskiy, 2005).

Moral competence has been portrayed as a key determinant of leadership effectiveness (Bass & Steidlmeier, 1999; Lennick & Kiel, 2005; Ridings & McIver, 1997), albeit the relationship between follower moral competence and leadership effectiveness remains an understudied area. More is known about the impact of leader's moral competence on followers' outcomes, such as motivation and psychological empowerment (e.g., Kim & Kim, 2013) than the impact of followers' moral competence on preference and response to leadership. In a relevant study by Van Dyne and LePine (1998), employees with high moral competence are more concerned

about standing up for what is right and advocating promotive ethical behavior that emphasizes expression of reality of making innovative suggestions for change. It suggests that high moral competence subordinates are capable of and willing to question a leader's decisions. When faced with a leader whose actions appear inappropriate, these individuals bring the perceived inconsistencies to the leader's attention; and they actively oppose a decision they consider morally wrong. Hence, high (vs. low) moral competence subordinates are willing to devote extra energy toward discretionary behaviors such as respect, fairness, justice, honesty and ethical behavior at the workplace. Such extra-role behaviors can be heightened when leadership grants independence and autonomy to morally competent subordinates. Differently stated, subordinates with high (vs. low) moral competence should be entitled to have their autonomy and to make a value-driven decision-making when facing moral dilemmas. Hence, we reasoned that;

> *Proposition 2: high (vs. low) moral competence subordinates (i.e., knowledge workers) would respond positively and more strongly to leadership styles that grant autonomy by engaging in various proactive extra-role behaviors.*

Ambiguity Tolerance

Knowledge workers (i.e., highly educated individuals) are also distinguished from non-knowledge workers on ambiguity tolerance dimension (Geller, Tambor, Chase, & Holtzman, 1993; Harding & Ren, 2007; Weissenstein et al., 2014). Ambiguity tolerance describes the process an individual (leaders and non-leaders) perceive, interpret, react and adjust to ambiguous situations. Ambiguity tolerance is an individual core disposition that shapes spontaneous psychological reactions of people towards ill-defined and cognitively demanding work situations (Merrotsy, 2013). In organizational studies, employee ambiguity tolerance has been identified as a critical skill that may enhance leadership effectiveness and found to be positively related to job performance, self-efficacy, decision-making, creativity, complexity, critical thinking, coping with change, risk acceptance, organizational commitment and job

satisfaction (Dollinger, Saxton, & Golden, 1995; Endres, Chowdhury, & Milner, 2009; Furnham & Marks, 2013; Ghosh & Ray, 1997; Gupta & Fogarty, 1993; Judge, Thoresen, Pucik, & Welbourne, 1999; Salyer, 1995; Schwenk, 1982).

Persons lower in ambiguity tolerance (i.e., ambiguity intolerance) are characterized as favoring actions with predictable outcomes. Geller et al. (1993) found that individuals demonstrating intolerance of ambiguity prefer the state of stereotypes and concrete notions to a situation of probability and uncertainty. Ambiguity intolerant individuals tend to perceive uncertain tasks as threatening, negative, as a source of discomfort and stress, and more likely to give up following a failed attempt (Budner, 1962; Dorfman & Howell, 1988). Ambiguity intolerance subordinates are argued, will prefer structured elements in learning (Furnham, 1994), prefer a paternalistic leader (Bakalis & Joiner, 2004), and develop a passive coping style (Furnham & Marks, 2013). On the other hand, ambiguity tolerance subordinates enjoy spheres associated with complexities and diverse perspectives and are comfortable dealing with the shades of gray in life and do not rely upon all-or-none thinking. An earlier study by Norr and Crittenden (1975) found that ambiguity tolerant subordinates favor motivational methods and interpersonal relations over professional behaviors and class structure. Individuals with high ambiguity tolerance may actually seek out uncertain tasks, enjoy them and persist despite initial failures (Furnham & Ribchester, 1995). As such, it is suggested that ambiguity tolerant individuals cope well with major challenges, anxiety, stress, and conflict (Judge et al., 1999; Keenan, 1978; Teoh & Foo, 1997); and are "likely to be psychologically empowered and develop intrinsic and active task orientation towards complex jobs, leading to spontaneous idea generation, and problem solving" (Sung, Antefelt, & Choi, 2015, p. 9).

In summary, AT has been studied as a factor that shapes individuals' sense-making of ambiguous and complex situations (Sung et al., 2015); receptiveness for detailed understanding of rules, regulations, existing processes, guidelines and potential constraints (Hofstede, 2001);

and degree to which subordinates desire to know the views and expectations of their leaders about their initiatives (Hofstede, 2001). As such, ambiguity tolerant subordinates will prefer and thrive under empowerment leadership. Empowerment through having the freedom to make decisions, propose and engage in activities without always needing to seek approval from the leader can make ambiguity tolerant employees feel a self-sense of importance in the organization. Through empowering influence tactics, ambiguity tolerant individuals feel motivation, perceive complex tasks as interesting and desirable and thus, increases performance. Hence, in organizations entailing complex demands and considerable ambiguity, the benefits of empowering leader behaviors will be stronger among ambiguity tolerance subordinates (vs. ambiguity intolerant subordinates).

> *Proposition 3: The benefits of empowering leader behaviors will be higher for knowledge workers than for non-knowledge workers.*

Dogmatism

The concept of dogmatism explicates a psychosocial change undergirding individual differences with regard to the openness and closeness of belief systems (Rokeach, 1960), cognitive conservatism (Greenwald, 1980) and provides a theoretical underpinning to speculate about how individuals (i.e., followers) perceive and react to leadership in work settings. As an individual disposition, the level of dogmatism shapes how individuals (i.e., leaders and non-leaders) adopt, communicate and enact their belief systems. Dogmatic individuals personify closed-mindedness, resistance to changing attitudes or beliefs; likely to have strong authoritarian and conservative opinions about the social order, with a tendency to accept the legitimacy of traditional practices (Colella, 2001; S. Hunter, Harris, & Trusty, 1998; Rokeach, 1960; Weed, Mitchell, & Moffitt, 1981). This line of reasoning suggests that individuals who score high on dogmatism will tend to rely on and defer to authority figures, seek leaders who express firm, unwavering beliefs, and will prefer groups (e.g. teams or work units) in which everyone shares the same opinions.

On the other hand, knowledge workers, individuals who are habitually less dogmatic, evaluate information on a more objective basis (Palmer & Kalin, 1991) and have a less tendency to accept the legitimacy of traditional leadership structures in the workplace. Less dogmatic employees are likely to challenge workplace hierarchies and resist a subordinate status in the leadership environment at the workplace. Consequently, knowledge workers are more likely to assume a fundamental role in co-constructing or legitimizing effective leadership. In an earlier study, Weed et al. (1981) found that high-dogmatism subjects work best with a highly task-oriented leader and worst with a highly human-relations-oriented leader. The authors also found support that low-dogmatism subjects are more satisfied with a human-relations style than high dogmatism subjects. Hence, leaders who emphasize structuring behavior get better performance from high-dogmatism subordinates and the benefits of such tactics are likely to be lower for low-dogmatism subjects.

Indeed, evidence for the strong positive correlation between authoritarianism and dogmatism abound in the literature, with earlier studies defining dogmatism as general authoritarianism. However, we focus on the distinction between closed-mindedness (*vs.* open-mindedness) and associated submissiveness that respectively, is the irreducible conceptual core of dogmatism and authoritarian personality. In sum, based on the literature related to knowledge workers' values and relying on dogmatism as a theoretical dimension, we proposed that their ideal leadership preferences are more likely to recognize and involve followers (i.e., knowledge workers) in co-creating leadership effectiveness.

> *Proposition 4a: Dogmatism moderates the relationship between leader-focused leadership style and follower work outcomes such that the effect is positive and stronger for highly dogmatic followers relative to less dogmatic followers.*

> *Proposition 4b: Dogmatism moderates the relationship between follower-focused leadership styles such that the effect is positive and stronger for less dogmatic followers relative to highly dogmatic followers.*

Need for Closure

Research on personality and individual differences demonstrate the need for closure (NFC) as a stable individual disposition. Low dispositional NFC individuals are predisposed to avoid closure and prefer openness whereas, on the other hand, high dispositional NFC individuals display a systematic proclivity to value closure positively. In particular, high dispositional NFC individuals are characterized by preference for order and structure, a need for predictability and secure knowledge, and to maintain it permanently (Webster & Kruglanski, 1994). Consequently, high NFC individuals tend to 'seize' on information that affords a judgment on an issue of interest and to 'freeze' upon such judgment. In contrast, low dispositional NFC individuals prefer to keep their options open and avoid committing to definite opinions (Kruglanski, 2004).

Prior research has shown that subordinate personality-level need for closure significantly affects a variety of interpersonal, intrapersonal, and group phenomena (see Bélanger et al., 2015; Kruglanski, 2004; Shah, Kruglanski, & Thompson, 1998). In work settings, subordinates' disposition on need for closure as it relates to compliance with leader influence tactics has received research attention. Categorically, the synergy between leader and followers that underlie organizational functioning requires that employees remain responsive to leader influence. The type of power tactics that a leader utilizes to influence subordinates has been a focus of much research investigating determinants of compliance (seeKipnis, Schmidt, & Wilkinson, 1980; A Pierro, De Grada, Raven, & Kruglanski, 2004; Yukl & Falbe, 1991). The burgeoning literature on social power contextualize and cluster interpersonal power relations (i.e., leader-subordinate relations) into 'hard' and 'soft' power tactics (Raven, 1992, 1993; Raven, Schwarzwald, & Koslowsky, 1998) depending on the amount of freedom subordinates have regarding compliance. Soft power tactics are not associated with enforceable rules that dictate punishment and rewards; and provide greater freedom of choice (Raven et al., 1998). On the other hand, hard power tactics reduce one's freedom to comply by stressing compliance

with enforceable rules, supported by threats or promises of appropriate (negative or positive) (Raven et al., 1998). In terms of research evidence, a recent study by Bélanger et al. (2015) found that subordinates high (vs. low) on need for closure reported greater willingness to comply with harsh social power tactics but lower willingness to comply with soft power tactics. In another study by (Antonio Pierro, Kruglanski, & Raven, 2012), the authors found that the benefits of soft tactics decreased as a function of subordinates' need for closure. The authors found also that organizational outcomes were improved when subordinates high (vs. low) on need for closure were exposed to hard power tactics and those low on need for closure were exposed to soft tactics.

Hence, the benefits (or lack thereof) of hard and soft power tactics lies with subordinates' willingness to comply. We suggest therefore that knowledge workers' (low) NFC personality disposition can influence the selection of power tactics by power figures (i.e., leaders) and their likelihood of compliance. In summary, a considerable body of research supports the notion that employees NFC moderates compliance with leader power tactics.

> *Proposition 5: NFC moderates the relationship between leader power tactics and a variety of follower work outcomes such that (a) the effect is stronger for knowledge workers (vs. high NFC employees) when the power tactics is soft and (b) the effect is weaker for knowledge workers (vs. high NFC employees) when leader power tactics is hard.*

General Intelligence
There is a sizeable body of research on correlates of intelligence in work settings, but very little of this material focuses on how follower intelligence shapes responses to leadership. The most prominent work in this area is undoubtedly the studies exploring relationships between intelligence and job performance and its related literature on intelligence as a selection variable in recruitment processes (Schmidt, Ones, & Hunter, 1992). The key finding from this research is that intelligence is a generalizable and robust predictor of job performance and that the

94

predictive validity of intelligence increases with job complexity (J. E. Hunter, 1986; Salgado et al., 2003). Theoretically, it seems that a significant cause of this relationship is that more intelligent employees are better learners and acquire more job-relevant knowledge faster than the less intelligent (J. E. Hunter & Schmidt, 1996; Schmidt & Hunter, 2004). A greater repository of declarative and procedural knowledge, in turn, allows for higher levels of performance, especially in complex jobs. A recent meta-analysis extends this finding to specific non-task dimensions (including organizational citizenship behavior) relevant for organizational performance (Gonzalez-Mulé, Mount, & Oh, 2014). In this line of research, Dilchert, Ones, Davis, and Rostow (2007) demonstrated that intelligence is negatively related to a sample of deviant behaviors that are detrimental to organizational performance. The authors theorized that this may be because more intelligent employees are better at seeing the full consequences of their actions and also trade off short term for long term consequences of their actions.

Apart from the higher level of the job performance of more intelligent individuals, research has also shown that they tend to think and behave differently and to respond differently to important organizational events than less intelligent individuals. For example, Morgeson, Delaney-Klinger, and Hemingway (2005) found that differences in cognitive ability partly explained how broadly employees define their work roles in that more cognitively able individuals tended to take on broader roles, involving a more extensive set of tasks than less able individuals. This relationship was thought to be mediated by the higher self-efficacy associated with more able employees. Intelligence also seems to be a critical determinant of the adaptability of employees. In an experiment where the rules for making good decisions were changed midway into the experiment, the ability-decision making performance link was actually strengthened after the change. This finding was taken by the authors to be indicative of higher adaptability of more intelligent subjects (LePine, Colquitt, & Erez, 2000). Moreover, employee intelligence has been firmly linked to their creative capacity in such a way that more intelligent individuals have more

capacity for generating new and valuable ideas, some of which are implemented and positively affect the performance of their groups and organizations (Kuncel, Hezlett, & Ones, 2004). Finally, intelligence is both a moderately strong predictor of perceptions of leadership and emergent leadership, as well as a significant but weak predictor of leadership effectiveness. However, as already stated, little research has focused on the intelligence of those affected by leaders' traits and behaviors. How followers' intelligence moderates the impact of leaders' traits and behavior is still largely unchartered territory. Hence, intelligence and followers' responses to leadership is theoretically positioned follows:

> *Proposition 6: A leader's capacity to add value is primarily mediated by how followers respond to his or her behavior over time. How then could intelligence moderate known links between specific leader behaviors and outcomes of relevance to organizational performance?*

Discussion

Our discussion so far explicates knowledge workers' 'ideal' leadership preferences. With the assumption that knowledge workers' values shape their preferences for ideal leadership behaviors, we drew upon the contextually informed body of literature in educational psychology (Pascarella & Terenzini, 1991, 2005) that has implicated, among a wide range of variables, psychosocial changes in influencing the degree to which values affect one's experience within the workplace. Following a speculative analysis that is grounded in available evidence, this conceptual study enhances our understanding of knowledge workers' psychosocial variables (i.e., personality, attitudes, and behaviors) that may influence leadership preferences.

As a preliminary to exploring the substantive question about knowledge workers' preference for ideal leadership behaviors, we devoted research attention towards understanding how knowledge workers can be thought to be different from other workers. Conceptualized as highly

educated individuals, we identified individual difference dispositions–dogmatism, authoritarianism, ambiguity tolerance, moral competence, and need for closure–that are characteristic and distinguish knowledge workers from other workers. We next explored how these dispositions that define knowledge workers' perceptions, personalities, emotions and experiences shape behavior and preference for leadership. From this, we deduced that knowledge workers would earnestly desire leadership behaviors that endorse follower consideration and involvement, soft power tactics, stimulate, empower and motivate; and grant task autonomy and independence in the workplace.

Study Implications and Directions for Future Research.

This study has some implications. First, there is still a surprisingly consistent tendency for researchers to neglect workers' preferences for ideal leadership behaviors. A root cause for this gap in the literature seems to stem, in part, from limited research attention to the antecedents of subordinates' values and their dispositional tendencies. Our study provides a conceptual individual difference dispositional framework to position a behavioral account of knowledge workers. We upheld the notion that the global effects of education on students' results in psychosocial changes, that crystalize and become the very defining personality of knowledge workers. Future empirical research linking educational level to a constellation of psychosocial changes that inform the values, attitudes, and behaviors of knowledge workers is thus, desired. Also, evidence for the boundary conditions of these links in a work setting will be necessary.

Second, leader behaviors that emphasize consideration and involvement of subordinates; soft power tactics; stimulate, empower and motivate; and grant task autonomy and independence in the workplace are reasoned to form part of the core preferences of knowledge workers. Theoretically, all these ideal leader behaviors are closely associated with knowledge workers' values and behaviors. One seemingly prominent knowledge worker value, individualized consideration, suggests that leader behaviors ought to be inherently follower-focused. Other

traits like ambiguity tolerance and low dispositional need for closure can also influence knowledge workers to seek leader behaviors that empower, grant autonomy, and enact soft power tactics to influence results. Indeed, deducing an all-encompassing set of leader behaviors will be the ideal solution to maximize leadership effectiveness. However, it seems not to be methodically feasible to capture the entire list of preferred leader behaviors. Therefore, we postulate that contemporary leadership theory that subsumes many of the conceptually supported leader behaviors preferred by knowledge workers, such as transformational leadership, servant leadership, self-, and shared-leadership and authentic leadership can provide an appropriate and perhaps, a more pragmatic approach to empirical assessments and practice. Contemporary leadership scholars encourage relational orientation to complement their traditional task-oriented leadership behaviors (Chin, 2004; Eagly & Johnson, 1990; Fletcher & Kaufer, 2003) and represents a viewpoint with substantial promise to advance leaders' understanding of the functional importance of workers' individual personality differences in predicting their preferences for relational behaviors (Gabriel, Carvallo, Dean, Tippin, & Renaud, 2005; Lopez & Brennan, 2000). However, the type of ideal behaviors that knowledge workers would like their ideal leader to exhibit in the workplace seem to be at the junction of several extant leadership styles including, followership theory, path-goal theory, transformational leadership, servant leadership, authentic leadership, leadership styles based on use of authority, and managerial (leadership) styles and leadership grid theory. For instance, the preference for follower-involvement in co-constructing or legitimizing leadership effectiveness is espoused by various leadership styles, including path-goal theory and followership theory, whereas, path-goal theory and managerial (leadership) style subsume participative, supportive and achievement-oriented behaviors, which are all preferred leader behaviors among knowledge workers. Conceivably, generalizing about follower-focused or relational leadership styles seem suitable, though, will require addressing a dilemma of

leadership styles and performance appraisal in a knowledge worker setting. To this end, an avenue for future research will be to investigate the effectiveness of follower-focused leadership styles in a knowledge worker context and the contextual role of personality traits.

Limitations

In this study, we have made assumptions that knowledge workers' personalities, behaviors, and values will be related closely to their preferences for leadership behaviors. Even though we grounded our assertions in available evidence, this study did not extend to capture the effect of other antecedents that might influence workers' preference for leadership nor the antecedent conditions for leadership structures that organizational leaders utilize. Besides, this study does not attempt a review of the different extant leadership styles. It is beyond the scope of this study. Instead, this study points out that some commonly held universal leader behaviors preferred by knowledge workers exist.

References

Adorno, T. W., Frenkel-Brunswik, E., Levinson, D. J., Sanford, R. N., Aron, B. R., Levinson, M. H., & Morrow, W. R. (1950). The authoritarian personality.

Allport, G. W., Clark, K., & Pettigrew, T. (1954). The nature of prejudice.

Altemeyer, B. (1998). The other "authoritarian personality". In *Advances in experimental social psychology* (Vol. 30, pp. 47-92): Elsevier.

Altemeyer, B. (2002). Dogmatic behavior among students: Testing a new measure of dogmatism. *The Journal of Social Psychology, 142*(6), 713-721.

Bakalis, S., & Joiner, T. A. (2004). Participation in tertiary study abroad programs: The role of personality. *International journal of educational management, 18*(5), 286-291.

Bartels, M., Rietveld, M. J., Van Baal, G. C. M., & Boomsma, D. I. (2002). Heritability of educational achievement in 12-year-olds and the overlap with cognitive ability. *Twin Research and Human Genetics, 5*(6), 544-553. doi:org/10.1375/twin.5.6.544

Bass, B. M., & Steidlmeier, P. (1999). Ethics, character, and authentic transformational leadership behavior. *The leadership quarterly, 10*(2), 181-217.

Bélanger, J. J., Pierro, A., Kruglanski, A. W., Vallerand, R. J., De Carlo, N., & Falco, A. (2015). On feeling good at work: The role of regulatory mode and passion in psychological adjustment. *Journal of Applied Social Psychology, 45*(6), 319-329.

Bloom, B. S. (1964). *Stability and change in human characteristics*: Wiley.

Boatwright, K. J., & Forrest, L. (2000). Leadership preferences: The influence of gender and needs for connection on workers' ideal preferences for leadership behaviors. *Journal of Leadership Studies, 7*(2), 18-34. doi:org/10.1177/107179190000700202

Bobo, L., & Licari, F. C. (1989). Education and political tolerance: Testing the effects of cognitive sophistication and target group affect. *Public Opinion Quarterly, 53*(3), 285-308.

Brint, S. (1984). " New-Class" and Cumulative Trend Explanations of the Liberal Political Attitudes of Professionals. *American journal of sociology, 90*(1), 30-71. doi:org/10.1086/228047

Brown, A. L. (1978). Knowing when, where, and how to remember; a problem of metacognition. *Advances in instructional psychology, 1*, 77-166.

Budner, S. (1962). Intolerance of ambiguity as a personality variable 1. *Journal of personality, 30*(1), 29-50.

Campbell, J. P. (1990). Modeling the performance prediction problem in industrial and organizational psychology. In M. D. Dunnette & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (pp. 687-732). Palo Alto, CA, US: Consulting Psychologists Press.

Caspi, A., & Roberts, B. W. (2001). Personality development across the life course: The argument for change and continuity. *Psychological Inquiry, 12*(2), 49-66.

Catalano, R. F., Berglund, M. L., Ryan, J. A., Lonczak, H. S., & Hawkins, J. D. (2004). Positive youth development in the United States: Research findings on evaluations of positive youth development programs. *The annals of the American academy of political and social science, 591*(1), 98-124.

Ceci, S. J. (1991). How much does schooling influence general intelligence and its cognitive components? A reassessment of the evidence. *Developmental psychology, 27*(5), 703.

Chatard, A., & Selimbegovic, L. (2007). The impact of higher education on egalitarian attitudes and values: Contextual and cultural determinants. *Social and Personality Psychology Compass, 1*(1), 541-556.

Chin, J. L. (2004). 2003 Division 35 presidential address: Feminist leadership: Feminist visions and diverse voices. *Psychology of Women Quarterly, 28*(1), 1-8.

Close, M. J., & Bergmann, T. J. (1979). Dogmatism and attained educational level: A field study. *Psychological Reports, 44*(2), 671-673. doi:org/10.2466/pr0.1979.44.2.671

Colby, A., Kohlberg, L., Speicher, B., Candee, D., Hewer, A., Gibbs, J., & Power, C. (1987). *The measurement of moral judgement: Volume 2, Standard issue scoring manual* (Vol. 2): Cambridge university press.

Colella, A. (2001). Coworker distributive fairness judgments of the workplace accommodation of employees with disabilities. *Academy of Management Review, 26*(1), 100-116.

Crossman, B., & Crossman, J. (2011). Conceptualising followership–a review of the literature. *Leadership, 7*(4), 481-497.

Davies, M. F. (1993). Dogmatism and te Persistence of Discredited Beliefs. *Personality and Social Psychology Bulletin, 19*(6), 692-699.

Davies, M. F. (1998). Dogmatism and belief formation: Output interference in the processing of supporting and contradictory cognitions. *Journal of personality and social psychology, 75*(2), 456.

Davis, J. A. (1975). Communism, conformity, cohorts, and categories: American tolerance in 1954 and 1972-73. *American journal of sociology, 81*(3), 491-513.

Deary, I. J., & Johnson, W. (2010). Intelligence and education: causal perceptions drive analytic processes and therefore conclusions. *International journal of epidemiology, 39*(5), 1362-1369.

Dekker, P., & Ester, P. (1987). Working-class authoritarianism: a re-examination of the Lipset thesis. *European Journal of Political Research, 15*(4), 395-415. doi:org/10.1111/j.1475-6765.1987.tb00884.x

Dilchert, S., Ones, D. S., Davis, R. D., & Rostow, C. D. (2007). Cognitive ability predicts objectively measured counterproductive work behaviors. *Journal of Applied Psychology, 92*(3), 616.

Dollinger, M. J., Saxton, T., & Golden, P. A. (1995). Intolerance of ambiguity and the decision to form an alliance. *Psychological Reports, 77*(3_suppl), 1197-1198.

Dorfman, P. W., & Howell, J. P. (1988). Dimensions of national culture and effective leadership patterns: Hofstede revisited. *Advances in international comparative management, 3*(1), 127-150.

Duckitt, J. (2001). A dual-process cognitive-motivational theory of ideology and prejudice. In *Advances in experimental social psychology* (Vol. 33, pp. 41-113): Elsevier.

Duriez, B., & Soenens, B. (2006). Religiosity, moral attitudes and moral competence: A critical investigation of the religiosity-morality relation. *International Journal of Behavioral Development, 30*(1), 76-83.

Duriez, B., & Van Hiel, A. (2002). The march of modern fascism. A comparison of social dominance orientation and authoritarianism. *Personality and Individual Differences, 32*(7), 1199-1213.

Dynes, W. (1967). Education and tolerance: An analysis of intervening factors. *Social Forces, 46*(1), 22-34.

Eagly, A. H., & Johnson, B. T. (1990). Gender and leadership style: A meta-analysis. *Psychological Bulletin, 108*(2), 233.

Ehrlich, H. J., & Bauer, M. L. (1966). The correlates of dogmatism and flexibility in psychiatric hospitalization. *Journal of consulting psychology, 30*(3), 253.

Endres, M. L., Chowdhury, S., & Milner, M. (2009). Ambiguity tolerance and accurate assessment of self-efficacy in a complex decision task. *Journal of Management & Organization, 15*(1), 31-46.

Eynon, G., Hills, N. T., & Stevens, K. T. (1997). Factors that influence the moral reasoning abilities of accountants: Implications for universities and the profession. *Journal of business ethics, 16*(12-13), 1297-1309.

Falch, T., & Sandgren Massih, S. (2011). The effect of education on cognitive ability. *Economic Inquiry, 49*(3), 838-856. doi:org/10.1111/j.1465-7295.2010.00312.x

Farh, J.-L., Hackett, R. D., & Liang, J. (2007). Individual-level cultural values as moderators of perceived organizational support–employee outcome relationships in China: Comparing the effects of power distance and traditionality. *Academy of Management Journal, 50*(3), 715-729.

Feldman, K. A., & Newcomb, T. M. (1969). *The impact of college on students*. Piscataway, NJ, US: Transaction Publishers.

Feldman, S., & Johnston, C. (2014). Understanding the determinants of political ideology: Implications of structural complexity. *Political Psychology, 35*(3), 337-358.

Fletcher, J. K., & Kaufer, K. (2003). Shared leadership. *Shared leadership: Reframing the hows and whys of leadership*, 21-47.

Folger, R. (1998). Fairness as moral virtue. In *Managerial ethics* (pp. 23-44): Psychology Press.

Freud, S. (1923). The ego and the id. Standard Edition, 19. In: London: Hogarth Press.

Furnham, A. (1994). A content, correlational and factor analytic study of four tolerance of ambiguity questionnaires. *Personality and Individual Differences, 16*(3), 403-410.

Furnham, A., & Marks, J. (2013). Tolerance of ambiguity: A review of the recent literature. *Psychology, 4*(09), 717.

Furnham, A., & Ribchester, T. (1995). Tolerance of ambiguity: A review of the concept, its measurement and applications. *Current psychology, 14*(3), 179-199.

Gabriel, S., Carvallo, M., Dean, K. K., Tippin, B., & Renaud, J. (2005). How I see me depends on how I see we: The role of attachment style in social comparison. *Personality and Social Psychology Bulletin, 31*(11), 1561-1572.

Geller, G., Tambor, E. S., Chase, G. A., & Holtzman, N. A. (1993). Measuring physicians' tolerance for ambiguity and its relationship to their reported practices regarding genetic testing. *Medical care*, 989-1001.

Gerteis, J. (1998). Political Alignment and the American Middle Class, 1974-1994. *Sociological Forum, 13*(4), 639-666.

Ghosh, D., & Ray, M. R. (1997). Risk, ambiguity, and decision choice: Some additional evidence. *Decision Sciences, 28*(1), 81-104.

Gonzalez-Mulé, E., Mount, M. K., & Oh, I.-S. (2014). A meta-analysis of the relationship between general mental ability and nontask performance. *Journal of Applied Psychology, 99*(6), 1222.

Gottfredson, L. S. (1997). Why g matters: The complexity of everyday life. *Intelligence, 24*(1), 79-132.

Greenwald, A. G. (1980). The totalitarian ego: Fabrication and revision of personal history. *American Psychologist, 35*(7), 603.

Gross, N., & Fosse, E. (2012). Why are professors liberal? *Theory and Society, 41*(2), 127-168.

Gupta, P. P., & Fogarty, T. J. (1993). Governmental auditors and their tolerance for ambiguity: An examination of the effects of a psychological variable. *The Journal of Government Financial Management, 42*(3), 25.

