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TAKING A MULTILEVEL APPROACH TO CREATIVITY AND INNOVATION

ABSTRACT This chapter defines key areas, presents important issues around multilevel research, presents theoretical and empirical multilevel research findings and finishes with recommendations for researchers, practitioners and managers.

Introduction

Creativity and innovation are perhaps the most vital of all human resources. Creativity lies at the heart of finding new and useful ways of doings things. Innovation, be it in an organisation or society, is central to ensuring that creative ideas and concepts become products, processes and services of value. Due to the centrality of creativity and innovation, researchers and practitioners have long wanted to understand these constructs better. Early studies focused on the individual (e.g. Guilford, 1950) with attention then turning to team and organisational factors (e.g. Anderson, De Dreu and Nijstad, 2004). These individual, team and organisational factors were usually studied in isolation. Recent statistics and computational modelling advances allow these factors to be considered more holistically. That is, a multilevel approach.

Definitions, Key Considerations and Benefits of Multilevel Research

There is some confusion as to what constitutes a multilevel approach (Costa, Graca, Marques-Quinteiro, Santos, Caetano & Passos, 2013). Typically, the term 'multilevel' is used to denote a phenomenon with two or more levels.

Multilevel research is conducted when investigating the relationships between variables characterising lower levels, such as individuals, and higher-level variables, such as groups or teams. In much organisational research, level one (micro level), refers to individual variables, level two (meso level) refers to team variables and level three (macro level) refers to organisational variables (Kozwolski & Klein, 2000). Multilevel conceptualisations commonly refer to hierarchical 'nesting' or 'clustering' of levels. For example, individuals are nested within a team, which is in turn nested within an organisation (Nielsen, 2010). A multilevel approach allows a more integrated understanding of phenomena that unfold across levels in organisations.

Creativity may be considered the attribute of a person or persons, a process, an environmental variable or refer to the properties of a product (Batey, 2012). Plucker, Beghetto, and Dow (2004) define creativity as "the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is

both novel and useful as defined within a social context" (p.90). Whilst there is some evidence that this definition of creativity is gaining acceptance amongst the creativity research community (Baer & Kaufman, 2005), few studies measure creativity in accordance with this definition. This lack of synergy between how creativity is defined and measured can make the interpretation of the findings from different studies problematic.

Innovation may be defined as "the multi-stage process whereby organisations transform ideas into new or improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace" (p.1334, Baregheh, Rowley & Sambrook, 2009). Whilst this carefully constructed definition has been used in a number of studies (e.g. Baregheh, Rowley, Sambrook & Davies, 2012), the majority of innovation publications continue to use diverging definitions of innovation. This hinders meaningful discussion about innovation, especially across disciplines.

Much has been written about the nature and types of multilevel research. While it is outside the scope of this chapter to provide a thorough exposition of these issues, it is appropriate to address the fundamental consideration regarding whether a model is top-down or bottom-up in orientation.

Bottom-up multilevel models focus on the effects of a lower-level variable on a higher-level variable, such as the effects an individual has on their team. Top-down multilevel models focus on the effects of a higher-level variable on lower-level variables. For example, the effect organizational climate has on an individual employee. Whilst many models do not explicitly state whether they are bottom-up or top-down, the majority of multilevel models are top-down (Kozwolski & Klein, 2000).

Once a model has been determined as bottom-up or top-down in nature, there are further fundamental considerations to take into account.

Bottom-up models attempt to describe how lower-level constructs emerge to form higher-level phenomena. Emergence can be in terms of a composition model or a compilation model. In composition models, the phenomena observed in the lower-level remains fundamentally the same when observed at the higher level. For example, organizational climate emerges compositionally, because an individual's perception of climate at the micro level is in effect the same as the macro manifestation of climate at the organizational level, where many individual perceptions are aggregated. Compilation models examine phenomena that are similar, but not identical when observed at different levels. Team creativity is compilational, because it is not simply the aggregation of individual creativity. The distinction between whether a model is compilational or compositional is not necessarily always clear, and sometimes a construct may be either.

There are three types of top-down multilevel models (Klein & Kozwolski 2000). First, direct effects models. These predict the direct effect of higher-level variables on a lower-level variable. For example, the effect of organizational climate on individual creativity. Second, moderator models suggest that the relationship between two variables at the same level, such as individual creativity and individual creative self-efficacy, are moderated by a higher-level variable, such as organizational climate. Third, frog pond models show the complex interactions between lower and higher-level variables. For example, a frog pond model could show the effect of individual creativity on team creative performance, relative to the creativity of each member of the team.

There are benefits to be gained from the adoption of a multilevel research paradigm. First, combining micro and macro levels in research allows for a more integrated and holistic

understanding of the interplay between complex variables that cannot be yielded from single level research (Nielsen, 2010), and can make for more accurate estimates of variance (Brass, 2000).