Gustafsson, J.-E. (2001). Schooling and intelligence: Effects of track of study on level and profile of cognitive abilities. *International Education Journal, 2*(4).

Harding, N., & Ren, M. (2007). The importance in accounting of ambiguity tolerance at the national level: Evidence from Australia and China. *Asian Review of Accounting, 15*(1), 6-24.

Heaven, P. C., & Bucci, S. (2001). Right-wing authoritarianism, social dominance orientation and personality: An analysis using the IPIP measure. *European Journal of Personality, 15*(1), 49-56.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*: Sage publications.

Hunter, J. E. (1986). Cognitive ability, cognitive aptitudes, job knowledge, and job performance. *Journal of Vocational Behavior, 29*(3), 340-362.

Hunter, J. E., & Schmidt, F. L. (1996). Intelligence and job performance: Economic and social implications. *Psychology, Public Policy, and Law, 2*(3-4), 447.

Hunter, S., Harris, M. B. C., & Trusty, J. (1998). Relationships Among Dogmatism, Family Ideology, and Religiosity in Master's-Level Counseling Students. *Counseling and Values, 43*(1), 70-77.

Hyman, H. H., & Wright, C. R. (1979). Education's lasting influence on values.

Jencks, C., Smith, M., Acland, H., Bane, M. J., Cohen, D., & Gintis, H. (1972). *Inequality: A reassessment of the effect of family and schooling in America*. New York Harper Colophon Books.

Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003). Political conservatism as motivated social cognition. *Psychological Bulletin, 129*(3), 339.

Judge, T. A., Thoresen, C. J., Pucik, V., & Welbourne, T. M. (1999). Managerial coping with organizational change: A dispositional perspective. *Journal of Applied Psychology, 84*(1), 107.

Keenan, A. (1978). Selection interview performance and intolerance of ambiguity. *Psychological Reports, 42*(2), 353-354.

Kelley, R. E. (1988). In praise of followers. *Harvard business review*(November-Decembe), 142-148.

Kelley, R. E. (1992). *The power of followership: How to create leaders people want to follow, and followers who lead themselves*: Broadway Business.

Kim, T.-Y., & Kim, M. (2013). Leaders' moral competence and employee outcomes: The effects of psychological empowerment and person–supervisor fit. *Journal of business ethics, 112*(1), 155-166.

Kipnis, D., Schmidt, S. M., & Wilkinson, I. (1980). Intraorganizational influence tactics: Explorations in getting one's way. *Journal of Applied Psychology, 65*(4), 440.

Kohlberg, L. (1964). Development of moral character and moral ideology. *Review of child development research, 1*, 381-431.

Kohlberg, L. (1969). *Stage and sequence; The cognitive-developmental approach to socialization*.

Kohn, M. L., & Schooler, C. (1969). Class, occupation, and orientation. *American Sociological Review, 34*(5), 659-678. doi:10.2307/2092303

Kruglanski, A. W. (2004). *The psychology of closed-mindedness*. New York: Psychology Press.

Kruglanski, A. W. (Ed.) (1990). *Motivations for judging and knowing: Implications for causal attribution* (Vol. 2). New York, NY, US: Guilford Press.

Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind:" Seizing" and" freezing.". *Psychological review, 103*(2), 263.

Kruglanski, A. W., Webster, D. M., & Klem, A. (1993). Motivated resistance and openness to persuasion in the presence or absence of prior information. *Journal of personality and social psychology, 65*(5), 861.

Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2004). Academic performance, career potential, creativity, and job performance: Can one construct predict them all? *Journal of personality and social psychology, 86*(1), 148.

Lehmann, I. J. (1963). Changes in critical thinking, attitudes, and values from freshman to senior years. *Journal of educational psychology, 54*(6), 305.

Lennick, D., & Kiel, F. (2005). Linking strong moral principles to business success. *Pennsylvania: Wharton School of the University of Pennsylvania*.

LePine, J. A., Colquitt, J. A., & Erez, A. (2000). Adaptability to changing task contexts: Effects of general cognitive ability, conscientiousness, and openness to experience. *Personnel psychology, 53*(3), 563-593.

Lipsitz, L. (1965). Working-class authoritarianism: A re-evaluation. *American Sociological Review, 30*(1), 103-109.

Lopez, F. G., & Brennan, K. A. (2000). Dynamic processes underlying adult attachment organization: Toward an attachment theoretical perspective on the healthy and effective self. *Journal of Counseling Psychology, 47*(3), 283.

Lubinski, D. (2004). Introduction to the special section on cognitive abilities: 100 years after Spearman's (1904)"'General intelligence,'objectively determined and measured". *Journal of personality and social psychology, 86*(1), 96.

Marks, W. (1982). *The idea of lQ*. Washington, DC: University Press of America.

Mayer, R. E. (2002). Rote versus meaningful learning. *Theory into practice, 41*(4), 226-232.

McCrae, R. R., & Costa Jr, P. T. (1994). The stability of personality: Observations and evaluations. *Current directions in psychological science, 3*(6), 173-175.

McCutcheon, A. L. (1985). A latent class analysis of tolerance for nonconformity in the American public. *Public Opinion Quarterly, 49*(4), 474-488.

McKeough, A., & Sanderson, A. (1996). Teaching storytelling: A microgenetic analysis of developing narrative competency. *Journal of Narrative and Life History, 6*(2), 157-192.

Merrotsy, P. (2013). Tolerance of ambiguity: a trait of the creative personality? *Creativity Research Journal, 25*(2), 232-237.

Moore, L. M., & Ovadia, S. (2006). Accounting for Spatial Variation in Tolerance: The Effects of Education and Religion. *Social Forces, 84*(4), 22058-22222.

Morgeson, F. P., Delaney-Klinger, K., & Hemingway, M. A. (2005). The importance of job autonomy, cognitive ability, and job-related skill for predicting role breadth and job performance. *Journal of Applied Psychology, 90*(2), 399.

Nahum-Shani, I., & Somech, A. (2011). Leadership, OCB and individual differences: Idiocentrism and allocentrism as moderators of the relationship between transformational and transactional leadership and OCB. *The leadership quarterly, 22*(2), 353-366.

Neisser, U., Boodoo, G., Bouchard Jr, T. J., Boykin, A. W., Brody, N., Ceci, S. J., . . . Sternberg, R. J. (1996). Intelligence: Knowns and unknowns. *American Psychologist, 51*(2), 77.

Nisbett, R. E., Aronson, J., Blair, C., Dickens, W., Flynn, J., Halpern, D. F., & Turkheimer, E. (2012). Intelligence: new findings and theoretical developments. *American Psychologist, 67*(2), 130.

Norr, J. L., & Crittenden, K. S. (1975). Evaluating college teaching as leadership. *Higher Education, 4*(3), 335-350.

Palmer, D. L., & Kalin, R. (1991). Predictive validity of the dogmatic rejection scale. *Personality and Social Psychology Bulletin, 17*(2), 212-212.

Pascarella, E. T., Edison, M., Nora, A., Hagedorn, L. S., & Terenzini, P. T. (1996). Influences on students' openness to diversity and challenge in the first year of college. *The Journal of Higher Education, 67*(2), 174-195.

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students: Findings and insights from twenty years of research*. San Francisco: : Jossey-Bass.

Pascarella, E. T., & Terenzini, P. T. (2005). *How College Affects Students: A Third Decade* San Francisco: Jossey-Bass.

Petetsen, L. E., & Dietz, J. (2000). Social Discrimination in a Personnel Selection Context: The Effects of an Authority's Instruction to Discriminate and Followers' Authoritarianism. *Journal of Applied Social Psychology, 30*(1), 206-220.

Phye, G. D. (Ed.) (1997). *Handbook of classroom assessment*. San Diego: Academic Press.

Pierro, A., De Grada, E., Raven, B., & Kruglanski, A. (2004). Fonti, antecedenti e conseguenti del potere in contesti organizzativi: l'interpersonal power/interaction model. *Potere e Leadership. Teorie, metodi e applicazioni*, 33-58.

Pierro, A., Kruglanski, A. W., & Raven, B. H. (2012). Motivational underpinnings of social influence in work settings: Bases of social power and the need for cognitive closure. *European Journal of Social Psychology, 42*(1), 41-52.

Pierro, A., Mannetti, L., De Grada, E., Livi, S., & Kruglanski, A. W. (2003). Autocracy bias in informal groups under need for closure. *Personality and Social Psychology Bulletin, 29*(3), 405-417.

Podolskiy, O. (2005). Investigating new ways to study adolescent moral competence. *Europe's Journal of Psychology, 1*(4).

Rattazzi, A. M. M., Bobbio, A., & Canova, L. (2007). A short version of the Right-Wing Authoritarianism (RWA) Scale. *Personality and Individual Differences, 43*(5), 1223-1234.

Raven, B. H. (1992). A power/interaction model of interpersonal influence: French and Raven thirty years later. *Journal of Social Behavior & Personality*.

Raven, B. H. (1993). The bases of power: Origins and recent developments. *Journal of social issues, 49*(4), 227-251.

Raven, B. H., Schwarzwald, J., & Koslowsky, M. (1998). Conceptualizing and measuring a power/interaction model of interpersonal influence 1. *Journal of Applied Social Psychology, 28*(4), 307-332.

Rest, J. R., Narvaez, D., Thoma, S. J., & Bebeau, M. J. (1999). DIT2: Devising and testing a revised instrument of moral judgment. *Journal of educational psychology, 91*(4), 644.

Ridings, W. J., & McIver, S. B. (1997). *Rating the Presidents: A Ranking of US Leaders, from the Great and Honorable to the Dishonest and Incompetent*: Carol Publishing Group.

Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies. *Psychological Bulletin, 132*(1), 1.

Rokeach, M. (1954). The nature and meaning of dogmatism.

Rokeach, M. (1960). The open and closed mind: Investigations into the nature of belief systems and personality systems.

Salgado, J. F., Anderson, N., Moscoso, S., Bertua, C., De Fruyt, F., & Rolland, J. P. (2003). A meta-analytic study of general mental ability validity for different occupations in the European community. *Journal of Applied Psychology, 88*(6), 1068.

Salyer, J. (1995). Environmental turbulence. Impact on nurse performance. *The Journal of nursing administration, 25*(4), 12-20.

Sapir, E. (1934). The Emergence of the Concept of Personality in a Study of Cultures. *The Journal of Social Psychology, 5*(3), 408-415.

Schmidt, F. L., & Hunter, J. E. (2004). General mental ability in the world of work: occupational attainment and job performance. *Journal of personality and social psychology, 86*(1), 162.

Schmidt, F. L., Ones, D. S., & Hunter, J. E. (1992). Personnel selection. *Annual review of psychology, 43*(1), 627-670.

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of educational psychology, 82*(3), 498.

Schubert, A.-L., Hagemann, D., & Frischkorn, G. T. (2017). Is general intelligence little more than the speed of higher-order processing? *Journal of Experimental Psychology: General, 146*(10), 1498.

Schwenk, C. R. (1982). Effects of inquiry methods and ambiguity tolerance on prediction performance. *Decision Sciences, 13*(2), 207-221.

Shah, J. Y., Kruglanski, A. W., & Thompson, E. P. (1998). Membership has its (epistemic) rewards: need for closure effects on in-group bias. *Journal of personality and social psychology, 75*(2), 383.

Shuell, T. J. (1990). Phases of meaningful learning. *Review of educational research, 60*(4), 531-547.

Son Hing, L. S., Bobocel, D. R., Zanna, M. P., & McBride, M. V. (2007). Authoritarian dynamics and unethical decision making: high social dominance orientation leaders

and high right-wing authoritarianism followers. *Journal of personality and social psychology, 92*(1), 67.

Spearman, C. (1904). " General Intelligence," objectively determined and measured. *The American Journal of Psychology, 15*(2), 201-292.

Stadler, M., Becker, N., Gödker, M., Leutner, D., & Greiff, S. (2015). Complex problem solving and intelligence: A meta-analysis. *Intelligence, 53*, 92-101.

Stouffer, S. A. (1963). *Communism, Conformity, and Civil Liberties*. Gloucester, MA: Peter Smit.

Sung, S. Y., Antefelt, A., & Choi, J. N. (2015). Dual effects of job complexity on proactive and responsive creativity: Moderating role of employee ambiguity tolerance. *Group & Organization Management, 42*(3), 1-31. doi:10.1177/1059601115619081

Tatzel, M. (1980). Tolerance for ambiguity in adult college students. *Psychological Reports, 47*(2), 377-378.

Teoh, H. Y., & Foo, S. L. (1997). Moderating effects of tolerance for ambiguity and risktaking propensity on the role conflict-perceived performance relationship: Evidence from Singaporean entrepreneurs. *Journal of business Venturing, 12*(1), 67-81.

Thorne, L. (1999). The influence of social interaction on auditors' moral reasoning.

Thoroughgood, C. N., Padilla, A., Hunter, S. T., & Tate, B. W. (2012). The susceptible circle: A taxonomy of followers associated with destructive leadership. *The leadership quarterly, 23*(5), 897-917.

Timming, A. R., & Johnstone, S. (2015). Employee silence and the authoritarian personality: A political psychology of workplace democracy. *International Journal of Organizational Analysis, 23*(1), 154-171.

Uhl-Bien, M., Riggio, R. E., Lowe, K. B., & Carsten, M. K. (2014). Followership theory: A review and research agenda. *The leadership quarterly, 25*(1), 83-104.

Van Dyne, L., & LePine, J. A. (1998). Helping and voice extra-role behaviors: Evidence of construct and predictive validity. *Academy of Management Journal, 41*(1), 108-119.

Vogt, W. P. (1997). *Tolerance & education: Learning to live with diversity and difference*: Sage Publications, Inc.

Vroom, V. H. (1959). Some personality determinants of the effects of participation. *The Journal of Abnormal and Social Psychology, 59*(3), 322-327. doi:org/10.1037/h0049057

Walumbwa, F. O., & Lawler, J. J. (2003). Building effective organizations: Transformational leadership, collectivist orientation, work-related attitudes and withdrawal behaviours in three emerging economies. *International journal of human resource management, 14*(7), 1083-1101.

Walumbwa, F. O., Lawler, J. J., & Avolio, B. J. (2007). Leadership, individual differences, and work-related attitudes: A cross-culture investigation. *Applied psychology, 56*(2), 212-230.

Webster, D. M., & Kruglanski, A. W. (1994). Individual differences in need for cognitive closure. *Journal of personality and social psychology, 67*(6), 1049.

Weed, S. E., Mitchell, T. R., & Moffitt, W. (1981). Leadership style, subordinate personality and task type as predictors of performance and satisfaction with supervision. In *Psychology and Industrial Productivity* (pp. 123-140): Springer.

Weil, F. D. (1985). The variable effects of education on liberal attitudes: A comparative-historical analysis of anti-Semitism using public opinion survey data. *American Sociological Review*, 458-474.

Weissenstein, A., Ligges, S., Brouwer, B., Marschall, B., & Friederichs, H. (2014). Measuring the ambiguity tolerance of medical students: a cross-sectional study from the first to sixth academic years. *BMC family practice, 15*(1), 6.

Williams, J. A. (1966). Regional differences in authoritarianism. *Social Forces*, 273-277.

Williams Jr, J. A., Nunn, C. Z., & Peter, L. S. (1976). Origins of tolerance: Findings from a replication of Stouffer's Communism, conformity, and civil liberties. *Social Forces, 55*(2), 394-408.

Wilson, G. D. (1973). A dynamic theory of conservatism.

Yukl, G. (1971). Toward a behavioral theory of leadership. *Organizational behavior and human performance, 6*(4), 414-440.

Yukl, G., & Falbe, C. M. (1991). Importance of different power sources in downward and lateral relations. *Journal of Applied Psychology, 76*(3), 416.

Article 3:

Knowledge Workers: How Are They Different? (And Why Does It Matter?)

Issahaka A. W. and Lines, R. (2019)
Norwegian school of economics

Knowledge Workers: How Are They Different? (And Why Does It Matter?)

Abdallah Wumpini Issahaka
Norwegian School of Economics

Rune Lines
Norwegian School of Economics

In this study, we integrate research in educational psychology, a field that partly has focused on the global effects of higher education on individuals to conceptualize and test a model that explains how knowledge workers can be thought to differ from other groups of workers. Conceptualizing a common constellation of personality dispositions associated with knowledge workers (i.e., ambiguity tolerance, need for closure, dogmatism, authoritarianism, and cognitive ability), we propose multiple outcome pathways by which individual-level education affects the five personality traits under study. Based on a nest5ed sample of 351 employees across 54 workgroups, the results were consistent with our predictions.

Keywords: Knowledge workers, education effects, psychosocial changes

INTRODUCTION

With the shift into a knowledge economy, management scholars and practitioners alike (Alvesson, 2001; Darr & Warhurst, 2008; Drucker, 1959, 1999; Kelloway & Barling, 2000), emphasize the growing importance of knowledge and knowledge work processes in value-creation. A growing body of research demonstrates the crucial role of highly skilled professionals to engage in knowledge work processes, and therefore suggests that knowledge workers, individuals in whose heads knowledge resides, are assets to be valued, stimulated and managed in an organization (e.g., Tompoe, 1993; Stewart and Ruckdeschel, 1998; Drucker, 2002; Bogdanowicz and Bailey, 2002; Lewis, Agaewal and Sambamurthy, 2003; Davenport, 2005).

The knowledge economy describes a new wave of development in global economic restructuring away from the industrial revolution age (Blair, 1998; OECD, 2001; Reich, 1993). Knowledge has substituted manual work as a base for industrial production. This evolution has created an increasing workforce of highly skilled professionals, called knowledge workers (Machlup, 1962; Noyelle, 1990; Stanback, 1979); a vibrant innovation landscape (Bell, 1973; Drucker, 1993; Nonaka & Takeuchi, 1995; Prusak, 2009; Von Nordenflycht, 2010); and the emergence of knowledge-based organizations (Bell, 1973, 1979; Davenport, Thomas, & Cantrell, 2002; Drucker, 1959; Mandt, 1978). Indeed, the basis for competitive advantage now depends more on employee creativity and intellectual capabilities to produce and distribute novel ideas. Hence, the need for greater reliance on intellectual capabilities for sustainable economic growth and to achieve the primary management task of value creation cannot be overemphasized (Bettis & Hitt, 1995; Conner & Prahalad, 1996; Hitt, Keats, & DeMarie, 1998; Powell & Snellman, 2004).

The research attention on knowledge workers is growing alongside the rhetoric of 'knowledge management,' 'leadership,' and 'human resource management' explicitly devoted to understanding knowledge workers and finding pathways to manage them effectively. Based on a literature review, we distinguish between two broadly observed approaches that define and conceptualize knowledge workers. The first is from authors (Drucker, 1994; Hislop, 2008; Benson and Brown, 2007; Darr and Warhurst, 2008) that identify with a 'job-content' approach, in which focus is on what knowledge workers do and the activities in which they are engaged. The second, as exemplified by Davenport and colleagues (Davenport et al., 2002), espouse a viewpoint that focuses on prerequisite qualities, skills, and capabilities necessary for an individual to handle knowledge work in a primary role. A commonly associated attribute is that of their high education and expertise skills. For example, consultants (Donnelly, 2009), medical professionals (Mastekaasa, 2011), and accountants (Von Nordenflycht, 2010) are considered to be professional persons (i.e., knowledge workers) with a high degree of formal education and knowledge expertise.

Under the job-content approach, at least three lines of studies are identified. The first line of research, dating back to the 1960s, focused on the rise of knowledge-intensive industries/firms. 'Occupation-driven analysis' dominates this stream of research towards an understanding of knowledge workers (Darr & Warhurst, 2008, p. 26). A shared ideology among scholars using this concept is the level of sophistication and intensive use of knowledge associated with the job (Alvesson, 2001; Hunter, Beaumont, & Lee, 2002; Robertson & Swan, 2003). Professions conceptualized under this category include scientists and engineers (Beaumont & Hunter, 2002; Quinn, 2005), lawyers (Hunter et al., 2002), accountants (Morris & Empson, 1998), and information technology and software workers (Choi & Varney, 1995; Swart & Kinnie, 2003). The second line of studies focused on the emergence of new kinds of jobs and novel forms of work organization. These studies argue that knowledge work is not restricted to a handful of industries but is more widespread, involving a series of changes to the nature of work (activities). Knowledge work is designed to encourage job autonomy, decentralization, teams, and networks. The third line of studies focused on the role of learning and continuous innovation within firms. This approach describes knowledge work in terms of individuals' outcomes as opposed to job characteristics. It emphasizes value creation mediated by creativity and innovation as a core element to identifying knowledge work (e.g., Wikström & Norman, 1994). A focus on the nature of individual workplace outcomes deviates from the occupation-driven analysis towards a consideration of what an individual contributes (Kelloway and Barling, 2000: 290). That is, the output of individuals within knowledge work must represent creativity, innovation, and value creation (Maruta, 2012).

However, conceptual unclarity plagues the job-content approach and seemingly accounts for the lack of consensus on how knowledge workers should be defined and understood. Research discussions on the definition and '*images*' of knowledge workers have largely remained conceptual and draw upon a loose consortium of propositions derived from the literature on the 'knowledge economy,' 'know-work processes' and 'knowledge-based organizations.' As such, many studies end up listing professions or industries taken as examples of knowledge workers, knowledge work, and knowledge-based organizations. Systematic empirical research on the concept of knowledge workers is scarce. Hence, contributions to knowledge work/er research demonstrate little in the way of common theoretical underpinnings to guide its development.

On the other hand, formal education as a defining factor of a knowledge worker has received the unequivocal agreement. Indeed, formal education and experience are seen to be a key input shaping the workforce needed in the knowledge economy. However, the implications of that difference (higher education) are not explicitly studied. It begs the question, how are persons with higher education different from persons similar in other aspects but without (higher) education? A further question is: what are the implications for leadership and management in the context of knowledge workers if we look at them as highly educated individuals? Although a few studies have proposed leadership styles and organizational structures for managing knowledge workers, none is formally grounded on how they are different from other groups of workers. To fill this literature gap, the need for a firmer theoretical background on knowledge workers that can be subjected to rigorous empirical testing is imperative.

As Doty and Glick (1994) exemplified, typologies are a unique form of theory building towards improved understanding and modeling. We utilize typologies to achieve a parsimonious framework that conceptualizes knowledge workers based on a common constellation of individual-difference dispositions associated with knowledge workers and distinguish them from other workers. In this way, our theorizing is enriched by adopting a focus based on individual-level dispositional tendencies associated with (higher) education. Defining knowledge workers as highly educated individuals, we draw on the body of research in educational psychology to propose and test a model that clarifies a dispositional view of education-effects on individuals. That is, we identify personality traits and dispositional tendencies that distinguish groups of individuals that are similar in many aspects but differ on educational level.

The remainder of the paper is structured as follows. The next section describes the theoretical framework and hypotheses. Adopting typologies as theory-building tools, we review the developmental theories of student change to identify and discuss the elicitation of personality dispositions as a response to college effects (education) and also examine, the contextual role of aging and organizational structures on the relationship between education and personality dispositions in a workplace setting. The research method and results follow next. Lastly, the contributions and implications of this research and directions for future research are discussed.

THEORY AND HYPOTHESES

Theories and Models of Student Development
The importance of education in shaping attitudes, values, and norms has, for a long time, received acknowledgment among social scientists. Student development refers to "the ways that a student grows, progresses, or increases [their] developmental capabilities as a result of enrollment in an institution of higher education" (Rodgers, 1990: 27). Theories of student development and change has been conceptualized in at least three related clusters: as developmental theories of student change (e.g., Chickering, 1969; Perry, 1970, 1981) –addresses the nature, structure, and processes of individual human growth; as college impact models (e.g., Alexander W Astin, 1984; Alexander William Astin, 1985; Pascarella, 1985; Tinto, 1975, 1987) emphasizing change associated with characteristics of the institutions students attend (between-college effects) or with the experience students have while enrolled (within-college effects); and as socialization models (e.g., Kaufman & Feldman, 2004) to understand the origins of change in students external rather than internal worlds.

In this study, we take the first family of theories focused primarily on the nature and content of intraindividual change and "view development as a general movement towards greater differentiation, integration, and complexity in the ways that individuals think and behave" (Pascarella and Terenzine, 2005: 19). Often, the movement is seen as orderly, sequential and hierarchical (usually across the life span), passing through ever higher and more complex stages that are to some extent age-related (Pascarella & Terenzini, 1991, 2005). Several taxonomies of developmental theories exist, each with its advantages. In a comprehensive review of theories and models of student development, Pascarella and Terenzini (1991; 2005) accommodate the growth of identity theories by adopting and revising the four-category structure initiated by Knefelkamp, Widick, and Parker (1978) and revised by Rodgers (1989). The four clusters of theories are psychosocial development theories, cognitive-structural theories, typological models, and Person-environment interaction theory and models.

Psychosocial Theories
Psychosocial theories emphasize the self-reflective and interpersonal dimensions of students' lives. It views individual development essentially as a sequential process that involves the accomplishment of a series of developmental tasks. This family of theories asserts that the nature of tasks and challenges is influenced in part, as a consequence of age progression and, partly as a consequence of sociocultural (environmental) influences. Influential theories within psychosocial theories include Chickering's (1969) theory of identity development (i.e., seven vectors of student development); Erikson (1959; 1963, 1968) identity models; Marcia's (1964; 1966) model of ego identity status; and Heath's maturity model (1978;

1968). These theories describe how students' perspectives of their own identity and society evolve through the conflicts and challenges they experience. Hence, the underlying core values are conflict, independence, interdependence, and autonomy.

Cognitive-Structural Theories

Cognitive-structural theories seek to describe the process of change. Change refers to alterations that occur over time in students' internal cognitive or affective characteristics (Pascarella and Terenzini, 1991: 16). This family of theories explains how students think, reason, organize, and make meaning of their experiences. Complimentary to the psychosocial theory, "One describes what students will be concerned about and what decisions will be primary; the other suggests how students will think about those issues and what shifts in reasoning will occur" (Knefelkamp, Widick, & Parker, 1978 p. xii). A shared assertion by cognitive-structural theories is that individuals go through a sequential process, with cognitive development unfolding by stages as students build upon past experiences. Also, the cognitive development process is considered hierarchical, and the progression is irreversible.

Perry's (1970, 1981) theory of intellectual development identified describes the typical course of development of student's patterns of thoughts. It is a stage model of students moving through nine sequential positions in four general categories. The sequential stages are dualism, multiplicity, relativism, and commitment in relativism. Perry's model illustrates a "logical order in which one form leads to another through differentiation and reorganizations required for the meaningful interpretation of increasingly complex experience" (1970: 3). Thus, one is not capable of understanding anything that more than one step beyond where they are, and that cognitive development is promoted by encounter with difference and diversity.

Another cognitive "stage" theory is Kohlberg's theory of moral development (1969, 1972, 1981, 1984). Away from Perry's approach focused on cognitive and ethical growth, Kohlberg's theory of moral development explains how students' ability to reason affects their behavior and conduct. The theory describes six stages of moral development categorized into three levels of moral reasoning. Sequential progression from a pre-conventional level, to conventional level, and to post-conventional level requires students to go through moral conflicts and to develop a sense of personal responsibility for their actions and ultimately for a morally just society. Kohlberg's work has inspired new theories by subsequent researchers (cf. Gilligan, 1977; Loevinger, 1976). Theories in development of college students' ethics, faith, and spirituality have arisen from Kohlberg's work. Overall, teaching, learning, reflection, change, and empathy are the values that underlie many cognitive-structural theories.

Typological Models

Typological models emphasize distinct but relatively stable differences among individuals. These models categorize individuals into groups according to some distinctive characteristics, such as personality (see Myers, 1976; Myers, McCaulley, & Most, 1985). There are several commonalities among "type" models. First, preferences or styles that characterize individuals and differentiate them are assumed to develop relatively early in life and to remain comparatively stable, although not invariant, over time. Second, an individual may demonstrate characteristics indicative of other types within the taxonomy but tend to think or behave in ways consistent with the distinctive features or preferences of the dominant type. Third, type categories describe areas of preference or tendencies that people have in common, but they do not explain idiosyncratic differences. That is, it emphasizes a focus on the intraindividual structure of personality, and encourages a consideration of the constellation of personality characteristics at an individual level. According to Rodgers, they constitute "various tracts of wholeness," 'zipcode' areas within which they grow and develop (1989: 153). Finally, these models generally do not attempt to explain either the content or processes of change or development in students (Pascarella and Terenzini, 2005:46).

Nonetheless, typological models are useful in understanding differences between individuals based on education and in illuminating why educated individuals may respond in ways different from other groups of individuals without college experience. Thus, type theories provide conceptual clarity to characterizing groups of individuals by shared traits. Efficiently collapsing across a broad range of descriptors into a

concise typology gives insight into the underlying etiology driving the relationship among the traits, thus delivering a richer and more coherent theory of personality.

Person-Environment Interaction Models

Person-environment interaction models focus in detail on how the environment influences behavior through its interactions with individuals' characteristics. Differently stated, these theories describe how student's behavior and growth are directly affected by the educational environment. Like the typology models, they do not explain the nature of processes of student development but identify some origins of behavior and provide frameworks for discussing student change and college effects.

These theories identify substantive and process features associated with highly educated individuals, and by extension, knowledge workers. These theories guide our selection of potentially important and theoretically grounded variables. As such, we will draw attention to the prominent ones among them. The section that follows, therefore, explicate conceivable links between conceived stable individual-difference personality dispositions and collage effect (i.e., education), to form a personality-based concept of knowledge workers. Indeed, a small but growing number of studies have aimed to capture the human spark of education by reconceiving educational impact as dispositional in nature, rather than abilities-centric (e.g., Ennis, 1991; D. Perkins, Tishman, Ritchhart, Donis, & Andrade, 2000; D. N. Perkins, Jay, & Tishman, 1993), although not specific to a knowledge worker context.

How are persons with higher education different: A dispositional view

In this section, we discuss "acquired or nurtured" individual-difference tendencies that are, in part, an outcome of education effects. Without asserting an exhaustive set of dispositional tendencies, what follows is a discussion of identified dimensions on which group-differences based on education level (knowledge workers versus non-knowledge workers) can be established. The identified dimensions (authoritarianism, ambiguity tolerance, dogmatism, need for closure, and cognitive ability) serves to illuminate how education effects present a new humanistic way of thinking about knowledge workers and how they are different. The distinction between treatment effects and selection effects is a concern among social scientists. Thus, although we ground our discussion in the available evidence, it is hard to distinguish the case of treatment effects for identified dispositions, but there is some support that selection effects are partly responsible for what appears as group differences in cognitive ability or education effects.

Authoritarianism

Authoritarianism (Bob Altemeyer, 1998) is a personal disposition conceptualized as a syndrome composed of three interrelated attitude clusters: authoritarian submission (a tendency towards uncritical submission to authorities), authoritarian conventionalism (strict adherence to conventional norms and values), and authoritarian aggression (feelings of aggression towards norm violators) (Rattazzi, Bobbio, & Canova, 2007). A long history of research in political psychology has focused on better understanding the antecedents and consequences of authoritarianism. From its early days, this research has explored the role played by education in reducing the tendency towards authoritarianism. The earlier studies of this issue consistently reported a negative relationship between the level of education and authoritarianism (Kohn, 1969; Lipsitz, 1965; Williams, 1966). It seems that any authoritarian tendencies in an individual were reduced or alleviated as a consequence of attending higher education (e.g. a college). Although subsequent research has shown that the strength level of education effect seems to depend on factor such as the content of the educational program (e.g. which subject major), and national culture (Dekker & Ester, 1987), the majority of the evidence still supports the existence of a direct negative relationship between level of education and authoritarianism. Hence, we propose that:

Hypothesis 1a. The education level of individuals relates negatively to authoritarian disposition.

Tolerance for ambiguity

Budner (1962) defines tolerance for ambiguity as the tendency to "perceive ambiguous situations as desirable" and intolerance for ambiguity as "the tendency to perceive ambiguous situations as a source of threat." As a personality variable, ambiguity has been associated with positive traits, such as openness to new ideas and originality (Tatzel, 1980). On the other hand, ambiguity intolerance is associated with lower mental flexibility and negative personality traits, such as conformity, mental rigidity, and ethnic prejudice (Weissenstein, Ligges, Brouwer, Marschall, & Friederichs, 2014, p. 1). This implies that individual-level traits, such as uncertainty orientation, complexity, unfamiliarity and a predisposition to risk-taking are correlates of ambiguity tolerance. In the context of educational psychology, meaningful learning empowers students to gain problem-solving skills (Mayer, 2002; McKeough & Sanderson, 1996; Phye, 1997) and can solve new and ambiguous problems (Shuell, 1990).

According to (Hauser, 1970), less education and fundamentalist religious affiliations are part of individual characteristics associated with lower tolerance ((Moore & Ovadia, 2006, p. 2206): 2206). In terms of evidence, there is a consistent positive relationship between an individual's education level and tolerance. (Bobo & Licari, 1989; Davis, 1975; Dynes, 1967; Hyman & Wright, 1979; Stouffer, 1963; Weil, 1985; Williams Jr, Nunn, & Peter, 1976). The positive relationship between an individual's education level and tolerance is one of the most consistently documented results in the empirical research (Bobo & Licari, 1989; Davis, 1975; Dynes, 1967; Hyman & Wright, 1979; Stouffer, 1963; Weil, 1985; Williams Jr et al., 1976).

Through education, a tolerance-producing setting is created as individuals are exposed to values and ideas that may differ from those they uphold (Stouffer, 1963):127). Thus, (higher) education increases one's knowledge of diverse cultures, openness to novel ideas, and willingness to risk uncertainty and ambiguity (Moore & Ovadia, 2006): 2209).

Hypothesis 1b. The education level of individuals relates positively to ambiguity tolerance

Dogmatism

Dogmatism is a stable personal trait that is defined as a relative unchangeable unjustified certainty (Bob Altemeyer, 2002). In *The Open and Closed Mind*, Rockeach (1990) suggested that dogmatism reflects a deficit in integrating information that threatens multiple prior beliefs into a new belief system. Dogmatism, derived from social psychological theory, is a determinant of closed-mindedness, conformity, myopia, and self-righteousness. Research has shown that more dogmatic individuals show greater persistence of a belief after the evidence that formed the belief has been discredited (Martin F Davies, 1993), and they tend to ignore information that does not support their prior beliefs (Martin F Davies, 1998). Other studies have suggested an association between dogmatism and rigid problem-solving behavior and high resistance to change over the short-term and long-term (Ehrlich & Bauer, 1966 p. 253).

Educational experiences can broaden an individual's experience base, which encourages an open-minded personality to new experiences and consideration of alternative viewpoints and new experiences (Pascarella, Edison, Nora, Hagedorn, & Terenzini, 1996; Vogt, 1997). As students attain higher levels of education, their beliefs towards learning become more sophisticated and develop a mind richly grounded in intellectual virtues. According to (Schommer, 1990), university students tend to have more sophisticated beliefs than junior college students. Hence, the available evidence supports a negative relationship between higher educated and dogmatism.

Hypothesis 1c. The education level of individuals relates negatively to dogmatism tendencies

Need for cognitive closure

Need for cognitive closure, or simply need for closure (NFC) is defined as the preference for "an answer to a given topic, any answer compared to confusion and ambiguity" (Arie W Kruglanski, 1990):337). Although the need for closure may vary situationally (Arie W Kruglanski & Freund, 1983), it also represents

a dimension of stable individual differences (Webster & Kruglanski, 1994): 1050). Individuals with high levels of NFC are characterized by strong preferences for order and predictability afforded by stable, secure knowledge that unaffected by circumstances and not challenged by expectations. NFC is associated with a wish to reach firm and swift decisions, a need for decisiveness and a feeling of discomfort with ambiguity (Arie W Kruglanski, 1989, 1990; Richter & Kruglanski, 1998). They also experience solutions with lack of closure as aversive.

In the course of schooling, students inevitably experience ambiguity or confusion as they encounter challenging instructional tasks. It is especially true for students in secondary education, and higher where knowledge encountered is more likely to be increasingly complex, tentative, or controversial (e.g., DeBacker & Crowson, 2009; Kuhn, Black, Keselman, & Kaplan, 2000). Some studies have provided evidence for a positive relationship between need for closure and crystallized knowledge. In terms of evidence, weak to moderate positive correlations have been observed between need for closure and performance in college (e.g.,Cacioppo & Petty, 1982; Jarvis & Petty, 1996). Hence, higher education reduces learners' need for closure.

Hypothesis 1d. The education level of individuals relates negatively to their need for closure

General intelligence/cognitive abilities
General intelligence (g factor) refers to the existence of a broad mental capacity that influences performance on cognitive ability measures (Spearman, 1904). As a broad generalization, individuals high in general intelligence must exhibit domain-independent skills that foreground the presence and effectiveness of cognitive-, and meta- processes (e.g., Baron-Cohen, Leslie, & Frith, 1985; Carroll, 1993) and skills of thinking and learning, such as brainstorming, searching for evidence, and relating new information to old (D. Perkins, 1995). General intelligence remains relatively stable across the life span (Briley & Tucker-Drob, 2014)and arguably maintains a mostly similar strength and structure with age (Batterham, Mackinnon, & Christensen, 2011; Gignac, 2014; Tucker-Drob, 2009).

Education is consistently identified as an intelligence-boosting factor. The scientific case for the association between education and general intelligence (cognitive ability) is well established and report a moderate to strong correlation (e.g., Strenze, 2007). Away from debate on the causal relationship between education and intelligence along with the multiple interpretations (see, for example Deary & Johnson, 2010), there is consistent evidence supporting the view that education has a positive, causal effect on general intelligence (Ceci, 1991; Ritchie, Bates, & Deary, 2015; Ritchie & Tucker-Drob, 2018; Spearman, 1904). A recent meta-analysis study (Ritchie & Tucker-Drob, 2018) find consistent evidence for the positive effect of schooling on cognitive abilities of approximately 1 to 5 IQ points for an additional year of education. Also, based on moderation analysis, the authors find the effects persisted across the life span and were persistent in all broad categories of cognitive ability studied. Hence, based on the literature reviewed, education appears to be a consistent and robust method identified for raising intelligence.

Hypothesis 1e. The education level of individuals relates positively to their cognitive ability.

Contextual Moderation

Personality – Environment (Organization) Relationship
As noted above, person-environment interaction models provide frameworks for discussing student change and college effects. With an emphasis on the organizational environment, Strange (2003) views it as systems influenced by organizations' goals, values, activities, which in turn shapes organizational structures. The nature of the environment, thus, depends to some degree on organizations' complexity, centralization, formalization, and hierarchy.

Organizational structures (e.g., *degree of centralization*) form a basis in the design of units that group individuals, their reporting relationships, and the coordinate mechanism that integrate a unit's activities and

resources (Huber, 1991; Moorman, Niehoff, & Organ, 1993). We draw on the Attraction-Selection-Attrition (ASA) theory (Schneider, 1987) to explain how individuals perceive organizational structures as appropriate and relevant to them. The ASA model is person-based, and grounded in the view that organization structures, processes, and culture reflect the collective personality of individuals on a job (Schneider, 1987). The interrelated processes of attraction, selection, and attrition predict organizations as striving for homogeneity; hence, the *homogeneity hypothesis*: that members of the same unit or organization should be more similar in shared personality than members of different organizations. Assuming the homogeneity holds, it suggests that over time, a workgroup's collective personality will be favorably associated with the organization's structures. Therefore, low (*vs*. high) degree of centralization should be favorably associated with the identified non-cognitive individual-level dispositions (cross-level direct effect).

H2a. Centralization is related positively to dogmatism

H2b. Centralization is related positively to authoritarianism

H2c. Centralization is related positively to need for closure

H2d. Centralization is related negatively to ambiguity tolerance

However, organization structure perceptions will not result in the homogenization of traits within the organization or workgroups if perceptions of the structure are idiosyncratic, subjective phenomena (Schaubroeck, Ganster, & Jones, 1998). There are instances individuals find themselves in particular workgroups or organizations for reasons independent of the ASA theory. Quitting one's dissatisfying job is often a more complicated and challenging endeavor that it would appear to be. Such factors, including alternative employment availability and family concerns, for example, are constraints that may limit turnover, thus continuing tenure at an organization. Also, high-tenure individuals may have accumulated more sunk costs, or investments with the organization (Becker, 1960; Meyer & Allen, 1984), making it difficult to leave the organization regardless of organizational structures.

As such, individuals may be more attentive or responsive to organizational structures. It conceivably follows that this inconsistency would be particularly pronounced for those individuals who have been in their work positions for several years. It is our position; therefore, that being unwilling or unable to leave a dissatisfying workplace situation is likely to be more difficult and frustrating for individuals with high education, bent on autonomy, self-actualization, and creative behavior and uncomfortable with centralization, than for those who are indifferent and inert with low education. Therefore, we assert that the interaction between education and structures (i.e., centralization) may result in divergent complex behaviors depending on the individual's tenure on the job (cross-level interactive effects). Given the generally weak theoretical and empirical foundation, we did not formulate specific personality-situation relationships.

Hypothesis 3. Education and centralization interact: the relationship between education and personality is weaker in a centralized organizational structure.

Moderating Role of Age

Thus far, we have suggested that education is associated with some individual-level dispositions – dogmatism, need for closure, authoritarianism, ambiguity tolerance, and cognitive closure. The developmental theories, especially the psychosocial theories, partly attribute student development to age progression. Research on personality and aging (e.g., Caspi & Roberts, 2001; McCrae & Costa Jr, 1994; Roberts, Walton, & Viechtbauer, 2006)reflect a set of characteristic dispositions that determine emotional, interpersonal, experiential, attitudinal and motivational styles. The central issue concerns the extent to which aging processes are responsible for personality change.

Deep level personality changes in adulthood were, for a long time, a controversial issue among psychologists. The classical view held by psychoanalysts (Freud, 1923; Sapir, 1934) was up until recently

that personalities were formed in early years and remained virtually unchanged throughout the subsequent life span. For example, Sapir (1934) explicitly claimed that personality was formed by the age two or three. Freud (1923) argued that identity, ego, and superego were fully developed around age five. Bloom (1964) argued that there was "rapid personality development in the early years of infancy and childhood, the possibility of marked changes in the adolescent period, and the likelihood of small changes during adulthood and maturity" (p. 132-133). However, these earlier students of personality development have little empirical evidence to back up their claims, as very few longitudinal studies had been carried out. Now, and partly based on longitudinal evidence, one consensus is that personality is developing until the age of 30, coinciding with the current view on when the developmental stage of adulthood begins (McCrae & Costa Jr, 1994). In a more recent review of the research evidence, Caspi and Roberts (2001) concluded, "evidence indicates that personality appears to grow increasingly consistent with age to reach a plateau later in life than originally thought (e.g., 50 years). Furthermore, life experiences appear to be related to individual differences in personality change well into the 4th decade of life" (p. 51). Their conclusion is also supported by meta-analyses of more than 90 longitudinal studies of how changes in mean scores on the "Big five" personality traits are related to age (Roberts et al., 2006). Hence, available evidence does not contradict the idea that personal growth experience leads to deep level changes. Differently stated, education and aging, both have a prominent role in an individual's growth process leading to changes in traits that are often seen as crystallized and non-changeable –or the very defining properties of the individual.

Conceptualizing age to account for the personal growth process away from education experiences, the role of other life experiences may dilute the effects of the educational experience. For young individuals, life experiences away from schooling are limited compared to older individuals who are involved in many social, political, and corporate endeavors. These arguments lead us to advance an interactive prediction regarding how aging shape the association between education and personality. Therefore, we propose that age dilutes the effect of education on the constellation of personality dispositions already outlined above.

H4a. Age moderates the education-dogmatism relationship, such that the effect is weaker for aged compared to younger individuals.

H4b. Age moderates the education-need for closure relationship, such that the effect is weaker for aged compared to younger individuals.

H4c. Age moderates the education-authoritarianism relationship, such that the effect is weaker for aged compared to younger individuals.

H4d. Age moderates the education-ambiguity tolerance relationship, such that the effect is weaker for aged compared to younger individuals.

METHODS

Sample and Procedures

A total of 351 employees in 54 workgroups completed the survey for a response rate of 55%. Participants were full-time employees at two organizations (one public enterprise and one large private multinational) in Ghana. The public enterprise operates in the energy sector and is the largest electricity service provider in the country. Data for this study were collected via administering questionnaires during organizations' work time (i.e., lunch shifts). Using a unique identifier, this data set was linked with organizational administrative records, which identified each participant's workgroup, higher entities (i.e., unit, department, division), and immediate leader/supervisor. A workgroup is the smallest core entity in these organizations, consisting of members and their immediate supervisor/leader. For many of the workgroups, members have different responsibilities, yet, share a common goal.

The average workgroup size is 6.5 members, with only two workgroups having a single member. Thirty-four percent of the respondents were female. The average positional tenure was seven years and five

years respectively. The age of respondents ranged from 15 to 78 (mean = 36; standard deviation = 10.56). The respondents' jobs varied from manual labor through clerical to the executive, in such diverse settings as drivers, stores officer, procurement, operations, administration, sales and customer relations, purchasing clerk, engineering, insurance, and accountants. All respondents were informed that their responses would be confidential and used only for research purposes.

Measures

For all measures excluding education and cognitive ability, participants responded on a five-point Likert-type scales ranging from "1= strongly disagree" to "5=strongly agree", unless otherwise stated. All scales were adopted from established measures. Before computing composite scales, exploratory principal components analysis was used on all the multi-item scales to determine item retention. All scales satisfied Bartlett's test for sphericity (correlation matrix test) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy criterions for factorability.

Authoritarianism

Authoritarianism was assessed using seven items (counter-balanced) from Zakrisson (2005) short version of the Right-Wing Authoritarianism scale. Sample items are "Our society would be better off if we showed tolerance and understanding for untraditional values and opinions" and "Our country needs free thinkers, who will have the courage to stand up against traditional ways, even if this upsets the people." The coefficient alpha of the authoritarianism scale was .79.

Cognitive ability:

Cognitive ability was measured with a three-item Cognitive Reflective Test that Frederick (2005) developed and validated. A composite scale is computed as the total number of correct answers on the test.

Need for closure:

We followed Webster and Kruglanski (1994) and operationalized the need for closure as affective discomfort occasioned by ambiguity. Nine items were used. Sample items are "I feel uncomfortable when someone's meaning or intention is unclear to me" and "When I am confused about an important issue, I feel upset." The coefficient alpha of the need for closure scale was .84.

Ambiguity tolerance:

We measured ambiguity tolerance using Kirton (1981) reduced the 7-item scale from the Budner (1962) original 16-item scale of tolerance-intolerance of ambiguity. These 7-items reflect three sub-dimensions: novelty, complexity, and insolubility. Sample items are "An expert who does not come up with a definite answer probably does not know too much" and "A good job is one where what is to be done and how it is to be done are always dear." The coefficient alpha was .80.

Dogmatism

We followed Troldahl and Powell (1965) short form of Rokeach dogmatism scale. Troldahl and Powell suggested that "a researcher who wishes to use a short form of the dogmatism scale needs only to decide how many items he can use. He should then select the first "n" items in the Table 1 as the best set of items to use" (1965:214). Hence, the construct is operationalized with the first five items. Sample items are "In this complicated world of ours, the only way we can know what is going on is to rely on leaders or experts who can be trusted" and "My blood boils whenever a person stubbornly refuses to admit he is wrong." The reduced form scale showed reasonable internal consistency (coefficient alpha was .73).

Education

We measure respondents' highest education level attained. The highest attained education level ranged from primary to post-graduate degrees (e.g., MSc, Ph.D.). Their years of schooling ranged from 6 to 25,

with the largest percentage (52%) stopping their education at the end of college (i.e., 4years degree), and the next largest percentage (20.8%) at the end of high school.

Control variables

Guided by the theoretical framework and review of the relevant literature discussed above, we controlled for demographics (i.e., age, gender, and tenure) and work-related characteristics (i.e., job autonomy and organizational structures such as degree of centralization). Job characteristics scale comprise sub-dimensions as autonomy, skill variety, task identity, task significance, and feedback about results were measured with the Job Diagnostic Survey (Hackman & Oldham, 1975). Internal consistency is .80 (.72). The degree of centralization was assessed using a five-item hierarchy of the authority scale (Hage & Aiken, 1967; Hage & Aiken, 1970). It is intended to measure the degree to which organization members participate in decisions involving the tasks associated with their position (Pennings, 1973: 689). Cronbach's alpha is .83.

RESULTS

Measurement Model and Response Bias Checks

Before testing our hypothesis, we ran a confirmatory factor analysis (CFA) for our measures. We run a series of CFAs for our measures of centralization and the outcome variables (ambiguity tolerance, dogmatism, authoritarianism, and need for closure). The final measurement model fits fairly well: RMSEA=.062, CFI=.866, and SRMR=.054. According to Hu and Bentler (1999), it is often sufficient to rely on SRMR and one of the remaining indexes (i.e., RMSEA, CFI, or NNFI). Thus, our finding is satisfactory under Hu and Bentler (1999) interpretation of fit indexes. All constructs have reliability above .7, which are satisfactory (Nunnally, 1978). "Discriminant validity is achieved if the correlations between factors are less than 1.00 by an amount greater than two standard errors" (Xie, Bagozzi, & Grønhaug, 2015: 344). Our measurement fulfills this condition of discriminant validity. All factor loadings were significant and ranged from .52 to .87.

All personality measures, education, and control variables were accessed at the same time. This research design raises concerns about common method bias (note that this concern is not relevant to the education-personality relationships). Harman's single factor test showed more than a one-factor solution, which seems to suggest that common method bias may not be a problem. Scale items were averaged to form composite variables.

Hypothesis Tests

Descriptive statistics, bivariate correlations, and scale reliabilities are presented in Table 1. Table 1 reveals a statistically significant medium to high correlations ranging from .15 to .67 in absolute terms among the five personality traits under study. The correlations between educational level on one hand and dogmatism, need for closure, ambiguity tolerance, authoritarianism, and cognitive ability, on the other hand, were all significant ($p < .05$). Age, gender, positional tenure, degree of centralization, job autonomy were found to have many significant relationships with the personality trait variables. Hence, we controlled for age, gender, positional tenure, degree of centralization, job autonomy and a dummy variable to account for organization-specific differences for our analyses.

We expect education to predict or explain in different ways, the set of personality dispositions outlined. We conducted a multivariate analysis of variance (MANOVA) using personality constructs as dependent variable and education as a categorical independent variable. Table 2 report MANOVA results were statistically significant, and intraclass correlation ICC(1) values were greater than .12. That is, the two views on education and set of personality traits are closely related: the best linear combination of the personality traits is correlated at almost 0.60 with the best linear combination of education. All the associated tests were significantly rejecting the null hypothesis that the two sets of variables are not linearly related. Also, the effect sizes (ICC's) indicate a fairly substantial clustering in the data at the work-group

level. These results suggest that ambiguity tolerance, dogmatism, need for closure, authoritarianism, and cognitive ability distinguish between individuals within workgroups.

To account for the nested nature of data with varying sample sizes within workgroups, we conducted our analysis using random coefficient models (Aguinis, Gottfredson, & Culpepper, 2013; Raudenbush & Bryk, 2002) to estimate the association between the education predictor on the multiple level 1 personality trait outcomes.

TABLE 2
DESCRIPTIVE STATISTICS, SCALE RELIABILITIES, AND CORRELATIONS

Variables	Mean	s.d.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Age	36.105	10.557	1.00										
(2) Gender	.345	.476	-0.27*										
(3) Tenure, Positional	4.838	4.334	0.34*	-0.18*									
(4) Centralization	3.302	1.002	0.07	-0.06	0.14*								
(5) Autonomy	2.984	.493	0.04	-0.07	0.06	0.09							
(6) Education	2.496	.835	-0.24*	0.34*	-0.23*	-0.17*	-0.14*						
(7) Ambiguity Tolerance	2.625	.764	-0.30*	0.21*	-0.11*	-0.24*	-0.11*	0.48*	(0.80)				
(8) Dogmatism	3.285	.803	0.13*	-0.27*	0.14*	0.21*	0.17*	-0.47*	-0.64*	(0.73)			
(9) Need for Closure	3.337	.723	0.10	-0.20*	0.09	0.20*	0.17*	-0.41*	-0.58*	0.67*	(0.84)		
(10) Authoritative	2.94	.79	0.11*	-0.18*	0.01	0.16*	0.05	-0.49*	-0.39*	0.39*	0.37*	(0.79)	
(11) Cognitive ability	1.438	1.108	-0.02	0.15*	-0.03	-0.13*	-0.11*	0.43*	0.20*	-0.27*	-0.15*	-0.35*	1.00

* shows significance at the .05 level, N = 351 employees, and n = 54 workgroups.
  Cronbach alpha appears on the diagonal for multi-item measures in brackets.

TABLE 3
INTRACLASS CORRELATION AND MANOVA AT INDIVIDUAL LEVEL

Variable	ICC(1)	Squared canonical Correlation
Ambiguity tolerance	.32	.60
Dogmatism	.28	.15
Need for closure	.23	.04
Authoritarianism	.31	
Cognitive ability	.41	
Wilk's λ	.58***	

*** $p < .001$

The regression analyses are shown in Table 3. We tested our hypotheses using the RCM, which group-mean centered Level 1 predictors except for the dichotomized gender variable coded 0 for men and 1 for women. Following recommendations, Level 2 variables are grand-mean centered (Hofmann & Gavin, 1998). First, hypotheses 1a-1e relate education to individual-level personality dispositions. There was a significant hierarchical effect of education level on ambiguity tolerance, dogmatism, need for closure, authoritarianism, and cognitive ability such that, the higher the level of education, the stronger the effect [in absolute terms]. The findings support our proposition that highly educated individuals (knowledge workers) exhibit traits that are, on average different from those without higher education. Our results supporting hypothesis 1a-1e contributes to the literature by presenting initial evidence to support conceptualizing knowledge workers as highly educated individuals who exhibit individual differences dispositional tendencies that distinguish them from persons low on education (non-knowledge workers).

Hypothesis 2a-2d, that degree of centralization has a cross-level direct effect on traits, is also supported, as shown in Table 3. Hypothesis 4a-4d predicts that the relationships between education and each personality trait are moderated by Age. We test whether the strength of the education to personality mechanism is dependent on age such that relationships would be weakened when employees are aged (higher in Age). For ease of interpretation and to accommodate the relatively small sub-sample size of educated individuals above a 4-year bachelor's degree, we dichotomize the education variable coded 1 for higher education holders and 0 otherwise. As reported in Models 1, 3, 5 and 7 of Table 4, Age moderated the relationship between education and ambiguity tolerance ($\gamma =.02, p < .01$), need for closure ($\gamma = -.02, p < .01$) and Authoritarianism ($\gamma = -.02, p < .01$). However, the cross-level interaction effect of Hypothesis 3 reported in Table 4 was not supported for all the relationships between education and each personality trait.

We present the significant interaction results in Figures 1, 2, and 3. Figure 1 shows that among the older employees, education level is more positively associated with ambiguity tolerance. In Figure 2, Age boosts the negative relationship between education and personal need for closure. As shown in Figure 3, age strengthens the negative relationship between education and authoritarian tendencies.