Second, multilevel research increases the level of application-relevance, as it allows managers and practitioners to make conclusions based on the appropriate level of analysis (Kozwolski & Klein, 2000). For example decisions about the most appropriate approach to take for an individual can be derived from individual level data, while decisions about teams can be taken from team level data. This avoids the danger of extrapolating to the level of the team on the basis of individual level data.

Given that creativity and innovation are complex phenomena that operate at the level of the individual, team and organization, they would appear to be perfect candidates for multilevel research (Anderson et al., 2004).

Despite evidence of increasing consensus as to how creativity and innovation should be defined, in practice multilevel research often fails to start with unequivocal definition. As a result, inconsistent definition leads to inconsistent measurement, which leads to inconsistent findings. Similarly, despite it being possible to identify a multilevel model as top-down or bottom up, compilational or compositional, or as assessing direct effects, mediational effects or take a frog pond perspective, rarely do multilevel models in creativity and innovation research provide this level of clarity.

This chapter will now summarise theoretical and empirical work on multilevel models of creativity and innovation and provide guidance for studying creativity and innovation through a multilevel lens.

Multilevel Models of Creativity and Innovation

In order to follow a rigorous methodology for the review of multilevel models of creativity and innovation for this chapter, inclusion criteria were formulated. To be included in this chapter, a multilevel model had to include two or more levels, and be drawn from the psychological or management literature. The primary focus is to review models that give serious consideration to the relationships between levels. Brief reference will be made to models that focus on a single level but allude to relationships with other levels.

Theoretical Multilevel Models of Creativity and Innovation

Early theoretical multilevel models of creativity were expanded from models that sought to explain individual creativity, often with reference to situational variables (e.g. Ford, 1996; Mumford & Gustafson, 1988; Woodman & Schoenfeldt, 1990). The first multilevel model of creativity was developed by Woodman, Sawyer and Griffin (1993).

The authors contend that "an understanding of organizational creativity will necessarily involve understanding (a) the creative process, (b) the creative product, (c) the creative person, (d) the creative situation, and (e) the way in which each of these components interacts with the others" (p. 294). This still holds true for multilevel models of creativity and innovation, and accords with attempts to provide a comprehensive and parsimonious coverage of creativity measurement (Batey, 2012).

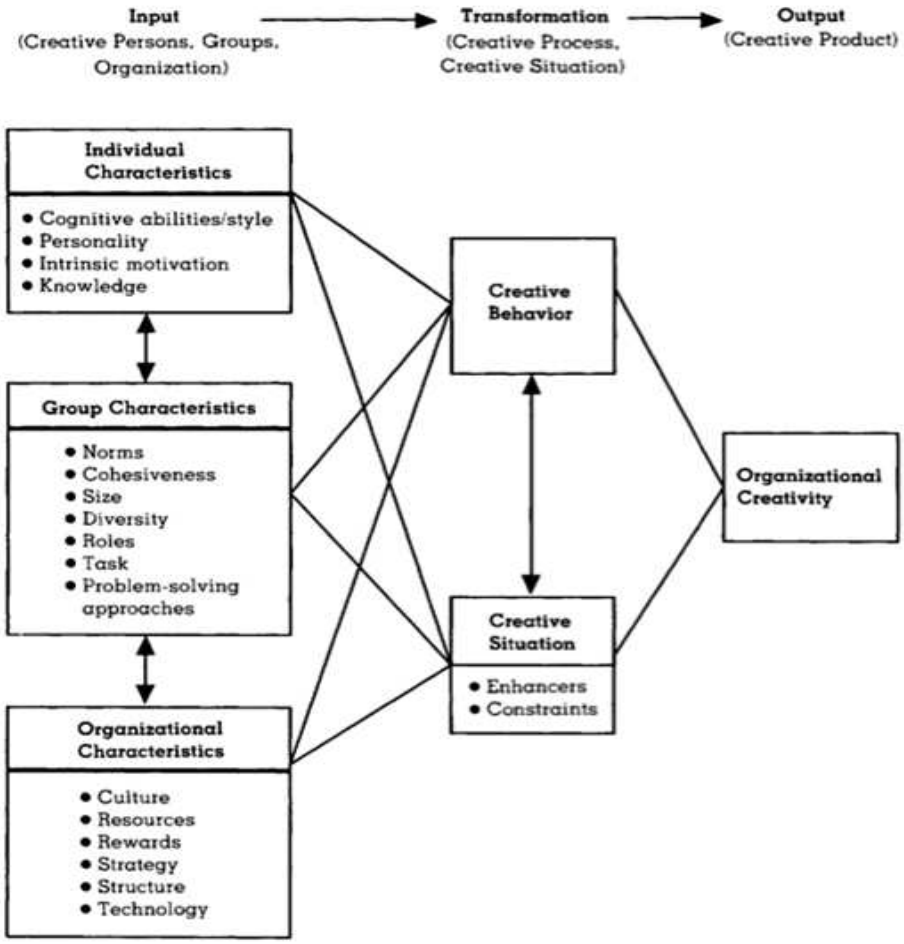

Figure 1: Interactionist Model of Organizational Creativity from Woodman, Sawyer & Griffin (1993, p. 309).