TABLE 4
RANDOM COEFFICIENT MODELING RESULTS

	Ambiguity Tolerance	Dogmatism	Need for Closure	Authoritarianism	Cognitive Ability
	(1)	(2)	(3)	(4)	(5)
Intercept	1.51***	4.17***	4.13***	3.63***	1.25***
	(0.19)	(0.19)	(0.19)	(0.22)	(0.32)
Secondary education	0.56***	-0.27*	-0.13	-0.36**	0.81***
	(0.12)	(0.13)	(0.12)	(0.13)	(0.19)
Tertiary, B.A/BSc	0.99***	-0.78***	-0.66***	-0.88***	0.91***
	(0.12)	(0.13)	(0.12)	(0.14)	(0.19)
Post tertiary MA/MSc/PhD	1.43***	-1.25***	-1.12***	-1.20***	1.10***
	(0.17)	(0.17)	(0.18)	(0.18)	(0.25)
Age	-0.01***	-0.00	-0.00	0.00	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Gender	0.01	-0.21*	-0.08	-0.03	0.12
	(0.07)	(0.08)	(0.08)	(0.08)	(0.11)
Autonomy	-0.03	0.07	0.06	-0.03	-0.22*
	(0.07)	(0.08)	(0.08)	(0.08)	(0.11)
Tenure, positional	0.03***	-0.00	-0.01	-0.02*	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Centralization	-0.12***	0.11**	0.11**	0.08*	-0.07
	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)
Organization, private	0.30**	-0.21*	-0.25*	-0.05	-0.43*
	(0.10)	(0.10)	(0.10)	(0.12)	(0.18)

Standard errors in parentheses. Reference category for education dummy coding is primary school and below. Reference category for organization dummy coding is public enterprise. N=354 and small n = 54 work-groups. $^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

TABLE 5
RANDOM COEFFICIENT MODELING RESULTS: CROSS-LEVEL EFFECTS

	Ambiguity Tolerance		Dogmatism		Need for Closure		Authoritarianism	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	2.08***	2.20***	3.80***	3.80***	3.79***	3.81***	3.34***	3.34***
	(0.09)	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)	(0.11)	(0.11)
Higher education	0.75***	0.64***	-0.65***	-0.65***	-0.63***	-0.63***	-0.66***	-0.66***
	(0.12)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.11)	(0.11)
Age	-0.02***	-0.01**	-0.00	-0.00	0.01	-0.00	0.01*	0.00
	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
Centralization	-0.15***	-0.11*	0.12**	0.09	0.11***	0.10	0.10**	0.11
	(0.03)	(0.05)	(0.04)	(0.06)	(0.03)	(0.05)	(0.04)	(0.06)
H_edu[1] X Age	0.02**		-0.00		-0.02**		-0.02**	
	(0.01)		(0.01)		(0.01)		(0.01)	
H_edu X Centralization		-0.05		0.05		0.01		-0.04
		(0.07)		(0.08)		(0.07)		(0.08)
Gender	0.07	0.02	-0.24**	-0.24**	-0.09	-0.10	-0.04	-0.04
	(0.07)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Autonomy	0.05	0.04	0.03	0.03	0.02	0.03	-0.05	-0.04
	(0.08)	(0.08)	(0.09)	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)
Tenure, positional	0.03**	0.03**	-0.00	-0.00	-0.01	-0.01	-0.02*	-0.03*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Organization, private	0.48***	0.22*	-0.17	-0.17	-0.22*	-0.24*	-0.06	-0.06
	(0.10)	(0.11)	(0.11)	(0.11)	(0.10)	(0.10)	(0.13)	(0.13)

Standard errors in parentheses. Standard errors in parentheses. Reference category for education dummy coding is primary school and below. Reference category for organization dummy coding is public enterprise. N=354 and small n = 54 work-groups.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes:
   [1] H_edu denotes the higher education variable

FIGURE 3
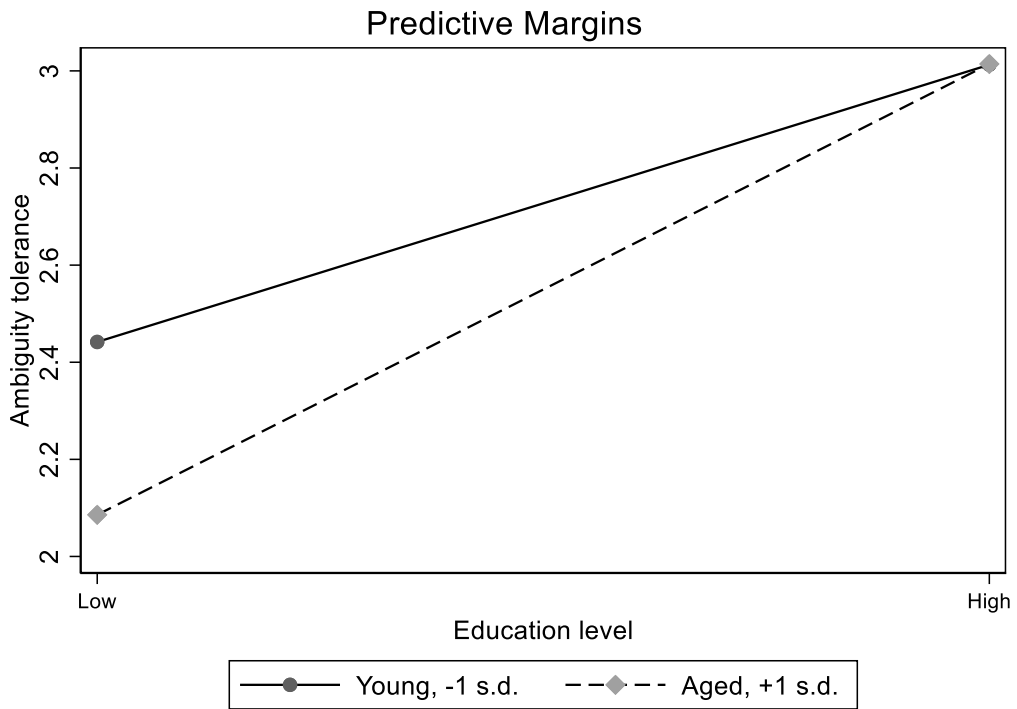**EFFECT OF AGE AND EDUCATION ON AMBIGUITY TOLERANCE**

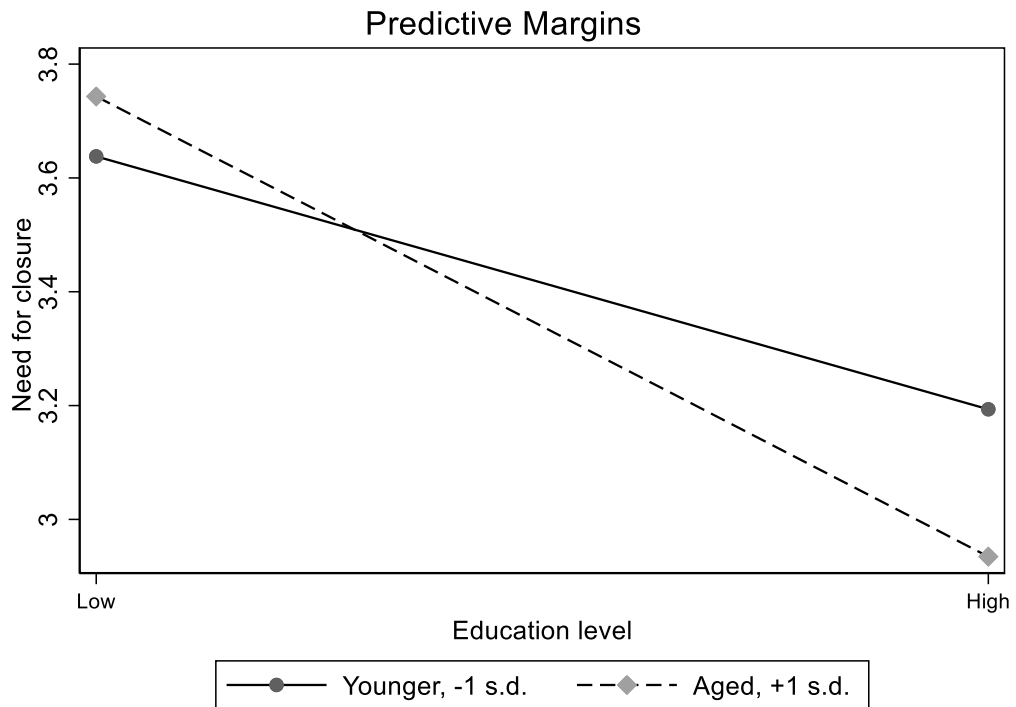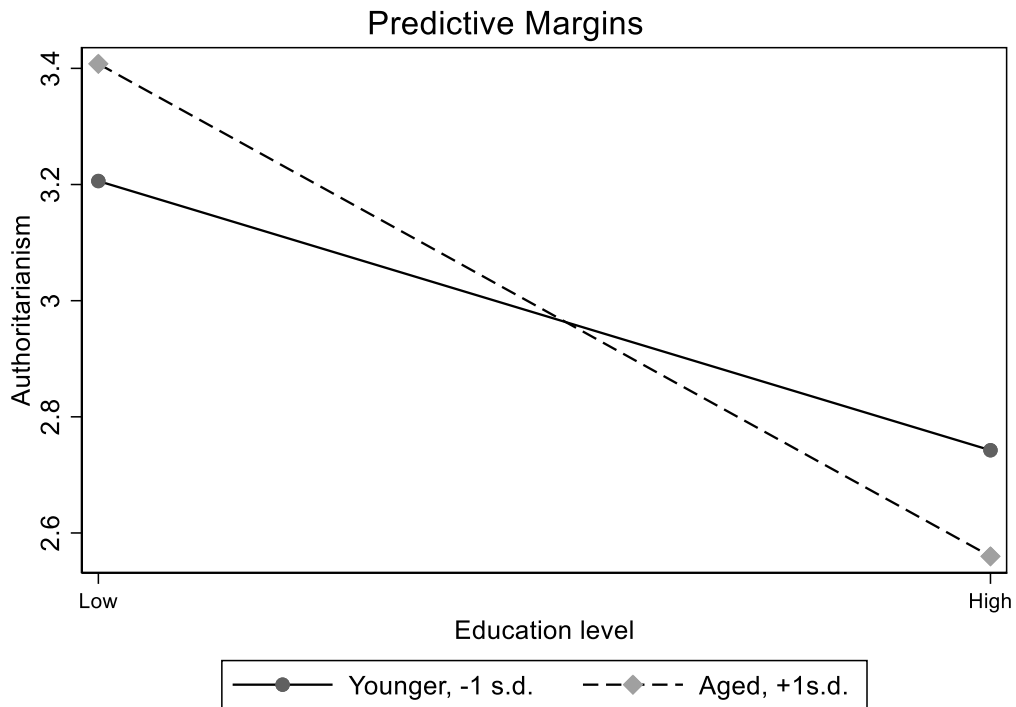**FIGURE 4**
EFFECT OF AGE AND EDUCATION ON NEED FOR CLOSURE

FIGURE 5
EFFECT OF AGE AND EDUCATION ON AUTHORITARIANISM

Predictive Margins

(Figure: Plot of Authoritarianism (y-axis, ranging 2.6 to 3.4) versus Education level (x-axis, Low to High). Two lines: "Younger, -1 s.d." (solid with circle markers) and "Aged, +1s.d." (dashed with diamond markers).)

DISCUSSION

We integrated development theories of student change and multilevel analysis to explicate dispositional-like individual-difference and 'images' characteristic of knowledge workers. This study contributes to a deeper understanding of the knowledge workers and how they are different. We theorized that knowledge workers, defined as highly educated individuals, are predisposed to some common constellation of personality traits and behaviors that accrue partly as an outcome of college effects. This study identified five nurtured traits: dogmatism, ambiguity tolerance, authoritarianism, need for closure, and cognitive ability. RCM supports a statistically significant positive association between education level and ambiguity tolerance and cognitive ability and a significant negative association between education level and dogmatism, authoritarianism, and need for closure.

Findings on the interaction effects support the moderating role of age in the relationship between education and ambiguity tolerance, the need for closure, and authoritarianism. Age reinforced the association between education level and the employees' trait tendencies. However, the moderating role of centralized organizational structure on the relationship between education and each identified individual-level personality difference was not significant. The findings on age and centralization seem to suggest that we cannot expect the identified nurtured personality traits associated with highly educated individuals (i.e., knowledge workers) to change. Hence, provides evidence that fortifies the stability in acquired traits.

Lastly, compared to public enterprise, dogmatism, ambiguity tolerance, and need for closure were significantly but marginally lower among employees in the private organization. Authoritarianism and cognitive ability were not statistically different between the two organizations. Also, gender was not a significant variable in the models.

Implications for Theory and Research

We developed and tested theoretical and empirical propositions explicating a dispositional-like view to distinguish knowledge workers from other groups of workers. A multilevel study of employees supported our prediction that a common constellation of personality traits associated with highly educated individuals to distinguish them from individuals similar, but without (higher) education. A novel contribution of our work is the introduction of a theoretical model that elucidates psychosocial

changes inherent in knowledge workers. Although we draw on the educational psychology literature, a field that has partly focused on the global effects of education, this study constitutes a new way of thinking about knowledge workers within the management field.

Our findings on age and centralization suggest stability in acquired traits and provide a context for leadership adaptation. Conceptualizing knowledge workers based on this study, a general implication for effective leadership adaptation can be grounded in the literature on situational leadership theory and contingency theory of leadership. Proposed by Hersey and Blanchard (1969; 1977), situational leadership theory is intuitively appealing, seemingly applicable to a wide range of leadership settings, and inherently recognizes that there is no single "best" style of leadership. Effective leadership is thus, contingent on adapting to the abilities and willingness (performance readiness) of individuals or groups that leaders are attempting to influence. Beyond the prescriptive nature of interactions of leader styles and followers attributes offered by the literature on situational leadership theory, the guidelines for interpersonal relations will require leadership theory to foreground the "images" of knowledge workers and its implication for their preferences and responses to leadership.

Another significant contribution of our research is that it expands understanding of the role of organizational structures and aging as a predictor (moderators) in shaping employees' personality dispositions. Other studies have documented relationships between personality traits and organizational structures. However, our model and empirical findings go beyond previous research by demonstrating the relationship in the context of knowledge workers and acquired traits as an outcome of college effects.

Practical implications

The study findings have a significant impact on management in knowledge-based organizations. Now more than ever, the knowledge economy has significantly increased reliance on a highly educated workforce to achieve primary management task of value creation to gain organizational competitive advantage. This new wave of global economic restructuring prompts a management concern to explore new pathways to manage knowledge workers effectively. This study offers that crucial first step and shows how knowledge workers can be thought to differ from other groups of workers. Management must, therefore, understand individual-difference dispositional tendencies that commonly characterize their knowledge workers because their behaviors, values, and norms can have substantial action consequences, which can be linked to positive or negative responses that workers take towards the organization.

Limitations and Future Research Directions

Although we touch on a limited set of dispositions, it is fair to say that research in individual differences tradition focused on personality has resulted in significant differences in the number and levels of the individual-difference dispositions, given (higher) education. Albeit, they are more similar than dissimilar in spirit, emphasizing tendencies primarily on such as open-mindedness, tolerance of ambiguity, moral competence, need for closure, and political liberalism. In future research, one can examine how the common constellation of traits unique to knowledge workers inform their preferences for and responses to leadership, human resource management, practices, and other organizational management systems.

Also, we gathered the survey data from the energy and service trading sectors in a medium developed country (Ghana). For future research avenues, it would be interesting to see how these results compared to similar industries in other countries in the region and the world, as well as whether or not the level of a country's world economic and socio-cultural stature has any impact on the strength of the findings.

REFERENCES

Aguinis, H., Gottfredson, R. K., & Culpepper, S. A. (2013). Best-practice recommendations for estimating cross-level interaction effects using multilevel modeling. *Journal of management, 39*(6), 1490-1528.

Altemeyer, B. (1998). The other "authoritarian personality" *Advances in experimental social psychology* (Vol. 30, pp. 47-92): Elsevier.

Altemeyer, B. (2002). Dogmatic behavior among students: Testing a new measure of dogmatism. *The Journal of Social Psychology, 142*(6), 713-721.

Alvesson, M. (2001). Knowledge Work: Ambiguity, Image and Identity. *Human Relations, 54*(7), 863-886. doi:10.1177/0018726701547004

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of college student personnel, 25*(4), 297-308.

Astin, A. W. (1985). *Achieving educational excellence*: Jossey-Bass.

Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a "theory of mind"? *Cognition, 21*(1), 37-46.

Batterham, P. J., Mackinnon, A. J., & Christensen, H. (2011). The effect of education on the onset and rate of terminal decline. *Psychology Aging, 26*(2), 339.

Beaumont, P. B., & Hunter, L. C. (2002). *Managing knowledge workers: The HR dimension*: Chartered Institute of Personnel and Development.

Becker, H. S. (1960). Notes on the concept of commitment. *American journal of sociology, 66*(1), 32-40.

Bell, D. (1973). *The coming of the post-industrial society.* Paper presented at the The Educational Forum.

Bell, D. (1979). The new class: a muddled concept. *Society, 16*(2), 15-23.

Bettis, R. A., & Hitt, M. A. (1995). The new competitive landscape. *Strategic management journal, 16*(S1), 7-19.

Blair, T. (1998). *The third way: new politics for the new century* (Vol. 7). London: Fabian Society

Bloom, B. S. (1964). *Stability and change in human characteristics*: Wiley.

Bobo, L., & Licari, F. C. (1989). Education and political tolerance: Testing the effects of cognitive sophistication and target group affect. *53*(3), 285-308.

Briley, D. A., & Tucker-Drob, E. M. (2014). Genetic and environmental continuity in personality development: A meta-analysis. *Psychological Bulletin, 140*(5), 1303.

Budner, S. (1962). Intolerance of ambiguity as a personality variable. *Journal of personality, 30*(1), 29-50.

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of personality social psychology, 42*(1), 116.

Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor-analytic studies*: Cambridge University Press.

Caspi, A., & Roberts, B. W. (2001). Personality development across the life course: The argument for change and continuity. *Psychological Inquiry, 12*(2), 49-66.

Ceci, S. J. (1991). How much does schooling influence general intelligence and its cognitive components? A reassessment of the evidence. *Developmental psychology, 27*(5), 703.

Chickering, A. W. (1969). *Education and identity*: Jossey-Bass San Francisco.

Choi, T. Y., & Varney, G. H. (1995). Rethinking the knowledge workers: Where have all the workers gone? *Organization Development Journal, 13*(2), 41-50.

Conner, K. R., & Prahalad, C. K. (1996). A resource-based theory of the firm: Knowledge versus opportunism. *Organization science, 7*(5), 477-501.

Darr, A., & Warhurst, C. (2008). Assumptions, Assertions and the Need for Evidence Debugging Debates about Knowledge Workers. *Current sociology, 56*(1), 25-45.

Davenport, T. H., Thomas, R. J., & Cantrell, S. (2002). The mysterious art and science of knowledge worker performance. *MIT-Sloan-Management-Review, 44*(1), 23-30.

Davies, M. F. (1993). Dogmatism and te Persistence of Discredited Beliefs. *Personality Social Psychology Bulletin, 19*(6), 692-699.

Davies, M. F. (1998). Dogmatism and belief formation: Output interference in the processing of supporting and contradictory cognitions. *Journal of personality social psychology, 75*(2), 456.

Davis, J. A. (1975). Communism, conformity, cohorts, and categories: American tolerance in 1954 and 1972-73. *American journal of sociology, 81*(3), 491-513.

Deary, I. J., & Johnson, W. (2010). Intelligence and education: causal perceptions drive analytic processes and therefore conclusions. *International journal of epidemiology, 39*(5), 1362-1369.

DeBacker, T. K., & Crowson, H. M. (2009). The influence of need for closure on learning and teaching. *Educational Psychology Review, 21*(4), 303-323.

Dekker, P., & Ester, P. (1987). Working-class authoritarianism: a re-examination of the Lipset thesis. *European Journal of Political Research, 15*(4), 395-415.

Drucker, P. F. (1959). *The Landmarks of Tomorrow*. New york: Harper & Row.

Drucker, P. F. (1993). *Post-capital society* (Vol. 109). New York: Harper& Collins.

Drucker, P. F. (1999). Management challenges for the twenty-first century. *Oxford, UK: Butterworth-Heinemann, 999*, 1.

Dynes, W. (1967). Education and tolerance: An analysis of intervening factors. *Social Forces, 46*(1), 22-34.

Ehrlich, H. J., & Bauer, M. L. (1966). The correlates of dogmatism and flexibility in psychiatric hospitalization. *Journal of consulting psychology, 30*(3), 253.

Ennis, R. (1991). Critical thinking: A streamlined conception. *Teaching philosophy, 14*(1), 5-24.

Erikson, E. H. (1959). Identity and the life cycle: Selected papers.

Erikson, E. H. (1963). Childhood and society (Rev. ed.): New York: Norton.

Erikson, E. H. (1968). Psychoanalysis and Theories of Man.(Book Reviews: Identity: Youth and Crisis; Childhood and Society (1950)). *Science, 161*, 257-258.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic perspectives, 19*(4), 25-42.

Freud, S. (1923). The libido theory. *General psychological theory: Papers on metapsychology*, 180-184.

Gignac, G. E. (2014). Dynamic mutualism versus g factor theory: An empirical test. *Intelligence, 42*, 89-97.

Gilligan, C. (1977). In a different voice: Women's conceptions of self and of morality. *Harvard educational review, 47*(4), 481-517.

Hackman, J. R., & Oldham, G. R. (1975). Development of the job diagnostic survey. *Journal of Applied Psychology, 60*(2), 159.

Hage, J., & Aiken, M. (1967). Relationship of centralization to other structural properties. *Administrative Science Quarterly*, 72-92.

Hage, J., & Aiken, M. (1970). *Social change in complex organizations* (Vol. 41): Random House Trade.

Hauser, R. M. (1970). Context and consex: a cautionary tale. *American journal of sociology, 75*(4, Part 2), 645-664.

Heath, D. (1978). A model of becoming a liberally educated and mature student. *Encouraging development in college students*, 189-212.

Heath, D. H. (1968). *Growing up in college*: Jossey-Bass.

Hersey, P., & Blanchard, K. H. (1969). Life cycle theory of leadership. *Training & Development Journal*.

Hersey, p., & Blanchard, K. H. (1977). *Management of Organizational Behavior: utilizing human resources*. New Jersey: Prentice Hall: Englewood Cliffs.

Hitt, M. A., Keats, B. W., & DeMarie, S. M. (1998). Navigating in the new competitive landscape: Building strategic flexibility and competitive advantage in the 21st century. *The Academy of Management Executive, 12*(4), 22-42.

Hofmann, D. A., & Gavin, M. B. (1998). Centering decisions in hierarchical linear models: Implications for research in organizations. *Journal of management, 24*(5), 623-641.

Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal, 6*(1), 1-55.

Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. *Organization science, 2*(1), 88-115.

Hunter, L., Beaumont, P., & Lee, M. (2002). Knowledge management practice in Scottish law firms. *Human Resource Management Journal, 12*(2), 4-21.

Hyman, H. H., & Wright, C. R. (1979). Education's lasting influence on values.

Jarvis, W. B. G., & Petty, R. E. (1996). The need to evaluate. *Journal of personality social psychology, 70*(1), 172.

Kaufman, P., & Feldman, K. A. (2004). Forming identities in college: A sociological approach. *Research in Higher Education, 45*(5), 463-496.

Kelloway, E. K., & Barling, J. (2000). Knowledge work as organizational behavior. *International journal of management reviews, 2*(3), 287-304.

Kirton, M. J. (1981). A reanalysis of two scales of tolerance of ambiguity. *Journal of Personality Assessment, 45*(4), 407-414.

Knefelkamp, L., Widick, C., & Parker, C. A. (1978). Editors' notes: Why bother with theory? *New Directions for Student Services, 1978*(4), vii-xvi.

Kohlberg, L. (1969). *Stage and sequence: The cognitive-developmental approach to socialization*: Rand McNally.

Kohlberg, L. (1972). A cognitive-developmental approach to moral education. *Humanist, 32*(6), 13.

Kohlberg, L. (1981). Essays on moral development: The philosophy of moral development (Vol. 1). *San Francisco: Haper & Row*.

Kohlberg, L. (1984). Essays on moral development: Vol. 2. The psychology of moral development: Moral stages, their nature and validity: San Francisco: Harper & Row.

Kohn, M. L. (1969). Class and Conformity (Homewood, IL. *IL. IU., Dorsey*.

Kruglanski, A. W. (1989). The psychology of being" right": The problem of accuracy in social perception and cognition. *Psychological Bulletin, 106*(3), 395.

Kruglanski, A. W. (1990). Lay epistemic theory in social-cognitive psychology. *Psychological Inquiry, 1*(3), 181-197.

Kruglanski, A. W., & Freund, T. (1983). The freezing and unfreezing of lay-inferences: Effects on impressional primacy, ethnic stereotyping, and numerical anchoring. *Journal of experimental social psychology, 19*(5), 448-468.

Kuhn, D., Black, J., Keselman, A., & Kaplan, D. J. C. (2000). The development of cognitive skills to support inquiry learning. *Cognition Instruction, 18*(4), 495-523.

Lipsitz, L. (1965). Working-class authoritarianism: A re-evaluation. *American Sociological Review, 30*(1), 103-109.

Loevinger, J. (1976). Ego development: Conceptions and theories.

Machlup, F. (1962). *The production and distribution of knowledge in the United States* (Vol. 278). Princeton: university press.

Mandt, E. (1978). Managing the Knowledge Worker of the Future. *Personnel Journal, 57*(3), 138-143,162.

Marcia, J. E. (1964). *Determination and consistant validity of ego identity status*The Ohio State University).

Marcia, J. E. (1966). Development and validation of ego-identity status. *Journal of personality and social psychology, 3*(5), 551.

Maruta, R. (2012). Transforming knowledge workers into innovation workers to improve corporate productivity. *Knowledge-Based Systems, 30*, 35-47.

Mayer, R. (2002). Multimedia learning *Psychology of learning and motivation* (Vol. 41, pp. 85-139): Elsevier.

McCrae, R. R., & Costa Jr, P. T. (1994). The stability of personality: Observations and evaluations. *Current directions in psychological science, 3*(6), 173-175.

McKeough, A., & Sanderson, A. (1996). Teaching storytelling: A microgenetic analysis of developing narrative competency. *Journal of Narrative and Life History, 6*(2), 157-192.

Meyer, J. P., & Allen, N. J. (1984). Testing the" side-bet theory" of organizational commitment: Some methodological considerations. *Journal of Applied Psychology, 69*(3), 372.

Moore, L. M., & Ovadia, S. (2006). Accounting for spatial variation in tolerance: The effects of education and religion. *Social Forces, 84*(4), 2205-2222.

Moorman, R. H., Niehoff, B. P., & Organ, D. W. (1993). Treating employees fairly and organizational citizenship behavior: Sorting the effects of job satisfaction, organizational commitment, and procedural justice. *Employee responsibilities rights journal, 6*(3), 209-225.

Morris, T., & Empson, L. (1998). Organisation and expertise: An exploration of knowledge bases and the management of accounting and consulting firms. *Accounting, organizations and society, 23*(5), 609-624.

Myers, I. B. (1976). *Introduction to type®*: CPP.

Myers, I. B., McCaulley, M. H., & Most, R. (1985). *Manual: A guide to the development and use of the Myers-Briggs Type Indicator* (Vol. 1985): Consulting Psychologists Press Palo Alto, CA.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*: Oxford university press.

Noyelle, T. (1990). Toward a new labor market segmentation. *Skills, wages and productivity in the service sector*, 212-224.

Nunnally, J. (1978). C.(1978). *Psychometric theory, 2*.

OECD. (2001). *OECD Science, Technology and Industry Scoreboard 2001: Towards a Knowledge-based Economy*: Organisation for Economic Co-operation and Development.

Parker, C., Widick, C., & Knefelkamp, L. (1978). Editors' notes: Why bother with theory. *Applying new developmental findings. New Directions for Student Services, 4*.

Pascarella, E. T. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. *Higher education: Handbook of theory and research, 1*(1), 1-61.

Pascarella, E. T., Edison, M., Nora, A., Hagedorn, L. S., & Terenzini, P. T. (1996). Influences on students' openness to diversity and challenge in the first year of college. *The Journal of Higher Education, 67*(2), 174-195.

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students* (Vol. 1991): Jossey-Bass San Francisco.

Pascarella, E. T., & Terenzini, P. T. (2005). How college affects students: A third decade of research (Vol. 2): San Francisco: Jossey-Bass.

Pennings, J. (1973). Measures of organizational structure: A methodological note. *American journal of sociology, 79*(3), 686-704.

Perkins, D. (1995). *Outsmarting IQ: The emerging science of learnable intelligence*: Simon and Schuster.

Perkins, D., Tishman, S., Ritchhart, R., Donis, K., & Andrade, A. (2000). Intelligence in the wild: A dispositional view of intellectual traits. *Educational Psychology Review, 12*(3), 269-293.

Perkins, D. N., Jay, E., & Tishman, S. (1993). Beyond abilities: A dispositional theory of thinking. *Merrill-Palmer Quarterly (1982-)*, 1-21.

Perry, W. G. (1970). Forms of intellectual and ethical development in the college years. New York: Holt, Rinehart and Winston. *Inc. 連結*.

Perry, W. G. (1981). Cognitive and ethical growth. (|).

Phye, G. (1997). Inductive reasoning and problem solving: The early grades. *Handbook of Academic Learning construction of knowledge*, 451-471.

Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology*, 199-220.

Prusak, L. (2009). *Knowledge in organisations*: Routledge.

Quinn, R. W. (2005). Flow in knowledge work: High performance experience in the design of national security technology. *Administrative Science Quarterly, 50*(4), 610-641.

Rattazzi, A. M. M., Bobbio, A., & Canova, L. (2007). A short version of the Right-Wing Authoritarianism (RWA) Scale. *Personality and Individual Differences, 43*(5), 1223-1234.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1): Sage.

Reich, R. B. (1993). *The work of nations : preparing ourselves for 21st century capitalism. .* New York Vintage Books,.

Richter, L., & Kruglanski, A. W. (1998). Seizing on the latest: Motivationally driven recency effects in impression formation. *Journal of experimental social psychology, 34*(4), 313-329.

Ritchie, S. J., Bates, T. C., & Deary, I. J. (2015). Is education associated with improvements in general cognitive ability, or in specific skills? *Developmental psychology, 51*(5), 573.

Ritchie, S. J., & Tucker-Drob, E. M. (2018). How much does education improve intelligence? A meta-analysis. *Psychological science, 29*(8), 1358-1369.

Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies. *Psychological Bulletin, 132*(1), 1.

Robertson, M., & Swan, J. (2003). 'Control–What Control?'Culture and Ambiguity Within a Knowledge Intensive Firm*. *Journal of management Studies, 40*(4), 831-858.

Rodgers, R. F. (1989). Student development. *Student services: A handbook for the profession*, 117-164.

Rodgers, R. F. (1990). Recent theories and research underlying student development. *College student development: Theory and practice for the, 49*, 27-79.

Sapir, E. (1934). The Emergence of the Concept of Personality in a Study of Cultures. *The Journal of Social Psychology, 5*(3), 408-415.

Schaubroeck, J., Ganster, D. C., & Jones, J. R. (1998). Organization and occupation influences in the attraction–selection–attrition process. *Journal of Applied Psychology, 83*(6), 869.

Schneider, B. (1987). The people make the place. *Personnel psychology, 40*(3), 437-453.

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of educational psychology, 82*(3), 498.

Shuell, T. J. (1990). Phases of meaningful learning. *Review of educational research, 60*(4), 531-547.

Spearman, C. (1904). " General Intelligence," objectively determined and measured. *The American Journal of Psychology, 15*(2), 201-292.

Stanback, T. M. (1979). *Understanding the service economy: Employment, productivity, location*: Baltimore: Johns Hopkins University Press.

Stouffer, S. A. (1963). Methods of research used by American social scientists. *The behavioral sciences today*, 72.

Strange, C. C. (2003). Dynamics of campus environments. *Student services: A handbook for the profession, 4*, 297-316.

Strenze, T. (2007). Intelligence and socioeconomic success: A meta-analytic review of longitudinal research. *Intelligence, 35*(5), 401-426.

Swart, J., & Kinnie, N. (2003). Sharing knowledge in knowledge-intensive firms. *Human Resource Management Journal, 13*(2), 60-75.

Tatzel, M. (1980). Tolerance for ambiguity in adult college students. *Psychological Reports, 47*(2), 377-378.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of educational research, 45*(1), 89-125.

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition*: ERIC.

Troldahl, V. C., & Powell, F. A. (1965). A short-form dogmatism scale for use in field studies. *Social Forces, 44*(2), 211-214.

Tucker-Drob, E. M. (2009). Differentiation of cognitive abilities across the life span. *Developmental psychology, 45*(4), 1097.

Vogt, W. P. (1997). *Tolerance & education: Learning to live with diversity and difference*: Sage Publications, Inc.

Von Nordenflycht, A. (2010). What is a professional service firm? Toward a theory and taxonomy of knowledge-intensive firms. *Academy of Management Review, 35*(1), 155-174.

Webster, D. M., & Kruglanski, A. W. (1994). Individual differences in need for cognitive closure. *Journal of personality social psychology, 67*(6), 1049.

Weil, F. D. (1985). The variable effects of education on liberal attitudes: A comparative-historical analysis of anti-Semitism using public opinion survey data. *American Sociological Review*, 458-474.

Weissenstein, A., Ligges, S., Brouwer, B., Marschall, B., & Friederichs, H. (2014). Measuring the ambiguity tolerance of medical students: a cross-sectional study from the first to sixth academic years. *BMC family practice, 15*(1), 6.

Wikström, S., & Norman, R. (1994). Knowledge and value: A new perspective on transformation corporative: Routledge.

Williams, J. A. (1966). Regional differences in authoritarianism. *Social Forces*, 273-277.

Williams Jr, J. A., Nunn, C. Z., & Peter, L. S. (1976). Origins of tolerance: Findings from a replication of Stouffer's Communism, conformity, and civil liberties. *Social Forces, 55*(2), 394-408.

Xie, C., Bagozzi, R. P., & Grønhaug, K. (2015). The role of moral emotions and individual differences in consumer responses to corporate green and non-green actions. *Journal of the Academy of Marketing Science, 43*(3), 333-356.

Zakrisson, I. (2005). Construction of a short version of the Right-Wing Authoritarianism (RWA) scale. *Personality individual differences, 39*(5), 863-872.

Article 4

Authentic leadership and knowledge worker initiative: A moderated mediation model of ambiguity tolerance, dogmatism, and psychological empowerment

Issahaka A. W. and Lines, R. (2019)
Norwegian school of economics

Authentic leadership and knowledge worker initiative: A moderated mediation model of ambiguity tolerance, dogmatism, and psychological empowerment

Abstract:

The theory of authentic leadership is advanced by a joint investigation of the mediating role of (a) psychological empowerment in linking authentic leadership with two measures of knowledge worker initiative (charge taking and creative behaviour) and (b) the moderating role of ambiguity tolerance and dogmatism in influencing the mediation. The authors tested the model on data obtained from 396 knowledge workers and non-knowledge workers recruited from two large organisations. They found that authentic leadership influenced follower charge taking and creative behaviour via psychological empowerment, but that this process was dependent on knowledge workers' dogmatism and ambiguity tolerance. Hence, the results support the proposition that authentic leadership is functioning and can be effective in a creative knowledge environment.

Introduction

The shift into the knowledge economy marks a new era of global economic restructuring featuring a vibrant innovation landscape and an increasing reliance on highly skilled and educated professionals, termed knowledge workers (Davenport, Thomas, & Cantrell, 2002; Drucker, 2002; Noyelle, 1990; Powell & Snellman, 2004; Prusak, 2009). Now more than ever, the basis for competitive advantage among organizations requires knowledge workers, individuals in whose heads knowledge and creative capabilities reside, to engage proactively, create and distribute novel ideas (Andrews & Criscuolo, 2013; Crant, 2000; Drucker, 2002; Grant & Ashford, 2008; OECD, 2013) in a volatile, complex, uncertain and ambiguous working environment. Knowledge workers are, therefore, assets to be valued, stimulated and managed. Howbeit, there is still little convergence in the extant literature on effective leadership of knowledge workers (Kelloway & Barling, 2000; Uhl-Bien, Marion, & McKelvey, 2007), a concern that typifies Peter Drucker's assertion that leading knowledge workers will be the biggest management challenge of the 21st century.

How should knowledge workers (KW) be effectively led? The notion of authentic leadership has received growing attention and recognition in wake of the turbulent and dynamically changing work environment in recent years (Avolio & Gardner, 2005; Avolio, Gardner, Walumbwa, Luthans, & May, 2004; B. George, 2003; Walumbwa, Avolio, Gardner, Wernsing, & Peterson, 2008). Authentic leadership is espoused as a positive approach to organisational leadership (Walumbwa et al., 2008) that can empower followers towards higher productivity (Gardner & Schermerhorn, 2004; Rego, Sousa, Marques, & e Cunha, 2012). However, support for authentic leadership in a knowledge worker context is limited and primarily conceptual (e.g., Walumbwa, Christensen, & Hailey, 2011). Accordingly, it is time to promote an integrative model that can

position the field to better address whether authentic leadership is more (or less) effective for leading knowledge workers compared to other follower contexts.

Recent developments in leadership research and theory contend that appropriate interaction between leaders and followers is essential in the co-creation of leadership (e.g., Fairhurst & Uhl-Bien, 2012; Grint, 2005; Howell & Shamir, 2005; Uhl-Bien, Riggio, Lowe, & Carsten, 2014). The "context necessarily involves issues of power, control, motivational intentions (e.g., motivation to lead, resistance to change), personal characteristics (e.g., dominance, Machiavellianism, political skill), climate (e.g., empowering versus authoritarian), behavioural intentions and desired outcomes of followers" (Uhl-Bien et al., 2014, p. 96). Indeed, broader inquiries that emphasise cognition, attributes, behaviours and contexts in which leaders and followers can dynamically embed and interact over time (e.g., Avolio, 2007; Lord, Brown, Harvey, & Hall, 2001; Zaccaro & Klimoski, 2002) provide the impetus for more inclusive models of leadership effectiveness.

Despite this, limited attention has traditionally been paid to the empirical examination of the traits of followers or the interaction of leader and follower traits (Uhl-Bien et al., 2014, p. 84). As Grint (2000) describes, the field primarily excludes followers when explaining what constitutes leadership (Avolio, 2007, p. 26). Also, recent leadership theories including transformational, charismatic and authentic leadership, while recognising the importance of follower adaptation and role of situation, remain primarily focused on the extraordinary qualities of leaders for leadership effectiveness. Even though the "follower remains an unexplored source of variance in understanding leadership processes" (Lord, Brown, & Freiberg, 1999, p. 167), attention to followership in leadership research is growing (Baker, 2007; Carsten, Uhl-Bien, West, Patera, & McGregor, 2010; Sy, 2010). Hence, this study adopts a followership view of leadership processes

(see Uhl-Bien et al., 2014 for an overview) to emphasise attention to how followers view and enact following behaviours to leaders.

Particularly among knowledge workers, the decision to follow a leader may be a more active process based on the extent to which the leader is perceived as representing their values and identity (Felfe & Schyns, 2006; Howell & Shamir, 2005; Schyns & Felfe, 2006), self-conceptions (Keller, 1999) and perceived similarity (Felfe & Heinitz, 2008; Felfe & Schyns, 2006). Hence, this is in line with the view that knowledge workers are different, but these ideas are not grounded in research.

To advance theory, research and practice on leading knowledge workers, it is crucial to understand how leadership styles affect knowledge workers' performance in ways that accommodate the role of knowledge workers' personality in shaping their preference for and response to leadership styles. Our goal in this study, therefore, is to examine the contingencies under which authentic leadership stimulates or distracts from followers' creative behaviour and extra-role behaviour (i.e., charge taking), directly and indirectly via psychological empowerment. Drawing on a body of research in educational psychology, a field that has partly focused on the global effects of education on students (Pascarella & Terenzini, 1991, 2005), we identify two traits (ambiguity tolerance and dogmatism) that distinguish knowledge workers from other groups of workers. We propose that when followers are tolerant of ambiguity and exhibit low dogmatism tendencies, authentic leadership stimulates charge taking and creative behaviours, but when followers are ambiguity intolerant and exhibit high dogmatism tendencies, the positive effects of authentic leadership erode and may even reverse to a negative. We expect that an authentic leadership style will be adaptable in a knowledge worker context and engender their psychological empowerment to engage in creative and proactive behaviours. We base these predictions on congruence theory

(Shamir, 2007), according to which congruence and complementarity between authentic leadership and authentic followership result in the co-creation of leadership effectiveness. Congruence between authentic leader behaviours and followers' preferences of a leader is essential to stimulate productive follower outcomes. The lack of congruence between leaders and followers challenges any positive effects of authentic leadership.

Our research makes important theoretical contributions to the leadership literature, offering a more balanced perspective that recognises leaders and followers' behaviours in co-constructing leadership effectiveness. First, the literature lacks a guiding theoretical perspective explicating knowledge workers preference for and response to authentic leadership. A better understanding exists when the mechanisms by which authentic leaders exert their influence and how the influence is received and shaped by knowledge workers attitudes and behaviours are established (Yammarino, Dionne, Schriesheim, & Dansereau, 2008). Indeed, attention has been devoted to specifying the developmental dynamics between authentic leadership and follower attitudes and behaviours (Avolio et al., 2004; Gardner, Avolio, Luthans, May, & Walumbwa, 2005; B. George, 2003; Ilies, Morgeson, & Nahrgang, 2005), however, very little is known about the follower side of the authentic equation. Second, we provide a theoretical and an empirical account of the direct relationships between authentic leadership and charge-taking and creative behaviours, and indirectly via psychological empowerment. The mediating role of psychological empowerment has not received much research attention in the authentic leadership to creative behaviour and charge taking links. Though the relationships seem intuitively appealing, the weight of the empirical evidence is lacking.

The remainder of the article is structured as follows. The next section describes the theoretical framework and hypothesis development. Adopting a followership approach, we review the

concepts, 'images' and workplace outcomes of knowledge workers, discuss their attitude and behaviours as a basis to speculate about their preference for (or lack thereof) leadership structures and explicate the moderating effects of these follower personalities in response to authentic leadership. After that, we describe the research method and present empirical results. Lastly, we articulate the study's contributions, implications and future research directions. Figure 1 depicts our theoretical model.

Theoretical Background and Hypothesis Development
Authentic leadership has become a focal research topic in the wake of the 21st-century turbulent business landscape. Serving knowledge workers needs remains a leadership imperative and will require suitable leadership style(s) that accommodate their expectations of a leader. Authentic leadership is claimed to positively facilitate psychological capacities, ethical climate, trust and motivation of followers (Walumbwa et al., 2008; Walumbwa et al., 2011).
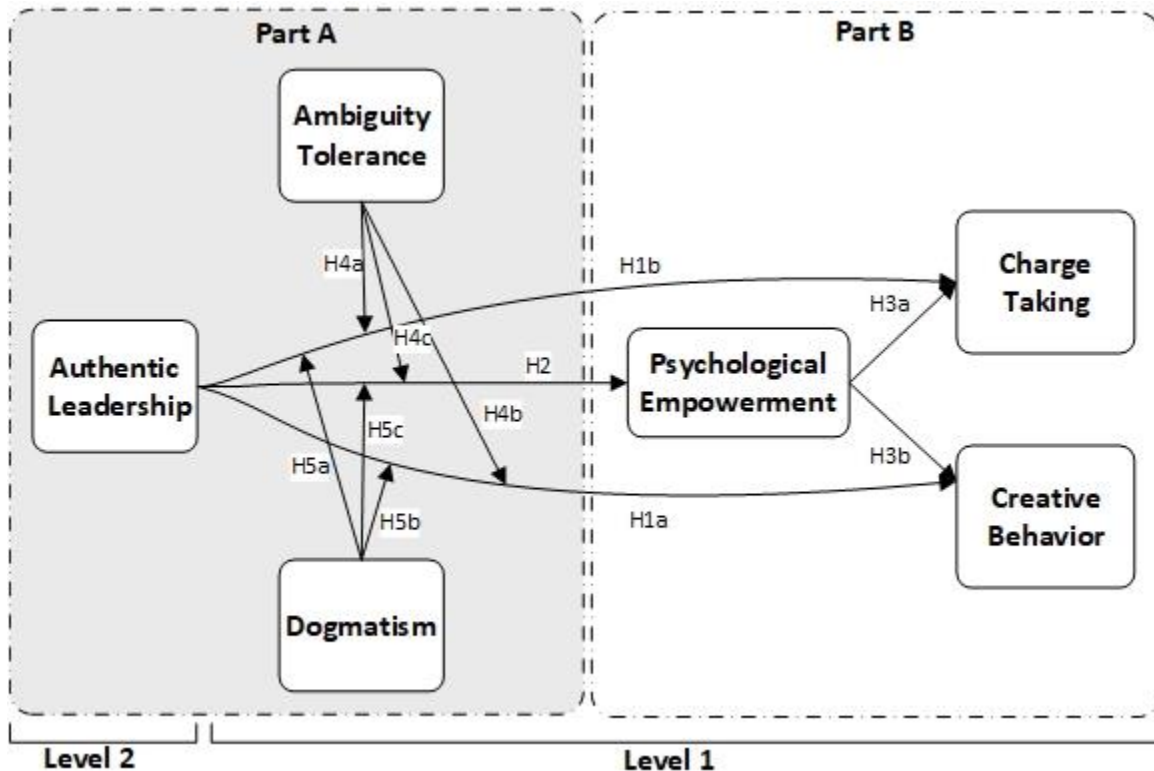

Figure 1: Overall research model: first stage additive dual moderated mediation model

145

Accordingly, authentic leadership might satisfy knowledge workers' needs and achieve positive outcomes. Thus, in this section, we trace the development of our overall multilevel research model. First, we explore authentic leadership as it relates to knowledge worker outcomes of proactive behaviour (i.e., charge taking) and creative behaviour. Next, we discuss the mediating role of psychological empowerment. Finally, and most importantly, we theorise the moderating role of knowledge worker personality (i.e., ambiguity tolerance and dogmatism) on their responses to authentic leadership.

Knowledge workers: concept, images and response outcomes

Knowledge workers are individuals with a high degree of education, expertise, or experience and the primary involved with the creation, distribution, or application of knowledge (Davenport, 2002, 2005). This increasing 'new' class of workers can be characterised by relatively distinct 'images' and workplace values. Knowledge workers seek employability (i.e., committed to the profession) over employment, life-long learning over life-long employment. Also, knowledge workers have individualised aspirations of self-expression and self-actualisation. They value involvement, challenge, assume personal responsibility for goal accomplishment, highly persistent in pursuit of goals, take calculated risks to reach goals and devotedly collect and use the information for feedback purposes (Maureen and Bailey, 2002; Dar and Warhurst, 2008). As individuals who enjoy work autonomy and independence, they engage spontaneously in a high degree of self-regulatory behaviour, including scheduling tasks, managing the ways tasks are carried out, freedom to experiment and take reasonable risks (see Barrett, 2004; Knell, 2000; Tampoe, 1993). Hence, knowledge workers can be viewed generally as empowered individuals having a high sense of self-efficacy and job autonomy who are proactive, creative and innovative (Conger & Kanungo, 1988; Ford & Fottler, 1995; Quinn & Spreitzer, 1997). Creative behaviour and charge taking behaviours are outcomes that matter a great deal in the now ever dynamic and

complex workplace and business environment (Grant & Ashford, 2008; Griffin, Neal, & Parker, 2007; Tepper, Lockhart, & Hoobler, 2001).

Unequivocally, knowledge workers are presumed to be highly educated. A shared dispositional view among educational psychologists (Hyman & Wright, 1979; Nunn, Crockett, & Williams, 1978; Phelan, Yu, & Davidson, 1994) is the important role of education in shaping of students' attitudes, values and norms. According to theories of student development (Pascarella & Terenzini, 2005; Rodgers, 1990), students grow, progress or increase developmental aptitudes as a result of enrolment in an institution of higher education whiles the literature on student change, including psychosocial theories (Chickering, 1969; Erik Homburger Erikson, 1959; Erik H Erikson, 1963, 1968), cognitive-structural theories (Knefelkamp, Widick, & Parker, 1978), and ecological models (Perry, 1970, 1981) suggest that education shapes the nature and content of intraindividual change in ways that distinguish between individuals similar in many aspects but who differ on education level. Such changes and development present a general movement towards greater differentiation, integration, and complexity in the ways that individuals think and behave. Often, the movement is seen as orderly, sequential and hierarchical, passing through ever higher and more complex stages that are to some extent age-related (Pascarella & Terenzini, 1991, 2005). Hence, the personality associated with highly educated individuals is fundament to how knowledge workers are different from other workers.

The structure of personality can be envisioned as a network of interconnected mental representations or "person-variables" that consist of individual's enduring beliefs, goals, identities, values, knowledge, and experiences (Dinh & Lord, 2012; Hannah, Woolfolk, & Lord, 2009; Read et al., 2010; Shoda, LeeTiernan, & Mischel, 2002). We identify two dimensions on which persons with higher education (i.e., knowledge workers) are thought to differ from individuals without

higher education grounded in the empirical literature where available. Identifying all-encompassing knowledge worker personalities is beyond the scope of this study. The two identified personality traits serve as a basis to speculate about knowledge workers preference for authentic leadership.

Tolerance of ambiguity: Budner (1962) defines tolerance for ambiguity as a tendency to "perceive ambiguous situations as desirable" and intolerance for ambiguity as "the tendency to perceive ambiguous situations as a source of threat". As a personality variable, ambiguity tolerance relates positively to other traits, such as openness to new ideas and originality (Tatzel, 1980). On the other hand, ambiguity intolerance is associated with lower mental flexibility and negative personality traits, such as conformity, mental rigidity and ethnic prejudice (Weissenstein, Ligges, Brouwer, Marschall, & Friederichs, 2014, p. 1). This implies that individual-level traits, such as uncertainty orientation, complexity, unfamiliarity and a predisposition to risk-taking are correlates of ambiguity tolerance. In the context of educational psychology, meaningful learning empowers students to gain problem-solving skills (Mayer, 2002; McKeough & Sanderson, 1996; Phye, 1997) and be capable of solving new and ambiguous problems (Shuell, 1990).

According to Hauser (1970), less education is part of individual characteristics associated with lower tolerance (Moore & Ovadia, 2006, p. 2206). In terms of evidence, there is a consistent positive relationship between an individual's education level and tolerance (Bobo & Licari, 1989; Davis, 1975; Dynes, 1967; Hyman & Wright, 1979; McCutcheon, 1985; Stouffer, 1963; Weil, 1985; Williams Jr, Nunn, & Peter, 1976). The positive relationship between an individual's education level and tolerance is one of the most consistently documented results in the empirical research (Bobo & Licari, 1989; Davis, 1975; Dynes, 1967; Hyman & Wright, 1979; McCutcheon, 1985; Stouffer, 1963; Weil, 1985; Williams Jr et al., 1976).

Through education, a tolerance-producing setting is created as individuals are exposed to values and ideas that may differ from those they uphold (Stouffer, 1963, p. 127). Thus, (higher) education increases one's knowledge of diverse cultures, openness to novel ideas, and willingness to risk uncertainty and ambiguity (Moore & Ovadia, 2006, p. 2209).

Dogmatism is a stable personal trait defined as a relative unchangeable unjustified certainty (Altemeyer, 2002). In "*The Open and Closed Mind*", Rokeach (1960) suggested that dogmatism reflects a deficit in integrating information that threatens multiple prior beliefs into a new belief system. Dogmatism, which derives from social psychological theory, dogmatism is a determinant of closed-mindedness, conformity, myopia, and self-righteousness. Research has shown that more dogmatic individuals show greater persistence of a belief after the evidence that formed the belief has been discredited (Davies, 1993), and they tend to ignore information that does not support their prior beliefs (Davies, 1998). Other studies have suggested an association between dogmatism and rigid problem-solving behaviour, and high resistance to change over short-term and long-term (Ehrlich & Bauer, 1966, p. 253).

Educational experiences can broaden an individual's experience base, which encourages an open-minded personality to new experiences and a consideration of alternative viewpoints and new experiences (Pascarella, Edison, Nora, Hagedorn, & Terenzini, 1996; Vogt, 1997). As students' progress in education, their beliefs towards learning become more sophisticated and develop a mind richly grounded in intellectual virtues. According to Schommer (1990), university students tend to have more sophisticated beliefs than junior college students. An earlier study by Lehmann (1963) reported significant decreases in dogmatism for male and female students from the first year to senior years attributed to the college experiences. Close and Bergmann (1979) also found that a significant inverse relationship between educational attainment and dogmatism, after

controlling for possible effects of age, organizational level, function, years in present position, years with present company, years as a manager, years of full-time work experience, staff-line role, span of control, order of birth, and family size. Hence, research evidence supports a negative relationship between education and dogmatism as a personality variable.

An Interactionist Model of Authentic Leadership of Knowledge Workers

Authentic leadership, creative behaviour and charge taking

Creative behaviour refers to the creative act, or a set of acts, which is made explicit through behaviour (Cabra & Uribe-Larach, 2013). Creative behaviour is not confined solely to the domain of cognition and intelligence, but also an action that yields output that is deemed original and useful (Puccio & Cabra, 2011). Research on creative behaviour suggests that the behaviour permits one to act unobstructed from self or externally imposed constraints in pursuit of self-expression, invention, discovery, design, and problem-solving. Accordingly, creative behaviour is not submissive; it is an action and operational result of individuals' creative components involving personality traits, process, and environment (Amabile, 2012; Bouchard Jr, Lykken, Tellegen, Blacker, & Waller, 1993; Cho, 2017; Guastello & Shissler, 1994).

On the other hand, proactive behaviours assess the creative and deliberate ways that employees plan and act on their environment to influence, change and alter it in ways they see fit. One such proactive behaviour is taking charge (Morrison & Phelps, 1999). Charge taking involves voluntary and productive efforts, by individual workers, to effect workplace functional change in terms of how work is executed within the context of their jobs, work units, or organisations (Morrison & Phelps, 1999, p. 403).

Authentic leaders are conceptualised to exhibit balanced processing, transparency, internalised moral perspective and self-awareness (Avolio et al., 2004; Gardner et al., 2005; Walumbwa et al., 2008). A fundamental tenet of authentic leadership theory is that authentic leaders can engage and promote authentic follower relations and positive emotions. Authentic leadership is reasoned to promote trust, respect, openness, guidance towards worthy objectives and emphasising follower development (Avolio et al., 2004; Dirks & Ferrin, 2002; Ilies et al., 2005; Kernis, 2003; Walumbwa et al., 2008).

In the following, we address the relationship between authentic leadership and follower response outcomes of creative behaviour and charge taking. The literature is laden with much knowledge about the impact of transformational leadership, empowering leadership, supportive supervision, transactional leadership and benevolent leadership on employee creativity and taking charge behaviours (Oke, Munshi, & Walumbwa, 2009; Oldham & Cummings, 1996; Scott & Bruce, 1994) compared to the impact of authentic leadership. Conceptually, authentic leaders are self-aware and trust their motives, feelings, desires and self-relevant cognitions (Kernis, 2003, p. 13), recognise their weaknesses and strengths and thus are thoughtful and receptive of followers' idea contributions and discretionary initiatives on the job (Zhou & George, 2003). Given the relational transparency and balanced processing sub-dimensions of authentic leadership, authentic leaders are more inclined to welcome follower creativity (Michie & Gooty, 2005) as they inherently openly share more quality information, express thoughts and feelings with followers and most importantly, analyse all relevant information before reaching a decision. The result is that followers are likely to be motivated to undertake creative and discretionary behaviour to enhance their work. Hence, we expect authentic leadership to have a positive effect on followers' creative and charge taking behaviours.

Hypothesis 1a: Authentic leadership is positively related to subordinates' creative behaviour.

Hypothesis 1b: Authentic leadership relates positively to subordinates' charge-taking behaviour.

The mediating role of psychological empowerment

Psychological empowerment, defined as a motivational construct manifesting "cognitions that reflect an active, rather than a passive, orientation to a work role" (Spreitzer, 1995, p. 1444) has gained widespread interest in these times of rampant global competition and change that requires employee proactivity, creative behaviour and innovation (Drucker, 1998). Spreitzer (1995) describes psychological empowerment as a kind of intrinsic motivation resulting from four kinds of perceptions: meaning, competence, self-determination, and impact.

The role of leadership to influence followers' psychological empowerment has received considerable research attention. In their meta-analytic review, Seibert, Wang, and Courtright (2011) identify leadership as an antecedent construct strongly related to psychological empowerment. Leadership behaviours related to psychological empowerment include transformational and charismatic leadership (Kark, Shamir, & Chen, 2003; Thomas & Velthouse, 1990), empowering leadership (Fong & Snape, 2015), supportive and trusting relationship with one's leader (Spreitzer, 2008). Authentic leadership is considered as a root concept that serves as the basis for all forms of positive leadership (Avolio & Gardner, 2005; Ilies et al., 2005; May, Chan, Hodges, & Avolio, 2003). Thus, authentic leadership is closely linked to psychological empowerment (Zhu, May, & Avolio, 2004).

Proposed key behaviours of authentic leaders including helping followers find meaning at work, building optimism and commitment in others, encouraging transparent relationships that build trust and promoting inclusive, positive work climates (Avolio & Gardner, 2005) are likely to increases

followers' perceptions of psychological empowerment (Liden, Sparrowe, & Wayne, 1997). Veritably, the result of such positive forms of leadership is that followers are likely to experience a stronger sense of meaning at work, which is one of the dominant factors in psychological empowerment (Bandura, 1986; May, Gilson, & Harter, 2004). Besides, knowledge workers perceive themselves as autonomous in their decision-making, a precondition to followers of authentic leaders (Conger, Kanungo, & Menon, 2000; Meyerson & Kline, 2008) is also an essential factor in the followers' psychological empowerment. Research evidence for the relationship between authentic leadership and psychological empowerment have previously been studied among nurses (Wong & Cummings, 2009), employees in several industries (Zhu, 2008) and principals in school settings (Shapira-Lishchinsky & Tsemach, 2014). These studies report a positive relationship. Therefore, we propose the following hypothesis:

> Hypothesis 2: Authentic leadership relates positively to subordinates' psychological empowerment.

Empowerment as an enabling process affects both the initiation and the persistence of followers' task-oriented behaviours (Bandura, 1977). Previous research has demonstrated that psychological empowerment positively relates to creative behaviour (Amabile, 1983; Quinn & Spreitzer, 1997; Spreitzer, 1996). Empowered individuals believe they are autonomous, have an impact, feel self-efficacious and less constrained on the job; circumstances which are likely to encourage creativity (Amabile, 1988; Redmond, Mumford, & Teach, 1993). Individual cognitive flexibility, which may contribute to creative problem solving, has been linked to psychological empowerment (Thomas & Velthouse, 1990). Also, followers who feel competent develop strong self-confidence and would actively develop their work competence and keenly seek ways to improve their work and work

153

conditions (Spreitzer, 1995). Thus, theory and empirical research support that psychological empowerment and creative behaviour are inextricable.

> Hypothesis 3a: Psychological empowerment mediates the relationship between authentic leadership and subordinate creative behaviour

Extra-role behaviours (i.e., charge taking) are organizationally beneficial discretionary behaviours that are outside the scope of an individual's formal job duties (Vandyne, Cummings, & Parks, 1995). Such productive but discretionary behaviour will require individuals with an active orientation toward their work roles, elicit autonomous motivation and perceive themselves as active contributors who can take the initiative. Psychological empowerment provides a source of autonomous motivation to engage in challenging extra-role behaviours (Gagné & Deci, 2005). Psychologically empowered followers are "likely to proactively execute their job responsibilities" (Spreitzer, 1995, p. 1448), which involves anticipating problems and initiative-taking to bring about constructive change (Morrison & Phelps, 1999). There is some empirical support for a positive relationship between psychological empowerment and extra-role behaviours (e.g., Alge, Ballinger, Tangirala, & Oakley, 2006; Choi, 2007). Therefore, we propose:

> Hypothesis 3b: Psychological empowerment mediates the relationship between authentic leadership and subordinate charge-taking behaviour.

The Moderating Role of Follower Individual-Difference Personality

Thus far, we have suggested that authentic leadership is positively associated with creative behaviour and charge taking via psychological empowerment at the individual level. Given the importance of followers' preference for leaders in the co-creation of leadership emergence and effectiveness, we suggest a follower personality as a contextual moderator of the relationships between authentic leadership and follower response outcomes of creative behaviour and charge

taking via psychological empowerment. Indeed, individual followers are not passive recipients of leader influence (Baker, 2007; Carsten et al., 2010; Shamir, 2007; Uhl-Bien et al., 2014) and may differ in their response to identical leadership behaviours (Grant, Gino, & Hofmann, 2011). The discrepancy in perception of followers of the same leader is not necessarily measurement error but also a reflection of individual differences among followers (e.g., Felfe & Heinitz, 2010; Graen, 1976; Hofmann, Morgeson, & Gerras, 2003).

Moreover, Algera and Lips-Wiersma (2012) study of authentic leadership and existential authenticity shows that extant theorising of authentic leadership contains some fundamental 'paradoxes' and shortcomings which quite possibly undermine its original objectives and conclude that embracing the existential roots and complexities of being human, rather than glossing over it is essential. The authors' rationale builds on the existential perspective that (i) in-authenticity is unavoidable, (ii) authenticity requires creating one's meaning, and (iii) authenticity does not imply goal and value congruence (pp. 122-125). Thus, alignment between authentic leaders and followers cannot be naturally assumed.

A shift from leader-focus to understand the conditions under which followers and leaders of the organisation behave authentically is apt. Authentic leadership theory says more to the qualities a leader must possess and passively "projecting" their authentic self to followers (Walumbwa et al., 2008). In our pursuit of greater depth and clarity on authentic leadership development in ways that are more meaningful for a knowledge worker context, we illuminate boundary conditions of the proposed relationships in a knowledge worker context as presented in part A of Figure 1. Specifically, we discuss two aspects of personality (i.e., individual-difference dispositions) that distinguish knowledge workers from other workers and speculate about how that shapes preferences for and responses to authentic leadership.

Ambiguity tolerance and intolerance. In organizational studies, employee ambiguity tolerance has been identified as a critical skill that may enhance leadership effectiveness and found to be positively related to job performance, self-efficacy, decision-making, creativity, complexity, critical thinking, coping with change, risk acceptance, organizational commitment and job satisfaction (Dollinger, Saxton, & Golden, 1995; Endres, Chowdhury, & Milner, 2009; Ghosh & Ray, 1997; Gupta & Fogarty, 1993; Judge, Thoresen, Pucik, & Welbourne, 1999; Schwenk, 1982). As such, knowledge workers who are individuals' tolerant of ambiguity exhibit openness to new ideas and originality (Tatzel, 1980), tend to align with an uncertainty orientation, complexity, unfamiliarity, predisposition to risk-taking and are most likely to engage in creative and proactive behaviour in the workplace (see Comadena, 1984; Zenasni, Besancon, & Lubart, 2008).

Individuals that are intolerant of ambiguity tend to favour actions with predictable outcomes. Geller, Tambor, Chase, and Holtzman (1993) found that individuals demonstrating intolerance of ambiguity prefer the state of stereotypes and concrete notions to a situation of probability and uncertainty. Ambiguity intolerant individuals tend to perceive uncertain tasks as threatening, negative, and more likely to give up following a failed attempt (Budner, 1962). As such, individuals intolerant of ambiguity suffer psychological discomfort and negative affectivity from exposure to ambiguous situations and tend to avoid it. Also, they tend to exhibit lower flexibility and negative personality traits, such as conformity and mental rigidity (Weissenstein et al., 2014, p. 1).

In terms of leadership preferences, ambiguity intolerance followers are argued, will prefer structured elements in learning (Furnham, 1994) and prefer a paternalistic or directive leader (Bakalis & Joiner, 2004). Directive leadership is hierarchical and values consistency, control, and predictability above all else, and goals are achieved using coercion and dominance. Such coercive

leaders pay close attention to their followers' actions, motivate them through discipline, and often employ transactional practices such as rewards and punishments to drive results. On the other hand, ambiguity tolerance subordinates enjoy spheres associated with complexities and diverse perspectives and are comfortable dealing with the shades of grey in life and do not rely upon all-or-none thinking. An earlier study by Norr and Crittenden (1975) found that ambiguity tolerant subordinates favour motivational methods and interpersonal relations over professional behaviours and class structure. Several studies have suggested that individual with high ambiguity tolerance may seek out uncertain tasks, enjoy them and persist despite initial failures. In addition, ambiguity tolerant individuals cope well with major challenges, anxiety, stress and conflict (Judge et al., 1999; Keenan, 1978; Teoh & Foo, 1997). Thus, authentic leadership approach of building the leader's legitimacy through honest relationships with followers to support and improve follower performance is likely to be favoured. Hence, a follower's level of ambiguity tolerance could be a mechanism that links authentic leadership to follower's performance. We therefore, propose the following hypotheses:

> Hypothesis 4a: Ambiguity tolerance moderates the relationship between authentic leadership and charge taking via psychological empowerment, such that when ambiguity tolerance is high (vs low), the authentic leadership to employee charge taking relationship will be stronger (weaker).

> Hypothesis 4b: Ambiguity tolerance moderates the relationship between authentic leadership and charge taking via psychological empowerment, such that when ambiguity tolerance is high (vs low), the authentic leadership to employee creative behaviour relationship will be stronger (weaker).

Dogmatism. High dogmatism reflects a deficit in integrating information that threatens multiple prior beliefs into a new belief system models (Davies, 1998; Kemp, 1962). The term dogmatic is associated with closed-mindedness, conformity, myopia, and intolerance of others (Lohman, 2010). In contrast, low dogmatism individuals are more apt to consider various perspectives and

ways of framing problems, which can result in their ability to derive successful solutions to problems. Like ambiguity tolerance and intolerance, a rationale exists to suggest that dogmatism plays a role in the way in which followers perceive and react to leadership. As an individual difference disposition, dogmatism is about how individuals (i.e. leaders and non-leaders) adopt, communicate and enact their belief systems. As such, high dogmatism individuals personify closed-mindedness, resistance to changing attitudes or beliefs, and concerning forming their attitudes and beliefs, tend to rely on and defer to authority figures. Individuals high in dogmatism strive to avoid inconsistency in their attitude and belief systems, and they react to inconsistent information by minimising or ignoring it (e.g., Durand & Lambert, 1975; Hunt Jr & Miller, 1968; Kleck & Wheaton, 1967; Leone, 1989; Palmer & Kalin, 1985).

As such, dogmatic subordinates will tend to seek leaders who express firm, unwavering beliefs and prefer groups (e.g. teams or organisation units) in which everyone shares the same opinions. Dogmatic individuals will prefer and accept leaders who maintain their beliefs and the status quo. In an earlier study, Weed, Mitchell, and Moffitt (1976) found that high-dogmatism subjects work best with a highly task-oriented leader and worst with a highly human-relations-oriented leader. The authors also found a support that low-dogmatism subjects are more satisfied with a human-relations style than high dogmatism subjects. Contingent leadership theory (e.g., Vroom & Yetton, 1973) suggest that directive leadership can be effective especially when leaders are capable of making high-quality decisions and when subordinates are committed to the decisions but toxic in a context of followers exhibiting non-compliance. In this line of thinking, we reason that leaders who emphasise structuring behaviour get better performance from high-dogmatism subordinates and the benefits of such tactics are likely to be lower for low-dogmatism subjects. Besides, low

dogmatism tendencies as a personality dimension have been associated with creative behaviour (Faschingbauer, Moore, & Stone, 1978). Accordingly, we posit the following hypotheses:

Hypothesis 5a: Dogmatism moderates the relationship between authentic leadership and charge taking via psychological empowerment, such that when dogmatism is high (vs low), the authentic leadership to employee charge taking relationship will be weaker (stronger).

Hypothesis 5b: Dogmatism moderates the relationship between authentic leadership and charge taking via psychological empowerment, such that when dogmatism is high (vs low), the authentic leadership to employee creative behaviour relationship will be weaker (stronger).

With a focus on the role of knowledge worker personality as a boundary condition on the positive effect of authentic leadership on follower outcomes of creative behaviour and charge taking through psychological empowerment, we purposely theorise and investigate a first-stage and direct effect moderation model. Hence, investigating the interactive effect of ambiguity tolerance and authentic leadership on both follower outcomes is sought by testing links H4a, H4b H4c, H3a and H3b in Figure 1. For the case of dogmatism as moderator, the links H5a, H5b, H5c, H3a and H3b in Figure 1 are examined.

Method
   Data
A total of 396 employees nested in 71 leaders completed the survey for a response rate of 67%. Participants were full-time employees from two organisations (one public enterprise and one large private multinational) in a medium developed country. The public enterprise operates in the energy sector and is one of the largest utility service providers in the country. The private multinational is a leading global commodity merchant company. An administering team of three persons received training and explained the purposes and procedures for implementing the survey directly to participants in the workplace. Granted access to a guest office, we administered the

questionnaires to employees in budges during lunch breaks. Respondents receive rewards for returning fully completed questionnaires. We apply this strategy to minimise missing values. Using a unique identifier, we nest the dataset based on organisational, administrative records, which identified participants with their immediate leader/supervisor. A workgroup consists of members with a common leader. The average group size is 5.5 members, with only two workgroups having a single member. Thirty-four per cent of respondents were female. The respondents age ranged from 15 to 78 (mean = 36; standard deviation = 10.69). Respondents are assured that their responses would be confidential and used only for research purposes.

Measures

All measures were assessed using established scales. Participants responded on a five-point Likert-type scales ranging from "1= strongly disagree" to "5=strongly agree (except for authentic leadership). For authentic leadership scale, the five-point Likert-type scale was anchored (1 = not at all, 2 = once in a while, 3 = sometimes, 4 = fairly often, and 5 = frequently). All scales satisfied Bartlett's test for sphericity (i.e., correlation matrix test) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy criterions for factorability.

Authentic leadership: The 16-item Authentic Leadership Questionnaire (ALQ) by Walumbwa et al. (2008) is used to assess authentic leadership. The scale covers four domains of authentic leadership structures, including transparency (five items), morality and ethics (four items), balanced processing (three items) and self-awareness (four items). The sampling procedure followed in this study involves interchangeable raters (i.e., employees) for Level-1 units who are nested within the leader (Level-2 unit). Hence, multilevel factor analysis is deemed appropriate (Hox, 2002; Muthen, 1994). Sample items are "My leader says exactly what he or she means" and "My leader demonstrates beliefs that are consistent with actions". The coefficient alpha was .94.

Psychological empowerment: Psychological empowerment was measured with Spreitzer's (1995) 12-item scale. Sample items are "The work I do is very important to me" and "I am confident in my ability to do my job." The coefficient alpha was .90.

Charge taking: Charge taking was measured with Morrison and Phelps (1999) 10-item scale. The scale was adapted to be self-rated by employees (followers) using their immediate work as their referents in responding. Sample items are "I often try to adopt improved procedures for doing my job" and "I often try to change how my job is executed in order to be more effective." The coefficient alpha was .93.

Creative behaviour: a 13-item scale measure of creative behaviour was adopted from George and Zhou (2001). Sample items are "I suggest new ways to achieve goals or objectives" and "I come up with new and practical ideas to improve performance". The coefficient alpha was .94.

Ambiguity tolerance: We measured ambiguity tolerance using Kirton (1981) reduced seven-item scale from the Budner (1962) original 16-item scale of tolerance-intolerance of ambiguity. These 7-items reflect three sub-dimensions: novelty, complexity and insolubility. Sample items are "An expert who doesn't come up with a definite answer probably doesn't know too much" and "A good job is one where what is to be done and how it is to be done are always dear." The coefficient alpha was .81.

Dogmatism: The dogmatism scale is adapted from Troldahl and Powell (1965) short form of Rokeach dogmatism scale. Troldahl and Powell suggested that "a researcher who wishes to use a short form of the dogmatism scale needs only to decide how many items he can use. He should then select the first "n" items in Table 1 as the best set of items to use" (1965:214). Hence, the construct is operationalised with the first five items reported in Table 1. The coefficient alpha was .75.

Control variables: Guided by the theoretical framework and review of the relevant literature discussed above, we controlled for follower's age and gender to account for an individual sense of personal control. We also controlled for clustering effects of accounting for data non-independence.

Aggregation analysis

To justify aggregation for the authentic leadership scale, the interrater agreement $r_{wg(J)}$ index (James, Demaree, & Wolf, 1984, 1993), and intraclass correlations ICC(1) and ICC(2) (Shrout & Fleiss, 1979) were calculated. The mean $r_{wg(J)}$ for the authentic leadership scale is .87 (median = .79; range = .69 - .87), which is above the recommended .70 threshold (Bliese, 2000) and suggest stronger support for the convergent nature of the authentic leadership construct. This suggests a strong agreement among the nested employees in a leader and that aggregation of the authentic leadership scale to the group level of analysis is appropriate. The intraclass correlations, ICC(1) and ICC(2) for the authentic leadership scale were .13 and .46, respectively.

Analytical approach

We conducted random coefficient models (RCM) analyses with the group-mean centring of Level 1 predictors except for the dichotomised gender variable to account for the nested structure of data. Authentic leadership is conceptualised as Level 2 variable and grand-mean centred. The deviance index defined as $-2 \times$ log-likelihood of a maximum-likelihood estimate is used to assess model fit. The smaller the deviance, the better a model fit (Raudenbush & Bryk, 2002). In addition, an accompanying chi-square test for the changes in deviance is calculated to examine the significance of increased model fit when new predictors were entered into a model.

For each model, we report the pseudo R^2 to reflect the effect size. Pseudo R^2 values were calculated on the basis of the formula 1 - [(Level 1 restricted error/n) + Level 2 restricted

error]/[(Level 1 unrestricted error/n) + Level 2 unrestricted error] (Snijders & Bosker, 1999), where n is the average number of individuals in each Level 2 unit. Pseudo R^2 reflects the percentage of total variance accounted for by the added predictors and is used solely for model comparison.

Before creating composite scale scores and undertaking multilevel modelling, we analyse scale unidimensionality, and series of measurement models using Mplus (version 8.2, Muthén & Muthén, 2019). First, we explore the multilevel factor structure of the 16-item authentic leadership scale. Within the multilevel theory, authentic leadership can be considered as a composition group-level construct (see Chan (1998) for a comprehensive overview). Composition variables are constructs that emerge from responses of individuals within the leader (i.e., workgroups). Even though these constructs are a function of the cognition, affect and personality of individuals, the psychometric properties emerge only at the group level of analysis. While individuals have their own beliefs about the attribute of a leader, shared believes only occur or are identifiable at the group level of analysis (Dorfman, Hanges, & Brodbeck, 2004). Composition variables operate almost identically or isomorphically at the group level and lower level of analysis (Bliese, 2000).

Accordingly, we fit a two-level exploratory structural equation model (ESEM) (see Asparouhov & Muthén, 2009; Marsh, Morin, Parker, & Kaur, 2014) to investigate the factor structure of a multidimensional evaluation of leaders' authentic leadership style. ESEM is considered as a methodological-substantive synergy (Marsh & Hau, 2007) that integrate confirmatory and exploratory factor analysis (Asparouhov & Muthén, 2009). The traditional confirmatory factor analysis (CFA) approach fixes many or all cross-loadings at zero, which often force the researcher to specify a more parsimonious model than is suitable for the data (see Marsh, Morin, Parker, and Kaur, 2014). Indeed, the ALQ often has many small cross-loadings that are well motivated by

substantive theory (e.g., Levesque-Côté, Fernet, Austin, & Morin, 2018). Hence, ESEM (in Mplus statistical software) is suitable to explore the best fitting measurement model of authentic leadership in ways that allow for flexible cross-loadings (i.e., item-item and item-factor relationships) and provides model fit indices. Next, a multilevel confirmatory factor analysis (MCFA) is used to examine the dimensionality of all constructs understudy at level 1 except the authentic leadership construct which is on both level 1 and level 2. Given the limited cluster sample size, randomly created item parcels were used as indicators for all unidimensional scales to ensure sample size adequacy and maintain sufficient item-to-sample ratios. For multidimensional scales, parcels were created based on a priori theoretical sub-dimensions.

Results

Measurement models

Based on the multilevel ESEM results for the authentic leadership scale with robust maximum likelihood (MLR), Table 1 reports fit indices for our chosen substantive cases from a full range of possibilities regarding the best-fitting factor structure. Multilevel ESEM models with 1 to 4 factors in different combinations at level 1 and level 2 were examined. The model with ALQ's a priori four dimensions at the within- and between levels (denoted ESEM44) seems to fits the data satisfactorily: $\chi^2 (124) = 309.925$, p<.01, CFI = .970, $SRMR_W$ = .029, $SRMR_B$ = .092, RMSEA = .062. However, there were many significant cross-loadings, and the four-factor structure, especially at level 2, is not clear and logically interpretable. Besides, the models with one factor at level 2 (i.e., ESEM11, ESEM41 and ESEMU1) show a good fit to the data and the factor structure at level 2 seems to be indicative of a global, authentic leadership measure. Hence, authentic leadership is conceptualized at level 2 as a composite scale of 16 items.

Following the specification of a fitting multilevel factor structure for the authentic leadership scale, the results of the intended MCFA model involving all study variables seems to fit the data very well, as shown in measurement model 3 of Table 1; $\chi^2 (243) = 645.601$, $p < .05$, RMSEA $= .065$, CFI $= .928$, TLI $= .916$, SRMR$_w = .061$, and SRMR$_b = .381$. Hence, composite scores were created as the average of scale items to form continuous variables.

Table 6: Comparison of multilevel measurement models for variables

Model	χ^2	df	RMSEA	CFI	TLI	SRMR$_w$	SRMR$_b$
Authentic leadership							
Measurement Model 1							
ESEM11	961.087	208	.096	.877	.858	.070	.182
ESEM41	346.945	166	.052	.970	.957	.029	.182
ESEM44	309.925	124	.062	.970	.941	.029	.092
ESEMU1	128.009	104	.024	.996	.991	.000	.182
Measurement Model 2							
MCFA	17.468	8	.055	.994	.991	.015	.128
Overall model							
Measurement Model 3							
MCFA all	645.601	243	.065	.928	.916	.061	.381

Notes:

1. ESEMAB denotes exploratory structural equation model (ESEM) with A factors at level 1 and B factors at level 2. U refers to unrestricted factor model.
2. In model 2, items of authentic leadership were grouped into four parcels for the limited cluster sample size.
3. In model 3, items for creative behavior were grouped in four parcels, charge taking into four parcels, ambiguity tolerance in three parcels and psychological empowerment in four factors after assessing the unidimensionality of each scale.

Descriptive Statistics.

Table 2 reports the descriptive statistics and correlations among the study variables. Authentic leadership was significantly correlated with charge taking ($r = .15$, $p < .01$) and creative behaviour ($r = .39$, $p < .05$). Psychological empowerment was significantly correlated with charge taking ($r = .34$, $p < .01$), creative behaviour ($r = .40$, $p < .01$) and authentic leadership ($r = .15$, $p < .01$). Age as a control variable were also significantly correlated with the moderator variables but not charge taking.

Table 7: Descriptive statistics and correlations at the individual level

	mean	s.d.	1	2	3	4	5	6	7	8	ICC(1)
1. Age	36.01	10.69									
2. Gender	0.34	0.47	-0.26*								
3. Authentic leadership	3.86	0.76	0.14*	-0.11*	(.94)						.13
4. Psychological empowerment	3.95	0.69	0.18*	-0.10*	0.55*	(.90)					.14
5. Charge taking	3.68	0.82	-0.03	0.10*	0.15*	0.34*	(.93)				.31
6. Creative behaviour	3.97	0.64	0.07	0.02	0.39*	0.40*	0.52*	(.94)			.26
7. Ambiguity tolerance	2.60	0.77	-0.29*	0.18*	-0.22*	-0.12*	0.13*	-0.02	(.81)		.31
8. Dogmatism	3.30	0.82	0.16*	-0.23*	0.26*	0.09	-0.07	0.11*	-0.65*	(.75)	.30

N = 396 and n = 71. Entries in bracket on diagonal are Cronbach's alpha coefficients
* $p < 0.05$, two-tail test.

Hypothesis Tests

First, we estimated a null model with no predictors at either the individual- or the group level to confirm between-group variations in charge-taking, $\text{ICC}(1) = \tau_{00} / (\tau_{00} + \delta^2) = .31$, creative behaviour, $\text{ICC}(1) = \tau_{00} / (\tau_{00} + \delta^2) = .26$, and psychological empowerment, $\text{ICC}(1) = \tau_{00} / (\tau_{00} + \delta^2) = .14$. It implied that 31% of the variance in charge taking resided between workgroup, and 69% of variance resided within workgroups. For creative behaviour, 26% of the variance resided between groups and 74% of the variance within groups. Also, 14% of the variance in psychological empowerment resided between groups, and 86% of variance resided within leader groups. To determine whether the nesting effect suggests a violation of independent observation, a design effect (Chan, 1998; Kaiser, Woodruff, Bilukha, Spiegel, & Salama, 2006; Ukoumunne, Gulliford, Chinn, Sterne, & Burney, 1999) of creative behaviour and charge taking were 2.395 and 2.17 respectively, exceeding the conventional cutoff value of 2. Thus, multilevel regression analyses were necessary.

Tables 3 and 4 presents the moderated-mediation RCM results. As shown in Model 4 and Model 8 in Table 4, authentic leadership was positively related to charge taking ($\beta = .16$, $p < .05$) and creative behaviour ($\beta = .35$, $p < .001$), confirming Hypothesis 1a and 1b respectively. Test of Hypothesis 2 that authentic leadership is positively related to psychological empowerment is supported ($\beta = .30$, $p < .001$) in Model 1 of Table 3. Hypothesis 3a and 3b predicted that authentic leadership was positively related to charge taking and creative behaviour, respectively, via psychological empowerment. To test this mediating mechanism, we first estimated a model where authentic leadership was related to psychological empowerment. Next, we included authentic leadership and psychological empowerment together in predicting charge taking. In the final step, we calculated the indirect effect with bias-corrected bootstrapped confidence intervals based on 10,000 random samples (see Krull & MacKinnon, 2001; MacKinnon, Lockwood, Hoffman, West,

& Sheets, 2002). Model 5 and Model 9 of Table 4, show that psychological empowerment was significant and positively related to charge taking ($\beta = .37$, p < .001) and creative behaviour ($\beta = .36$, p < .001). The bootstrap confidence interval of the indirect effect at the 95% level (i.e., the product of coefficients of authentic leadership—psychological empowerment and psychological empowerment—charge taking or creative behaviour links) did not include zero for the case of charge taking (controlling for ambiguity tolerance [.05, .15] and dogmatism [.06, .16]) and creative

Table 8: Moderated-Mediation Random Coefficient Modeling Results

	First stage (DV = Psychological empowerment)		
	Model 1	Model 2	Model 3
Age	0.00154	0.00191	0.00192
	(0.55)	(0.68)	(0.69)
Gender	-0.0921	-0.104	-0.0886
	(-1.59)	(-1.79)	(-1.52)
Tenure, positional	-0.00168	-0.00316	-0.00267
	(-0.25)	(-0.47)	(-0.40)
Organization 1	-0.0658	-0.0582	-0.0603
	(-1.09)	(-0.96)	(-1.00)
Authentic leadership	0.301***	0.293***	0.293***
	(6.75)	(6.49)	(6.60)
Ambiguity tolerance		0.0112	
		(0.24)	
Authentic leadership x Ambiguity tolerance		0.136*	
		(2.17)	
Dogmatism			0.0414
			(0.97)
Authentic leadership x Dogmatism			-0.0513
			(-0.98)
Intercept	0.0659	0.0822	0.0702
	(1.30)	(1.62)	(1.38)
Deviance	610.49	605.40	608.54
Pseudo R^2	.18	.19	.18

Note. For individual-level, N = 396; for group-level, n = 71. Values are standardised random intercept modelling coefficients, except gender (standard errors in parentheses). Model deviance is an indicator of model fit; the smaller the deviance, the better the model fit. Gender: male = 0, female = 1.
t statistics in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Two-tailed test.

Table 9: Moderated-Mediation Random Coefficient Modeling Results

	Second stage (DV = Charge taking)				Second stage (DV = Creative behaviour)			
	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Age	0.000850	-0.000248	0.000754	0.000697	0.00230	0.00136	0.00167	0.00195
	(0.21)	(-0.06)	(0.19)	(0.18)	(0.74)	(0.47)	(0.57)	(0.66)
Gender	0.00256	0.0368	0.0270	0.0261	0.0497	0.0713	0.0697	0.0634
	(0.03)	(0.46)	(0.34)	(0.33)	(0.79)	(1.20)	(1.17)	(1.06)
Tenure, positional	0.00374	0.00355	0.000213	-0.000398	-0.00574	-0.00607	-0.00678	-0.00850
	(0.39)	(0.39)	(0.02)	(-0.04)	(-0.80)	(-0.90)	(-1.00)	(-1.25)
Organization 1	0.110	0.115	0.115	0.127	0.0857	0.0904	0.0900	0.0981
	(0.73)	(0.76)	(0.77)	(0.83)	(1.04)	(1.00)	(0.99)	(1.07)
Authentic leadership	0.155*	0.00989	0.00216	-0.00448	0.354***	0.209***	0.210***	0.196***
	(2.51)	(0.17)	(0.04)	(-0.08)	(6.02)	(3.68)	(3.73)	(3.54)
Psychological empowerment		0.372***	0.356***	0.364***		0.363***	0.360***	0.360***
		(5.89)	(5.65)	(5.80)		(7.56)	(7.44)	(7.52)
Ambiguity tolerance			0.0279				0.0295	
			(0.48)				(0.66)	
Authentic leadership x Ambiguity tolerance			0.222**				0.0231	
			(2.63)				(0.37)	
Dogmatism				0.00170				0.00101
				(0.03)				(0.03)
Authentic leadership x Dogmatism				-0.174**				-0.101*
				(-2.60)				(-1.97)
Intercept	3.589***	3.566***	3.602***	3.595***	3.956***	3.941***	3.947***	3.957***
	(37.53)	(37.74)	(38.39)	(37.90)	(65.83)	(64.31)	(63.81)	(63.55)
Deviance	894.73	962.52	854.67	855.83	672.18	621.22	620.55	617.45
Pseudo R^2	.03	.07	.09	.08	.18	.22	.23	.23

Note. For individual-level, N = 396; for group-level, n = 71. Values are standardised random intercept modelling coefficients, except gender (standard errors in parentheses). Model deviance is an indicator of model fit; the smaller the deviance, the better the model fit. Gender: male = 0, female = 1.

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

behaviour (controlling for ambiguity tolerance [.06, .16] and dogmatism [.06, .17]). This suggests that psychological empowerment mediated the relationship between authentic leadership on one hand and charge taking and creative behaviour on the other. Hence, Hypothesis 3a and 3b were supported.

Hypothesis 4a (and 4b) predicted the relationship between authentic leadership and charge taking (creative behaviour) via psychological empowerment was moderated by individual-level ambiguity tolerance. Similar to hypothesis 4a and 4b is the case of hypotheses 5a and 5b, except that the moderator is dogmatism. Following the moderated-mediation methods suggested by (Edwards & Lambert, 2007), we tested whether the strength of the psychological empowerment mechanism between (a) authentic leadership and charge-taking and (b) authentic leadership and creative behaviour, were dependent on individual-level tolerance of ambiguity and dogmatism separately (see Duffy et al., 2012, for empirical examples of moderated-mediation in multilevel models). To test these cross-level moderated-mediation effects, we follow the recommendation by Hofmann and Gavin (1998) and grand-mean centred the Level 2 predictors to reduce the effects of multicollinearity. Given that $p < .10$ is a reasonable cut-off standard to achieve the best balance between statistical power and Type I errors in the case of cross-level moderation tests (LaHuis & Ferguson, 2009), we interpreted RCM coefficients at $p < .10$ level of significance using a two-tailed test (i.e., p < .05 if one-tailed).

Next, we test our hypothesized first stage and direct effect mediated moderation models (Hyposess 4a, 4b, 5a and 5b). Model 2 of Table 3 shos that ambiguity tolerance moderated the relationship between authentic leadership and psychological empowerment (first stage, $\beta = .14$, p < .05). Also, our hypotheses predicted a direct effect moderation of ambiguity tolerance such that the links 'authentic leadership—charge taking' (Hypothesis 4a) and 'authentic leadership—creative

behaviour' (Hypothesis 4b) would be stronger for individuals with high ambiguity tolerance. In the case of dogmatism as moderator, the links 'authentic leadership—charge taking' (Hypothesis 5a) and 'authentic leadership—creative behaviour' (Hypothesis 5b) would be weaker for persons with lower dogmatism tendencies. Based on Models 6, 7, 10 and 11 of Table 4, we compute and plot in Figures 2-5 the total effects of follower's (high vs low) dogmatism and ambiguity tolerance in shaping responses authentic leadership and its implications for follower outcomes of charge taking and creative behaviour.

Table 10: Path analysis of simple effects: Total effect of authentic leadership (via psychological empowerment) on charge taking at low and high levels of ambiguity tolerance, and Dogmatism

Moderator Variable	Stage First	Effect Direct	Effect Indirect	Effect Total
Ambiguity tolerance				
Low	.21†	-.13	.08*	-.05
High	.37†	.13†	.13*	.26*
Difference	.16*	.26**	.06*	.31*
Dogmatism				
Low	-	.10	.11	.21**
High	-	-.11	.11	-.00
Difference	-	-.22**	-	-.22*

Note: $N = 396$, $n = 71$. For rows labelled Low and High, table entries are simple effects computed based on Edward and Lambert (2007) procedures using coefficients from Table 3 and Table 4 at values of one standard deviation above and below the mean of the cluster mean-centred moderator variable. Tests of differences for the indirect and total effects were based on bias-corrected confidence intervals derived from 10,000 bootstrap estimates.
Difference = High – Low.
$\dagger$ $p < .10$. * $p < .05$. ** $p < .01$. Two-tailed test.

Table 5 shows the analysis of indirect, direct and total effects on charge taking split by high and low ambiguity tolerance and dogmatism. Similarly, Table 6 reports the analysis of indirect, direct and total effects on creative behaviour split by high and low ambiguity tolerance and dogmatism. Following recommendations from Edwards and Lambert (2007), we used bootstrapping methods to construct bias-corrected confidence intervals based on 10,000 random samples for the

171

significance tests of indirect and total effects. Given the multilevel setting in this study, we used

bootstrapping methods appropriate for multilevel models (i.e., using Stata 15 "mixed" and

"bootstrap" command together; see Carpenter, Goldstein, & Rasbash, 1999; Krull & MacKinnon,

2001; Poi, 2004).

Table 11: Path analysis of simple effects: Total effect of authentic leadership (via psychological empowerment) on creative behavior at low and high levels of ambiguity tolerance, and Dogmatism

Moderator	Stage	Effect		
Variable	First	Direct	Indirect	Total
Ambiguity tolerance				
Low	.21	.21	.08	.29
High	.37	.21	.14	.34
Differences	.16†	-	.06†	.06†
Dogmatism				
Low	-	.26	.11	.37
High	-	.13	.11	.24
Difference	-	-.13**	-	-.13†

Note: $N = 396$, $n = 71$. For rows labelled Low and High, table entries are simple effects computed based on Edward and Lambert (2007) procedures using coefficients from Table 3 and Table 4 at values of one standard deviation above and below the mean of the cluster mean-centred moderator variable. Tests of differences for the indirect and total effects were based on bias-corrected confidence intervals derived from 10,000 bootstrap estimates.
Difference = High – Low.
$\dagger$ $p < .10$. * $p < .05$. ** $p < .01$. Two-tailed test.

As reported in Table 5, differences in the effects for high and low ambiguity tolerance show that

the first stage of the indirect effect (authentic leadership—charge taking; .37-.21 = .16, p < .05),

total indirect effect (difference = .06, p < .05) and direct effect (difference = .26, p < .05) were

stronger for high ambiguity tolerance employees. This differences resulted in a significantly

stronger total effect for high ambiguity tolerance employees (difference = .31, p < .05) as

illustrated in Figure 2. Thus, the total effect for the association between authentic leadership and

charge taking via psychological empowerment is stronger among individuals exhibiting high

ambiguity tolerance relative to ambiguity intolerance. Also, in Table 5 we report statistically

significant differences in the effects of high and low dogmatism such that the total effect of authentic leadership on charge taking was stronger for low dogmatism (difference = -.22, p < .05). Figure 3 illustrates the differences in total effect in terms of difference in slopes for high and low dogmatism for the effect of authentic leadership on employees charge taking.
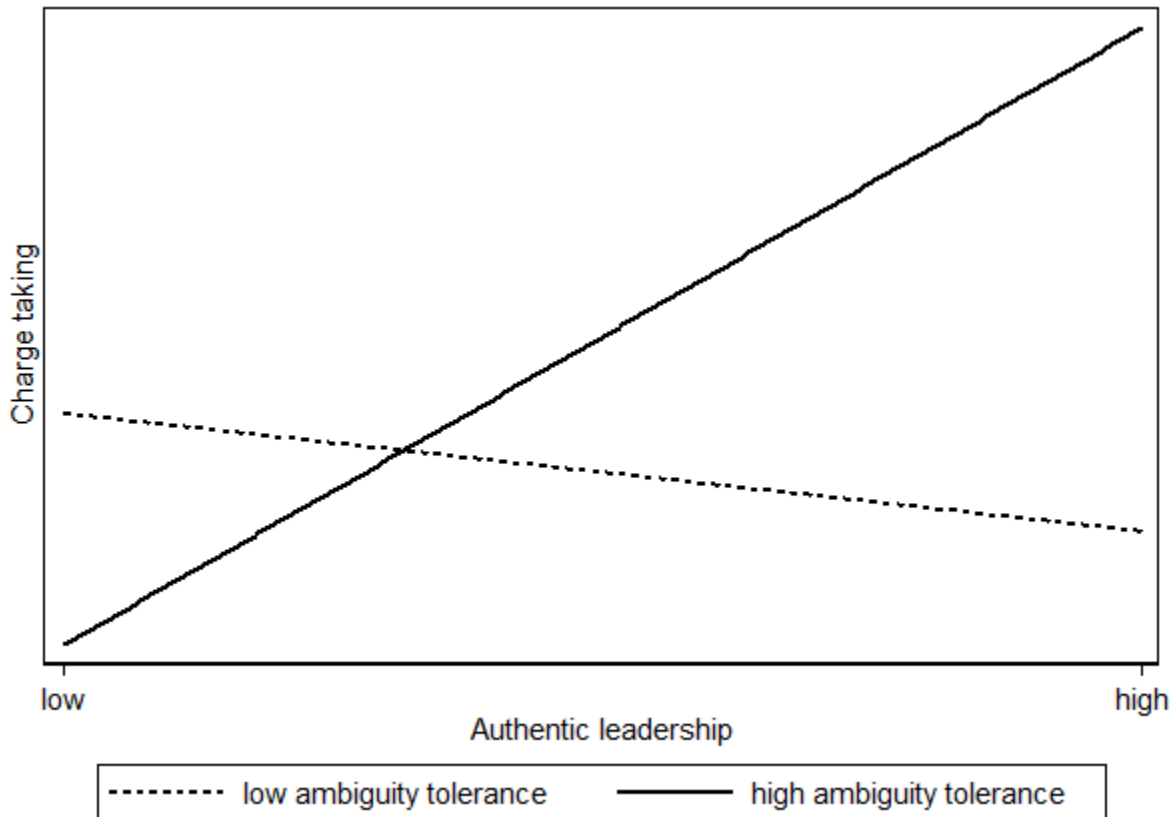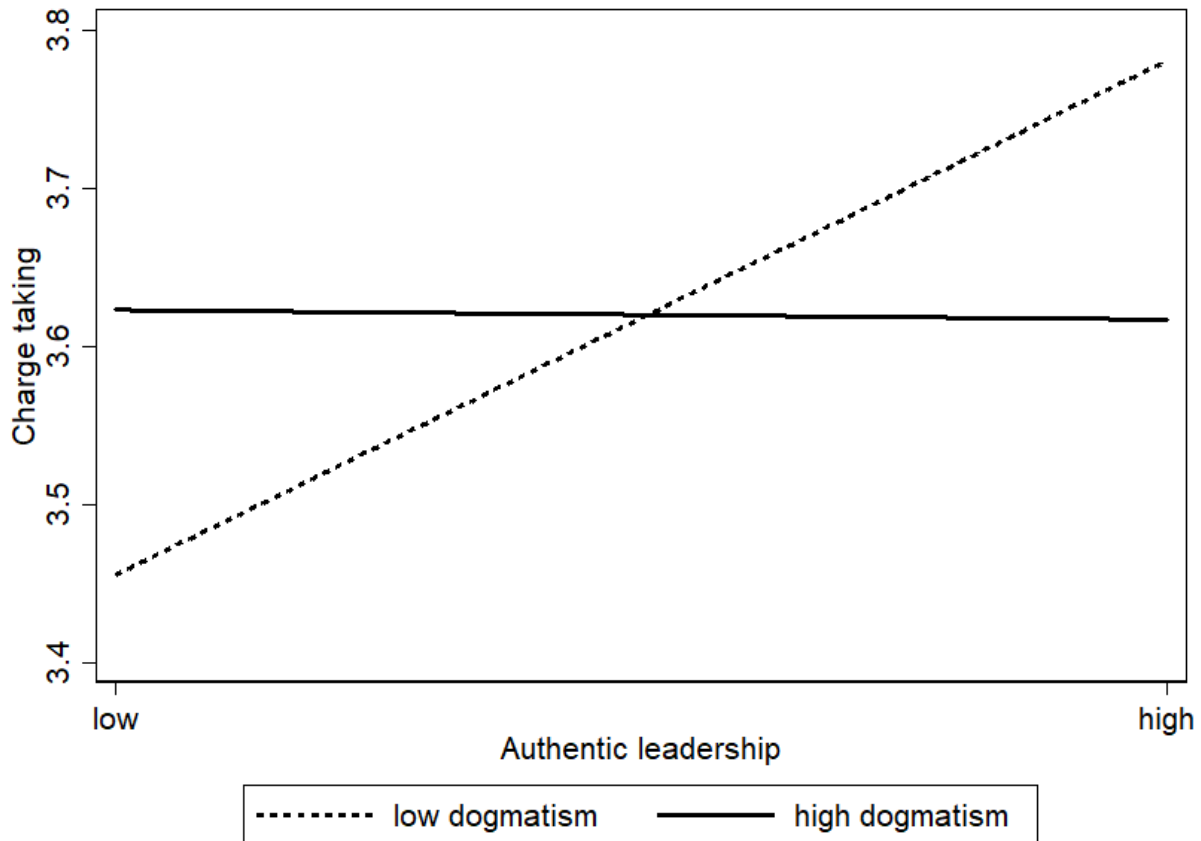

Table 6 shows support for the differences in the effects of high and low ambiguity tolerance (and dogmatism) on the total effect of authentic leadership on creative behaviour via psychological empowerment (ambiguity tolerance, difference = .06, p < .10; dogmatism, difference = -.13, p < .10). We find weak support that the positive relationship between authentic leadership and creative behaviour via psychological empowerment was stronger among employees with high ambiguity tolerance (and low dogmatism).

Figure showing Charge taking (y-axis, 3.4 to 3.8) versus Authentic leadership (x-axis, low to high). Legend: low dogmatism (dotted line), high dogmatism (solid line).

Discussion

In this section, the findings of this study and their theoretical contributions to knowledge worker and leadership research are discussed based on our hypothesised model. Next, we discuss in sequence, the practical implications, study limitations and suggest future research directions. Finally, we draw overall conclusions and summary.

Findings

Leaders face the challenge of stimulating and engaging knowledge workers towards value-creating behaviours and performance outcomes. Leadership styles have important influence on follower functioning. However, within a knowledge worker context, the precise leader behaviours that lead to effective and optimal functioning are not well defined. We build on existing literature that underscores the importance of authentic leadership as an effective predictor of follower

174

performance (Avolio & Gardner, 2005; B. George, 2003; Walumbwa et al., 2008; Wang, Sui, Luthans, Wang, & Wu, 2014).

Therefore, our primary objective in this study was to understand whether and how knowledge workers' personality shapes their preference for and responses to authentic leadership. Specifically, how ambiguity tolerance and dogmatism shapes responses to authentic leadership and the implications for workplace outcomes of creative behaviour and charge taking. We proposed and found a support that dogmatism and ambiguity tolerance moderate the relationship and are boundary conditions for the positive effect of authentic leadership on charge taking and creative behavior through psychological empowerment, albeit the support for the latter was weak. Nonetheless, the significant path analytic results of simple effects (see, Tables 5 and 6) reveal that promoting creative behaviour and charge taking among followers under an authentic leader is strengthened (vs weakened) when followers' exhibit high (vs low) ambiguity tolerance and low (vs high) dogmatism tendencies. As well, psychological empowerment mediates the mechanism. Thus, knowledge workers' personality ought be at the front and center in the research and practice of leadership in a knowledge worker context.

Theoretical implications and extensions
First, discussions about how knowledge workers are different have not been front and centre in the extant empirical leadership literature. Thus, grounding in available evidence from educational psychology, this study foremost, proposed how knowledge workers are different from other workers based on the educational amount and the global effects of education in shaping non-cognitive psychosocial changes (i.e., personality traits). Drawing on research in educational psychology, we identified ambiguity tolerance and dogmatism as personality traits that, on average, are likely to differ in groups of knowledge workers, compared with other groups of

workers with lower levels of education. Although these two traits are among those that have consistently been shown to correlate with educational levels (see Pascarella & Terenzini, 1991, 2005), they are not the only ones of potential relevance for understanding knowledge workers' preference for leadership styles. For example, another robust finding from research in educational psychology is that an individual's cognitive ability is quite strongly associated with the individual's years of schooling. In one study, the effect of education on measures of IQ was estimated at 2.9-3.1 points increase per year (Pascarella & Terenzini, 1991, 2005; Ritchie & Tucker-Drob, 2018). This mechanism underlying this effect is likely to be a combination of selection and treatment. Hence, it is reasonable to assume that knowledge workers – on average – hold higher levels of cognitive ability than other groups of workers. Future research should theorise and test the implications of more intelligent workers on preferences for leadership.

Moreover, educational level is positively associated with moral competence. Partly regardless of the educational content, it seems that one by-product of (higher) education is to produce individuals that are more capable of recognizing and solving moral dilemmas and that gradually, and possibly by passing through a set of developmental stages (Kohlberg, 1985), reach higher levels of moral competence as they receive more schooling. The links between follower moral competence and preferences for leadership has not been the focus of much research up to this point. We think that this relationship could be a fruitful area for future research on leadership, especially authentic leadership. One could speculate that as followers' levels of moral competence increase; they also become more sensitised to the authenticity of their leaders espoused and in-use values, talk and behaviours. It seems reasonable that highly morally competent followers are able to evaluate values and behaviours against socially and philosophically valid moral standards. Moreover, their moral competence will make them better equipped to detect inconsistencies

between leader talk and behaviour, and inconsistencies in behaviour across persons, situations, and over time.

Second, although a few studies have conceptualised authentic leadership in a knowledge worker context (e.g., Walumbwa et al., 2011), it remained to be established whether knowledge workers respond differently from non-knowledge workers to authentic leadership. This study is one of the few studies to show a positive effect of authentic leadership in a knowledge worker versus a non-knowledge worker setting. Specifically, knowledge worker personality of ambiguity tolerance and (low) dogmatic tendencies fosters authentic leadership's direct influence on knowledge workers creative behaviour and charge taking behaviour and indirectly via felt psychological empowerment. Our finding is consistent with followership theory, which suggests that followers' personality inherently shape their preference (or lack thereof), and response to leadership (see Uhl-Bien et al., 2014; Avolio, 2007). By extending the focus of our study findings, a basis for theorising about adaptation to leadership in a knowledge worker setting is opportune. As such, it will be interesting to investigate how other leadership styles will be moderated by dogmatism and ambiguity tolerance.

Third, the study findings suggest consequences for the theory of creativity and charge taking. Research suggests many forms of work-related creativity (Unsworth, 2001). Pro-active creativity composes one of these. This form has a particularly close connection to charge taking and occurs when individuals, driven by internal motivators, industriously search for problems to solve. Pro-active creativity is a psychological process with the potential to facilitate the transformation of individual work roles, workgroups, and organisations into desired future states (Rank, Pace, & Frese, 2004). It triggers going beyond the prescribed contents of one's job, spending additional energy at work, and demonstrating perseverance in the face of barriers (Frese & Fay, 2001). In

addition, our findings are consistent with past studies that have examined the positive effect of authentic leadership to knowledge workers' response outcomes including organisational citizenship behaviour (OCB) (e.g., Joo & Jo, 2017). Indeed, creative behaviour, charge taking, and OCB are positive outcomes that matter to leaders and organisations but are conceptually different constructs. OCB and charge taking are extra-role activities (Morrison & Phelps, 1999; Vandyne et al., 1995). OCB is associated with a discretionary helping behaviour and not rewarded in the context of an organisation's formal reward system (Konovsky & Pugh, 1994; Organ, 1988). On the other hand, charge taking "entails voluntary and constructive efforts, by individual employees, to effect organizationally functional change with respect to how work is executed within the contexts of their jobs, work units, or organisation" (Morrison & Phelps, 1999, p. 403). Unlike OCB, charge taking is inherently change-oriented and aimed at improvement. Overall, the pattern of outcomes results reported in this study suggests that authentic leadership style can affect positively, a range of knowledge worker outcomes.

Finally, we found a relationship between authentic leadership and knowledge worker performance in a Ghanaian context, which also adds to the universality of the authentic leadership construct. Future studies can constructively replicate these results in other regions to examine the role of culture.

Practical implications
This study has important implications for leaders and their organisations. This study result shows that organisational leaders that enact authentic leadership style can stimulate psychological empowerment and consequently creative and productively proactive response outcomes from their highly educated employees. The positive effects of authentic leadership may be diminished for employees with low educational levels. This suggests that promoting authentic leadership is an

organisational imperative. Thus, we believe that investing in training leaders to be authentic and recruiting authentic leaders will be beneficial to organisations, especially for knowledge-based organisations. In terms of employee recruitment, we also suggest that organisational leadership characterised by authentic leaders' on-board employees that exhibit high tendencies of knowledge worker personalities, including ambiguity tolerance, low dogmatism, and related correlates including, low need for closure, less authoritarian tendencies and high moral competence.

Beyond the role of authentic leadership in a knowledge worker context, leaders are increasingly concerned with managing diversity in the organisation (Yukl, 2001). That is the variety of differences among employees in an organisation. As is demonstrated in this study, educational background difference presents one such dimension of diversity. Although we establish an association (average effects) between education amount and personality traits, there exist error variance that may be attributable to some ageing process, genetics, gender, employee status, race, and culture among other factors. Hence, among groups of knowledge workers or highly educated individuals, there will exist individuals who are dogmatic or intolerant of ambiguity. Similarly, among groups of uneducated individuals, there may exist individuals who are less dogmatic or tolerant of ambiguity. A group of knowledge workers can be a varied audience. Our finding of a positive effect of authentic leadership, therefore, can generalise to the adaptable role that authentic leadership can play in leading diversity. Leader self-awareness, authenticity, power gap management, and cultural competence are among important considerations conceptualised to achieve a successful diversity leadership.

Limitations and Future Research Directions
This study has some limitations. First, we employed a primarily cross-sectional design (i.e., correlational study) and thus, interpretations of causality are based on the evidence of co-variation

and author's confidence in the proposed theoretical connections. As with many deductive studies, we do not operationalise the mechanisms nor directly measure this. Instead, our deductive approach developed hypotheses based on existing theory and tested with an appropriately designed research strategy (i.e., survey approach) albeit, measuring variables of interest and not the relationship itself. Correlations do not imply causation remains a drawback in correlational studies. With no random assignment to conditions, our study cannot rule out the possibility of a 'third' variable affecting the relationship between variables measured. Away from correlational samples, a more direct measurement of these mechanisms through experiments and qualitative in-depth interviews to explain and predict behaviour about how ambiguity tolerance and dogmatism (i.e., personality) can be tied to the preference for and responses to (authentic) leadership should be a focus of future research. Future studies should consider establishing causation in a controlled environment; experiments are generally the most precise studies and have much conclusive power.

Second, this study used two personality dimensions of knowledge workers. Although using two personality traits serves to emphasise our study objective, taking stock of an all-encompassing constellation of knowledge worker traits in conceptually meaningful ways to predict leadership is imperative. For instance, non-cognitive psychosocial changes including, authoritarianism, need for closure and moral competence, which are associated with education, has received considerable research attention in the educational psychology literature (see, Pascarella and Terenzini, 1991; 2005). How these traits can affect an individual's preference and response to leadership, separately or as a constellation, presents an avenue for future research.

Methodologically, we assessed the contributions of the two traits separately. More precise predictions can be drawn when these traits are considered and examined simultaneously in the same model. More so, future research should consider other knowledge workers' response

outcomes (e.g., task performance, knowledge sharing and initiative-taking), team performance outcomes and organisational outcomes. Future research should also add to this study by collecting measures of other related leadership constructs such as transformational leadership and servant leadership to assess if authentic leadership uniquely contributes to positive knowledge worker outcomes.

Finally, future research should explore the diversity leadership of knowledge worker teams. Our study focused on outcomes at the individual level and in one country. Examining at the team level and extending our model to other societal cultures is a step further for future research. In the case of knowledge workers, we will expect the preference and response to authentic leadership to be generally positive and stable across cultures even though the association might be stronger in the western societies and global north compared to the global south regions.

In conclusion, an authentic leadership style is effective in a knowledge worker context. Our results showed knowledge workers personality is congruent with authentic leader behaviours, and that produce higher felt psychological empowerment among such followers to engage in creative and charge taking behaviours. Ultimately, these response outcomes are likely to be an essential means for organisations to sustain competitive advantage.

References

Alge, B. J., Ballinger, G. A., Tangirala, S., & Oakley, J. L. (2006). Information Privacy In Organizations: Empowering Creative and Extrarole Performance. *Journal of Applied Psychology, 91*(1), 221-232. doi:org/10.1037/0021-9010.91.1.221

Algera, P. M., & Lips-Wiersma, M. (2012). Radical authentic leadership: Co-creating the conditions under which all members of the organization can be authentic. *The leadership quarterly, 23*(1), 118-131. doi:org/10.1016/j.leaqua.2011.11.010

Altemeyer, B. (2002). Dogmatic Behavior Among Students: Testing A New Measure Of Dogmatism. *The Journal of Social Psychology, 142*(6), 713-721. doi: org/10.1080/00224540209603931

Amabile, T. M. (1983). The social psychology of creativity: A componential conceptualization. *Journal of personality and social psychology, 45*(2), 357-376. doi:org/10.1037/0022-3514.45.2.357

Amabile, T. M. (1988). A model of creativity and innovation in organizations. *Research in organizational behavior, 10*(1), 123-167.

Amabile, T. M. (2012). Componential theory of creativity. *Harvard Business School, 12*(96), 1-10.

Andrews, D., & Criscuolo, C. (2013). *Knowledge-based capital, innovation and resource allocation*. Retrieved from

Asparouhov, T., & Muthén, B. (2009). Exploratory Structural Equation Modeling. *Structural equation modeling: a multidisciplinary journal, 16*(3), 397-438. doi:org/10.1080/10705510903008204

Avolio, B. J. (2007). Promoting more integrative strategies for leadership theory-building. *American Psychologist, 62*(1), 25.

Avolio, B. J., & Gardner, W. L. (2005). Authentic Leadership Development: Getting To The Root Of Positive Forms Of Leadership. *The leadership quarterly, 16*(3), 315-338. doi:org/10.1016/j.leaqua.2005.03.001

Avolio, B. J., Gardner, W. L., Walumbwa, F. O., Luthans, F., & May, D. R. (2004). Unlocking The Mask: A Look At The Process By Which Authentic Leaders Impact Follower Attitudes And Behaviors. *The leadership quarterly, 15*(6), 801-823. doi:org/10.1016/j.leaqua.2004.09.003

Bakalis, S., & Joiner, T. A. (2004). Participation In Tertiary Study Abroad Programs: The Role Of Personality. *International journal of educational management, 18*(5), 286-291. doi:org/10.1108/09513540410543420

Baker, S. D. (2007). Followership: The theoretical foundation of a contemporary construct. *Journal of Leadership & Organizational Studies, 14*(1), 50-60.

Bandura, A. (1977). Self-Efficacy: Toward a Unifying Theory of Behavioral Change. *Psychological review, 84*(2), 191-215. doi:org/10.1037/0033-295X.84.2.191

Bandura, A. (1986). The Explanatory and Predictive Scope of Self-Efficacy Theory. *Journal of Social and Clinical Psychology, 4*(3), 359-373. doi:10.1521/jscp.1986.4.3.359

Barrett, R. (2004). Working at webboyz: An analysis of control over the software development labour process. *Sociology, 38*(4), 777-794. doi:org/10.1177/0038038504045864

Bliese, P. D. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis.

Bobo, L., & Licari, F. C. (1989). Education and political tolerance testing the effects of cognitive sophistication and target group affect. *Public Opinion Quarterly, 53*(3), 285-308. doi:org/10.1086/269154

Bouchard Jr, T. J., Lykken, D. T., Tellegen, A., Blacker, D. M., & Waller, N. G. (1993). Creativity, Heritability, Familiarity: Which Word Does Not Belong? *Psychological Inquiry, 4*(3), 235-237. doi:org/10.1207/s15327965pli0403_18

Budner, S. (1962). Intolerance Of Ambiguity As A Personality Variable. *Journal of personality, 30*(1), 29-50. doi:org/10.1111/j.1467-6494.1962.tb02303.x

Cabra, J. F., & Uribe-Larach, D. (2013). Creative Behavior. In E. G. Carayannis (Ed.), *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship* (pp. 266-271). New York, NY: Springer New York.

Carpenter, J., Goldstein, H., & Rasbash, J. (1999). A non-parametric bootstrap for multilevel models. *Multilevel modelling newsletter, 11*(1), 2-5.

Carsten, M. K., Uhl-Bien, M., West, B. J., Patera, J. L., & McGregor, R. (2010). Exploring social constructions of followership: A qualitative study. *The leadership quarterly, 21*(3), 543-562.

Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology, 83*(2), 234-246.

Chickering, A. W. (1969). *Education And Identity*. San Francisco: Jossey-Bass

Cho, J. Y. (2017). An investigation of design studio performance in relation to creativity, spatial ability, and visual cognitive style. *Thinking Skills and Creativity, 23*, 67-78.

Choi, J. N. (2007). Change-oriented organizational citizenship behavior: effects of work environment characteristics and intervening psychological processes. *Journal of Organizational Behavior, 28*(4), 467-484.

Close, M. J., & Bergmann, T. J. (1979). Dogmatism and attained educational level: A field study. *Psychological Reports, 44*(2), 671-673. doi:org/10.2466/pr0.1979.44.2.671

Comadena, M. E. (1984). Brainstorming groups: Ambiguity tolerance, communication apprehension, task attraction, and individual productivity. *Small Group Behavior, 15*(2), 251-264.

Conger, J. A., & Kanungo, R. N. (1988). The empowerment process: Integrating theory and practice. *Academy of Management Review, 13*(3), 471-482.

Conger, J. A., Kanungo, R. N., & Menon, S. T. (2000). Charismatic leadership and follower effects. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior, 21*(7), 747-767.

Crant, J. M. (2000). Proactive behavior in organizations. *Journal of management, 26*(3), 435-462.

Davenport, T. H. (2002). Can you boost knowledge work's impact on the bottom line? *Harvard Management Update, 7*(12), 3-4.

Davenport, T. H. (2005). *Thinking for a Living: How to Get Better Performance and Results from Knowledge Workers*. Boston, MA: Harvard Business School Press.

Davenport, T. H., Thomas, R. J., & Cantrell, S. (2002). The mysterious art and science of knowledge worker performance. *MIT-Sloan-Management-Review, 44*(1), 23-30.

Davies, M. F. (1993). Dogmatism and te Persistence of Discredited Beliefs. *Personality and Social Psychology Bulletin, 19*(6), 692-699. doi:org/10.1177/0146167293196004

Davies, M. F. (1998). Dogmatism And Belief Formation: Output Interference In The Processing Of Supporting and Contradictory Cognitions. *Journal of personality and social psychology, 75*(2), 456--466. doi:.org/10.1037/0022-3514.75.2.456

Davis, J. A. (1975). Communism, conformity, cohorts, and categories: American tolerance in 1954 and 1972-73. *American journal of sociology, 81*(3), 491-513.

Dinh, J. E., & Lord, R. G. (2012). Implications of dispositional and process views of traits for individual difference research in leadership. *The leadership quarterly, 23*(4), 651-669.

Dirks, K. T., & Ferrin, D. L. (2002). Trust in leadership: Meta-analytic findings and implications for research and practice. *Journal of Applied Psychology, 87*(4), 611-628.

Dollinger, M. J., Saxton, T., & Golden, P. A. (1995). Intolerance of ambiguity and the decision to form an alliance. *Psychological Reports, 77*(3_suppl), 1197-1198.

Dorfman, P., Hanges, P., & Brodbeck, F. C. (2004). Leadership and cultural variation: The identification of culturally endorsed leadership profiles. *Culture, Leadership, and Organizations: The GLOBE Study of 62 Societies*, 669-719.

Drucker, P. F. (1998). The discipline of innovation. *Leader to Leader, 1998*(9), 13-15.

Drucker, P. F. (2002). The discipline of innovation. *Harvard business review, 80*, 95-104.

Durand, R. M., & Lambert, Z. V. (1975). Dogmatism and exposure to political candidates. *Psychological Reports, 36*(2), 423-429.

Dynes, W. (1967). Education and Tolerance: An Analysis Of Intervening Factors. *Social Forces, 46*(1), 22-34. doi:org/10.1093/sf/46.1.22

Edwards, J. R., & Lambert, L. S. (2007). Methods For Integrating Moderation and Mediation: A General Analytical Framework Using Moderated Path Analysis. *Psychological methods, 12*(1), 1. doi:org/10.1037/1082-989X.12.1.1

Ehrlich, H. J., & Bauer, M. L. (1966). The Correlates Of Dogmatism and Flexibility In Psychiatric Hospitalization. *Journal of consulting psychology, 30*(3), 253-259. doi:org/10.1037/h0023378

Endres, M. L., Chowdhury, S., & Milner, M. (2009). Ambiguity Tolerance and Accurate Assessment Of Self-Efficacy In a Complex Decision Task. *Journal of Management & Organization, 15*(1), 31-46. doi:org/10.1017/S1833367200002868

Erikson, E. H. (1959). Identity and The Life Cycle: Selected Papers. *Psychological Issues, 1*, 1-171.

Erikson, E. H. (1963). Childhood and Society (Rev. ed.): New York: Norton.

Erikson, E. H. (1968). *Psychoanalysis and Theories of Man.(Book Reviews: Identity: Youth and Crisis; Childhood and Society (1950))* (Vol. 161). New York, NY: Springer.

Fairhurst, G. T., & Uhl-Bien, M. (2012). Organizational discourse analysis (ODA): Examining leadership as a relational process. *The leadership quarterly, 23*(6), 1043-1062.

Faschingbauer, T. R., Moore, C. D., & Stone, A. (1978). Cognitive style, dogmatism, and creativity: Some implications regarding cognitive development. *Psychological Reports, 42*(3), 795-804.

Felfe, J., & Heinitz, K. (2008). The impact of followers' and leaders' personality and perceived similarity on followers' perceptions of transformational leadership and leader acceptance. *Personality and work*, 197-217.

Felfe, J., & Heinitz, K. (2010). The impact of consensus and agreement of leadership perceptions on commitment, organizational citizenship behaviour, and customer satisfaction. *European Journal of Work and Organizational Psychology, 19*(3), 279-303.

Felfe, J., & Schyns, B. (2006). Personality and the Perception of Transformational Leadership: The Impact of Extraversion, Neuroticism, Personal Need for Structure, and Occupational Self-Efficacy 1. *Journal of Applied Social Psychology, 36*(3), 708-739.

Fong, K. H., & Snape, E. (2015). Empowering leadership, psychological empowerment and employee Outcomes: Testing a multi-level mediating model. *British Journal of Management, 26*(1), 126-138.

Ford, R. C., & Fottler, M. D. (1995). Empowerment: A matter of degree. *Academy of Management Perspectives, 9*(3), 21-29.

Frese, M., & Fay, D. (2001). 4. Personal initiative: An active performance concept for work in the 21st century. *Research in organizational behavior, 23*, 133-187.

Furnham, A. (1994). A Content, Correlational and Factor Analytic Study Of Four Tolerance Of Ambiguity Questionnaires. *Personality and Individual Differences, 16*(3), 403-410. doi:.org/10.1016/0191-8869(94)90066-3

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior, 26*(4), 331-362.

Gardner, W. L., Avolio, B. J., Luthans, F., May, D. R., & Walumbwa, F. (2005). "Can you see the real me?" A self-based model of authentic leader and follower development. *The leadership quarterly, 16*(3), 343-372.

Gardner, W. L., & Schermerhorn, J. R. (2004). Unleashing individual potential. *Organizational dynamics, 3*(33), 270-281.

Geller, G., Tambor, E. S., Chase, G. A., & Holtzman, N. A. (1993). Measuring Physicians' Tolerance For Ambiguity And Its Relationship To Their Reported Practices Regarding Genetic Testing. *Medical care, 31*(11), 989-1001. Retrieved from http://www.jstor.org/stable/3766298

George, B. (2003). *Authentic Leadership: Rediscovering The Secrets To Creating Lasting Value*. San Francisco, CA: Jossy - Bass.

George, J. M., & Zhou, J. (2001). When Openness To Experience and Conscientiousness Are Related To Creative Behavior: An Interactional Approach. *Journal of Applied Psychology, 86*(3), 513-524. doi:org/10.1037/0021-9010.86.3.513

Ghosh, D., & Ray, M. R. (1997). Risk, ambiguity, and decision choice: Some additional evidence. *Decision Sciences, 28*(1), 81-104.

Graen, G. B. (1976). Role-making processes within complex organizations. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology*. Chicago, IL: Rand McNally.

Grant, A. M., & Ashford, S. J. (2008). The dynamics of proactivity at work. *Research in organizational behavior, 28*, 3-34.

Grant, A. M., Gino, F., & Hofmann, D. A. (2011). Reversing the extraverted leadership advantage: The role of employee proactivity. *Academy of Management Journal, 54*(3), 528-550.

Griffin, M. A., Neal, A., & Parker, S. K. (2007). A new model of work role performance: Positive behavior in uncertain and interdependent contexts. *Academy of Management Journal, 50*(2), 327-347.

Grint, K. (2005). Problems, problems, problems: The social construction of 'leadership'. *Human Relations, 58*(11), 1467-1494.

Guastello, S. J., & Shissler, J. E. (1994). A Two Factor Taxonomy of Creative Bechavior. *The Journal of Creative Behavior, 28*(3), 211-221.

Gupta, P. P., & Fogarty, T. J. (1993). Governmental auditors and their tolerance for ambiguity: An examination of the effects of a psychological variable. *The Journal of Government Financial Management, 42*(3), 25.

Hannah, S. T., Woolfolk, R. L., & Lord, R. G. (2009). Leader self-structure: a framework for positive leadership. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior, 30*(2), 269-290.

Hofmann, D. A., & Gavin, M. B. (1998). Centering Decisions In Hierarchical Linear Models: Implications For Research In Organizations. *Journal of management, 24*(5), 623-641. doi:org/10.1177/014920639802400504

Hofmann, D. A., Morgeson, F. P., & Gerras, S. J. (2003). Climate As A Moderator Of The Relationship Between Leader-Member Exchange and Content Specific Citizenship: Safety Climate As An Exemplar. *Journal of Applied Psychology, 88*(1), 170-178. doi:org/10.1037/0021-9010.88.1.170

Howell, J. M., & Shamir, B. (2005). The role of followers in the charismatic leadership process: Relationships and their consequences. *Academy of Management Review, 30*(1), 96-112.

Hunt Jr, M. F., & Miller, G. R. (1968). Open-and Closed-Mindedness, Belief-Discrepant Communication Behvior, and Tolerance For Cognitive Inconsistency. *Journal of personality and social psychology, 8*(1p1), 35-37. doi:org/10.1037/h0021238

Hyman, H. H., & Wright, C. R. (1979). *Education's Lasting Influence on Values*. Chicago: University of Chicago Press.

Ilies, R., Morgeson, F. P., & Nahrgang, J. D. (2005). Authentic leadership and eudaemonic well-being: Understanding leader–follower outcomes. *The leadership quarterly, 16*(3), 373-394.

James, L. R., Demaree, R. G., & Wolf, G. (1984). Estimating Within-Group Interrater Reliability With And Without Response Bias. *Journal of Applied Psychology, 69*(1), 85-98. doi:org/10.1037/0021-9010.69.1.85

James, L. R., Demaree, R. G., & Wolf, G. (1993). RWG: An Assessment Of Within-Group Interrater Agreement. *Journal of Applied Psychology, 78*(2), 306-309. doi:.org/10.1037/0021-9010.78.2.306

Joo, B.-K., & Jo, S. J. (2017). The effects of perceived authentic leadership and core self-evaluations on organizational citizenship behavior: The role of psychological empowerment as a partial mediator. *Leadership & Organization Development Journal, 38*(3), 463-481.

Judge, T. A., Thoresen, C. J., Pucik, V., & Welbourne, T. M. (1999). Managerial Coping With Organizational Change: A Dispositional Perspective. *Journal of Applied Psychology, 84*(1), 107-122.

Kaiser, R., Woodruff, B. A., Bilukha, O., Spiegel, P. B., & Salama, P. (2006). Using design effects from previous cluster surveys to guide sample size calculation in emergency settings. *Disasters, 30*(2), 199-211. doi:org/10.1111/j.0361-3666.2006.00315.x

Kark, R., Shamir, B., & Chen, G. (2003). The Two Faces Of Transformational Leadership: Empowerment And Dependency. *Journal of Applied Psychology, 88*(2), 246-255. doi:org/10.1037/0021-9010.88.2.246

Keenan, A. (1978). Selection Interview Performance and Intolerance of Ambiguity. *Psychological Reports, 42*(2), 353-354. doi:org/10.2466/pr0.1978.42.2.353

Keller, T. (1999). Images of the familiar: Individual differences and implicit leadership theories. *The leadership quarterly, 10*(4), 589-607.

Kelloway, E. K., & Barling, J. (2000). Knowledge work as organizational behavior. *International journal of management reviews, 2*(3), 287-304. doi:org/10.1111/1468-2370.00042

Kemp, C. G. (1962). Influence Of Dogmatism On The Training Of Counselors. *Journal of Counseling Psychology, 9*(2), 155-157. doi:org/10.1037/h0047600

Kernis, M. H. (2003). Toward a conceptualization of optimal self-esteem. *Psychological Inquiry, 14*(1), 1-26.

Kirton, M. J. (1981). A Reanalysis Of Two Scales Of Tolerance Of Ambiguity. *Journal of Personality Assessment, 45*(4), 407-414. doi:org/10.1207/s15327752jpa4504_10

Kleck, R. E., & Wheaton, J. (1967). Dogmatism and Responses To Opinion-Consistent and Opinion-Inconsistent Information. *Journal of personality and social psychology, 5*(2), 249-252. doi:org/10.1037/h0024197

Knefelkamp, L., Widick, C., & Parker, C. A. (1978). Editors' Notes: Why Bother With Theory? *New Directions for Student Services, 1978*(4), vii-xvi. doi:org/10.1002/ss.37119780402

Knell, J. (2000). *Most wanted: The quiet birth of the free worker*. London: Industrial Society.

Kohlberg, L. (1985). Kohlberg's stages of moral development. *WC Crain, Theories of development*, 118-136.

Konovsky, M. A., & Pugh, S. D. (1994). Citizenship behavior and social exchange. *Academy of Management Journal, 37*(3), 656-669.

Krull, J. L., & MacKinnon, D. P. (2001). Multilevel modeling of individual and group level mediated effects. *Multivariate behavioral research, 36*(2), 249-277.

LaHuis, D. M., & Ferguson, M. W. (2009). The accuracy of significance tests for slope variance components in multilevel random coefficient models. *Organizational Research Methods, 12*(3), 418-435.

Lehmann, I. J. (1963). Changes In Critical Thinking, Attitudes, And Values From Freshman To Senior Years. *Journal of educational psychology, 54*(6), 305-315. doi:org/10.1037/h0045302

Leone, C. (1989). Self-generated attitude change: Some effects of thought and dogmatism on attitude polarization. *Personality and Individual Differences, 10*(12), 1243-1252.

Levesque-Côté, J., Fernet, C., Austin, S., & Morin, A. J. (2018). New wine in a new bottle: Refining the assessment of authentic leadership using exploratory structural equation modeling (ESEM). *Journal of Business and Psychology, 33*(5), 611-628.

Liden, R. C., Sparrowe, R. T., & Wayne, S. J. (1997). Leader-member exchange theory: The past and potential for the future. *Research in personnel and human resources management, 15*, 47-120.

Lohman, M. C. (2010). Integrative literature review: An unexamined triumvirate: Dogmatism, problem solving, and HRD. *Human Resource Development Review, 9*(1), 72-88.

Lord, R. G., Brown, D. J., & Freiberg, S. J. (1999). Understanding the dynamics of leadership: The role of follower self-concepts in the leader/follower relationship. *Organizational behavior and human decision processes, 78*(3), 167-203.

Lord, R. G., Brown, D. J., Harvey, J. L., & Hall, R. J. (2001). Contextual constraints on prototype generation and their multilevel consequences for leadership perceptions. *The leadership quarterly, 12*(3), 311-338.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A Comparison Of Methods To Test Mediation and Other Intervening Variable Effects. *Psychological methods, 7*(1), 83-104. doi:org/10.1037/1082-989X.7.1.83

Marsh, H. W., & Hau, K.-T. (2007). Applications of latent-variable models in educational psychology: The need for methodological-substantive synergies. *Contemporary Educational Psychology, 32*(1), 151-170.

Marsh, H. W., Morin, A. J., Parker, P. D., & Kaur, G. (2014). Exploratory structural equation modeling: An integration of the best features of exploratory and confirmatory factor analysis. *Annual review of clinical psychology, 10*, 85-110.

May, D. R., Chan, A. Y., Hodges, T. D., & Avolio, B. J. (2003). Developing the moral component of authentic leadership. *Organizational dynamics*.

May, D. R., Gilson, R. L., & Harter, L. M. (2004). The psychological conditions of meaningfulness, safety and availability and the engagement of the human spirit at work. *Journal of occupational and organizational psychology, 77*(1), 11-37.

Mayer, R. E. (2002). Rote Versus Meaningful Learning. *Theory into practice, 41*(4), 226-232. doi:org/10.1207/s15430421tip4104_4

McCutcheon, A. L. (1985). A latent class analysis of tolerance for nonconformity in the American public. *49*(4), 474-488.

McKeough, A., & Sanderson, A. (1996). Teaching Storytelling: A Microgenetic Analysis Of Developing Narrative Competency. *Journal of Narrative and Life History, 6*(2), 157-192. doi:org/10.1075/jnlh.6.2.04tea

Meyerson, S. L., & Kline, T. J. (2008). Psychological and environmental empowerment: Antecedents and consequences. *Leadership & Organization Development Journal, 29*(5), 444-460.

Michie, S., & Gooty, J. (2005). Values, emotions, and authenticity: Will the real leader please stand up? *The leadership quarterly, 16*(3), 441-457.

Moore, L. M., & Ovadia, S. (2006). Accounting for spatial variation in tolerance: The effects of education and religion. *Social Forces, 84*(4), 2205-2222. doi:org/10.1353/sof.2006.0101

Morrison, E. W., & Phelps, C. C. (1999). Taking charge at work: Extrarole efforts to initiate workplace change. *Academy of Management Journal, 42*(4), 403-419.

Muthén, L., & Muthén, B. (2019). Mplus. *The comprehensive modelling program for applied researchers: user's guide, 5*.

Norr, J. L., & Crittenden, K. S. (1975). Evaluating College Teaching As Leadership. *Higher Education, 4*(3), 335-350. doi:org/10.1007/BF00136900

Noyelle, T. (1990). Toward A New Labor Market Segmentation. In T. Noyelle (Ed.), *Skills, wages and productivity in the service sector* (pp. 212-224). Boulder, CO: : Westview Press.

Nunn, C. Z., Crockett, H. J., & Williams, J. A. (1978). *Tolerance for nonconformity*. San Francisco: Jossey-Bass Publishers.

OECD. (2013). *OECD Skills Outlook 2013: First Results from the Survey of Adult Skills*. Retrieved from

Oke, A., Munshi, N., & Walumbwa, F. O. (2009). The influence of leadership on innovation processes and activities. *Organizational dynamics, 38*(1), 64-72.

Oldham, G. R., & Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. *Academy of Management Journal, 39*(3), 607-634. doi:.org/10.5465/256657

Organ, D. W. (1988). *Organizational citizenship behavior: The good soldier syndrome*. Lexington, MA, England: Lexington Books/DC Heath and Com.

Palmer, D. L., & Kalin, R. (1985). Dogmatic Responses To Belief Dissimilarity In The" Bogus Stranger" Paradigm. *Journal of personality and social psychology, 48*(1), 171-179. doi:org/10.1037/0022-3514.48.1.171

Pascarella, E. T., Edison, M., Nora, A., Hagedorn, L. S., & Terenzini, P. T. (1996). Influences on students' openness to diversity and challenge in the first year of college. *The Journal of Higher Education, 67*(2), 174-195. doi:org/10.1080/00221546.1996.11780255

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students: Findings and insights from twenty years of research*. San Francisco: : Jossey-Bass.

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade* San Francisco: Jossey-Bass.

Perry, W. G. (1970). *Forms Of Intellectual And Ethical Development In The College Years. .* New York: : Holt, Rinehart and Winston.

Perry, W. G. (1981). Cognitive and Ethical Growth. In K. A. Philip G. Altbach, Ilda Carreiro King (Ed.), *College Student Development and Academic Life: Psychological, Intellectual*. New York: Routledge.

Phelan, P., Yu, H. C., & Davidson, A. L. (1994). Navigating the psychosocial pressures of adolescence: The voices and experiences of high school youth. *American Educational Research Journal, 31*(2), 415-447.

Phye, G. (1997). Inductive Reasoning and Problem Solving: The Early Grades. *Handbook of Academic Learning construction of knowledge*, 451-471. doi:org/10.1016/B978-012554255-5/50015-6

Poi, B. P. (2004). From the help desk: Some bootstrapping techniques. *The Stata Journal, 4*(3), 312-328.

Powell, W. W., & Snellman, K. (2004). The Knowledge Economy. *Annual Review of Sociology*, 199-220. doi: 10.1146/annurev.soc.29.010202.100037

Prusak, L. (2009). *Knowledge In Organisations*. London: Routledge.

Puccio, G. J., & Cabra, J. F. (2011). Idea generation and idea evaluation: Cognitive skills and deliberate practices *Handbook of organizational creativity* (pp. 189-215): Elsevier.

Quinn, R. E., & Spreitzer, G. M. (1997). The road to empowerment: Seven questions every leader should consider. *Organizational dynamics, 26*(2), 37-49.

Rank, J., Pace, V. L., & Frese, M. (2004). Three avenues for future research on creativity, innovation, and initiative. *Applied psychology, 53*(4), 518-528.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods* (2 ed. Vol. 1). Thousand Oaks, CA: Sage.

Read, S. J., Monroe, B. M., Brownstein, A. L., Yang, Y., Chopra, G., & Miller, L. C. (2010). A Neural Network Model Of The Structure and Dynamics Of Human Personality. *Psychological review, 117*(1), 61-92. doi:org/10.1037/a0018131

Redmond, M. R., Mumford, M. D., & Teach, R. (1993). Putting creativity to work: Effects of leader behavior on subordinate creativity. *Organizational behavior and human decision processes, 55*(1), 120-151.

Rego, A., Sousa, F., Marques, C., & e Cunha, M. P. (2012). Authentic Leadership Promoting Employees' Psychological Capital and Creativity. *Journal of Business Research, 65*(3), 429-437. doi:org/10.1016/j.jbusres.2011.10.003

Ritchie, S. J., & Tucker-Drob, E. M. (2018). How Much Does Education Improve Intelligence? A Meta-Analysis. *Psychological science, 29*(8), 1358-1369. doi:org/10.1177/0956797618774253

Rodgers, R. F. (1990). Recent Theories and Research Underlying Student Development. In D. G. C. Associates (Ed.), *College Student Development: Theory And Practice For The 1990s* (Vol. 49, pp. 27-79). Alexandria, VA: : American College Personnel Association.

Rokeach, M. (1960). *The Open and Closed Mind: Investigations Into The Nature Of Belief Systems and Personality Systems*. Oxford, England:: Basic Books.

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of educational psychology, 82*(3), 498-504. doi:doi.org/10.1037/0022-0663.82.3.498

Schwenk, C. R. (1982). Effects of inquiry methods and ambiguity tolerance on prediction performance. *Decision Sciences, 13*(2), 207-221.

Schyns, B., & Felfe, J. (2006). The personality of followers and its effect on the perception of leadership: An overview, a study, and a research agenda. *Small Group Research, 37*(5), 522-539.

Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal, 37*(3), 580-607.

Seibert, S. E., Wang, G., & Courtright, S. H. (2011). Antecedents and Consequences Of Psychological And Team Empowerment In Organizations: A Meta-Analytic Review. *Journal of Applied Psychology, 96*(5), 981-1003. doi:org/10.1037/a0022676

Shamir, B. (2007). From passive recipients to active co-producers: Followers' roles in the leadership process. In B. Shamir, R. Pillai, M. C. Bligh, & M. Uhl-Bien (Eds.), *Follower-centered perspectives on leadership* (pp. 9-39). Greenwich, CT: Information Age Publishin.

Shapira-Lishchinsky, O., & Tsemach, S. (2014). Psychological empowerment as a mediator between teachers' perceptions of authentic leadership and their withdrawal and citizenship behaviors. *Educational Administration Quarterly, 50*(4), 675-712.

Shoda, Y., LeeTiernan, S., & Mischel, W. (2002). Personality as a dynamical system: Emergence of stability and distinctiveness from intra and interpersonal interactions. *Personality and Social Psychology Review, 6*(4), 316-325.

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass Correlations: Uses In Assessing Rater Reliability. *Psychological Bulletin, 86*(2), 420-428. doi:org/10.1037/0033-2909.86.2.420

Shuell, T. J. (1990). Phases of meaningful learning. *Review of educational research, 60*(4), 531-547.

Snijders, T. A., & Bosker, R. J. (1999). *Multilevel Analysis: An introduction to basic and advanced multilevel modelling*. London

Sage.

Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions, measurement, and validation. *Academy of Management Journal, 38*(5), 1442-1465.

Spreitzer, G. M. (1996). Social structural characteristics of psychological empowerment. *Academy of Management Journal, 39*(2), 483-504.

Spreitzer, G. M. (2008). Taking stock: A review of more than twenty years of research on empowerment at work. *Handbook of organizational behavior, 1*, 54-72.

Stouffer, S. A. (1963). *Communism, Conformity, and Civil Liberties*. New Brunswick, U.S.A: Transaction Publishers.

Sy, T. (2010). What do you think of followers? Examining the content, structure, and consequences of implicit followership theories. *Organizational behavior and human decision processes, 113*(2), 73-84.

Tampoe, M. (1993). Motivating knowledge workers—the challenge for the 1990s. *Long Range Planning, 26*(3), 49-55. doi:org/10.1016/0024-6301(93)90006-2

Tatzel, M. (1980). Tolerance for ambiguity in adult college students. *Psychological Reports, 47*(2), 377-378.

Teoh, H. Y., & Foo, S. L. (1997). Moderating Effects Of Tolerance For Ambiguity And Risktaking Propensity On The Role Conflict-Perceived Performance Relationship: Evidence From Singaporean Entrepreneurs. *Journal of business Venturing, 12*(1), 67-81. doi:org/10.1016/S0883-9026(96)00035-3

Tepper, B. J., Lockhart, D., & Hoobler, J. (2001). Justice, Citizenship, And Role Definition Effects. *Journal of Applied Psychology, 86*(4), 789-796. doi:org/10.1037/0021-9010.86.4.789

Thomas, K. W., & Velthouse, B. A. (1990). Cognitive elements of empowerment: An "interpretive" model of intrinsic task motivation. *Academy of Management Review, 15*(4), 666-681.

Troldahl, V. C., & Powell, F. A. (1965). A Short-Form Dogmatism Scale For Use In Field Studies. *Social Forces, 44*(2), 211-214. doi:org/10.1093/sf/44.2.211

Uhl-Bien, M., Marion, R., & McKelvey, B. (2007). Complexity leadership theory: Shifting leadership from the industrial age to the knowledge era. *The leadership quarterly, 18*(4), 298-318. doi:org/10.1016/j.leaqua.2007.04.002

Uhl-Bien, M., Riggio, R. E., Lowe, K. B., & Carsten, M. K. (2014). Followership theory: A review and research agenda. *The leadership quarterly, 25*(1), 83-104. doi:org/10.1016/j.leaqua.2013.11.007

Ukoumunne, O., Gulliford, M., Chinn, S., Sterne, J., & Burney, P. (1999). Methods for evaluating area-wide and organisation-based interventions in health and health care: A systematic review. *Health Technology Assessment (Winchester, England), 3*(5), iii-92.

Unsworth, K. (2001). Unpacking creativity. *Academy of Management Review, 26*(2), 289-297.

Vandyne, L., Cummings, L. L., & Parks, J. M. (1995). Extra-Role Behaviors-In Pursuit Of Construct And Definitional Clarity (A Bridge Over Muddied Waters) *Research In Organizational Behavior: An*

Annual Series Of Analytical Essays And Critical Reviews (Vol. 17, pp. 215-285). Greenwich, CT: JAI Press.

Vogt, W. P. (1997). *Tolerance & Education: Learning To Live With Diversity and Difference*. Thousand Oaks, CA, US: Sage Publications, Inc.

Vroom, V. H., & Yetton, P. W. (1973). *Leadership and decision-making* (Vol. 110): University of Pittsburgh Pre.

Walumbwa, F. O., Avolio, B. J., Gardner, W. L., Wernsing, T. S., & Peterson, S. J. (2008). Authentic leadership: Development and validation of a theory-based measure. *Journal of management, 34*(1), 89-126.

Walumbwa, F. O., Christensen, A. L., & Hailey, F. (2011). Authentic Leadership and The Knowledge Economy: Sustaining Motivation And Trust Among Knowledge Workers. *Organizational dynamics, 40*(2), 110-118. doi:10.1016/j.orgdyn.2011.01.005

Wang, H., Sui, Y., Luthans, F., Wang, D., & Wu, Y. (2014). Impact of authentic leadership on performance: Role of followers' positive psychological capital and relational processes. *Journal of Organizational Behavior, 35*(1), 5-21.

Weed, S. E., Mitchell, T. R., & Moffitt, W. (1976). Leadership style, subordinate personality and task type as predictors of performance and satisfaction with supervision. *The Journal of Applied Psychology, 61*(7), 58-66.

Weil, F. D. (1985). The variable effects of education on liberal attitudes: A comparative-historical analysis of anti-Semitism using public opinion survey data. *American Sociological Review*, 458-474.

Weissenstein, A., Ligges, S., Brouwer, B., Marschall, B., & Friederichs, H. (2014). Measuring The Ambiguity Tolerance Of Medical Students: A Cross-Sectional Study From The First To Sixth Academic Years. *BMC family practice, 15*(1), 6. doi:10.1186/1471-2296-15-6

Williams Jr, J. A., Nunn, C. Z., & Peter, L. S. (1976). Origins of tolerance: Findings from a replication of Stouffer's Communism, conformity, and civil liberties. *Social Forces, 55*(2), 394-408.

Wong, C. A., & Cummings, G. G. (2009). The influence of authentic leadership behaviors on trust and work outcomes of health care staff. *Journal of Leadership Studies, 3*(2), 6-23.

Yammarino, F. J., Dionne, S. D., Schriesheim, C. A., & Dansereau, F. (2008). Authentic leadership and positive organizational behavior: A meso, multi-level perspective. *The leadership quarterly, 19*(6), 693-707.

Yukl, G. (2001). *Leadership in Organizations* (5th ed.): Prentice Hall Int.

Zaccaro, S. J., & Klimoski, R. J. (2002). *The nature of organizational leadership: Understanding the performance imperatives confronting today's leaders* (Vol. 12): John Wiley & Sons.

Zenasni, F., Besancon, M., & Lubart, T. (2008). Creativity and tolerance of ambiguity: An empirical study. *The Journal of Creative Behavior, 42*(1), 61-73.

Zhou, J., & George, J. M. (2003). Awakening employee creativity: The role of leader emotional intelligence. *The leadership quarterly, 14*(4-5), 545-568.

Zhu, W. (2008). The effect of ethical leadership on follower moral identity: The mediating role of psychological empowerment. *Leadership Review, 8*(3), 62-73.

Zhu, W., May, D. R., & Avolio, B. J. (2004). The impact of ethical leadership behavior on employee outcomes: The roles of psychological empowerment and authenticity. *Journal of Leadership & Organizational Studies, 11*(1), 16-26.