Woodman, Sawyer and Griffin (1993) proposed that a combination of specific individual difference antecedents lead to individual creativity, which interact with group characteristics, and then interact with organizational characteristics (c.f. Figure 1). Together these individual, group and organizational characteristics interact to produce creative behavior and the creative situation, which in turn lead to a creative product. In effect this model recognizes the nesting of individual factors within group factors within organizational factors, and that the interactions between the levels are not unidirectional.

The multilevel model of Woodman et al. (1993) accords with the definition of creativity outlined at the beginning of this chapter and each part of the interactionist model lists a specific characteristic which means the model could be measured and tested empirically. However, an empirical test has yet to be conducted.

It is beyond the scope of this review to closely examine models only pertaining to individual creativity. However, Ford (1996) in his model of Individual Creative Action in Multiple Social Domains does briefly highlight the interplay between Groups, Organizations, Institutional Environments and Markets. Similarly, the Propulsion Model of Creativity proposed by Sternberg, Kaufman and Pretz (2002) conceptualized how different types of

creative products influence domains. The model also briefly explored common individual difference traits related to creative performance. Lastly, Drazin, Glynn, and Kazanjian (1999) produced a model of creativity which they termed 'multilevel', but it does not fulfill the inclusion criteria for this chapter. The model considers the role of time in the development of creative products, which is an area often overlooked.

Csikszentmihalyi (1999) hypothesized that creativity exists in the interaction between the individual, domain and field (c.f. Figure 2). An individual draws information from a domain and alters the information by using their cognitive processes, motivation and personality traits. The field, consisting of people who can influence or act as "gatekeepers" of a domain (e.g. academic journal editors, scientists who conduct peer-reviews), evaluate and promote or discourage new ideas. The domain in turn preserves creative contributions and selects which ideas are passed onto other members of the field. As yet, there have been no empirical investigations of the theory. Further, from a practitioners' perspective, the model does not provide significant insight regarding how best to develop creativity.

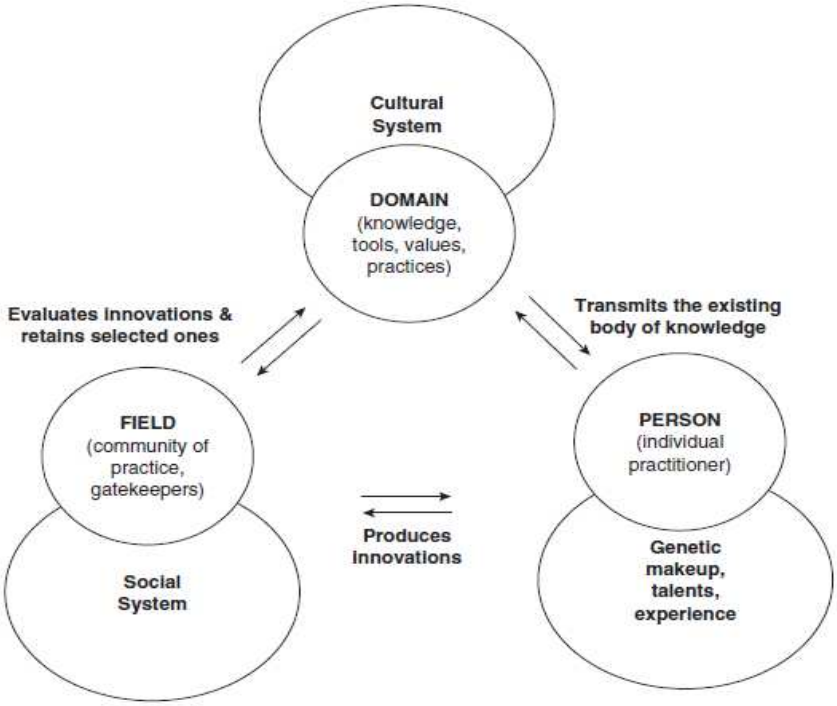

Figure 2: The Systems Model of Creativity, from Csikszentmihalyi (1999)

In their review of the creativity literature from 1998 to 2008, Hennessey and Amabile (2010) concluded that a systems perspective was necessary to understand creativity. Though simplistic, the representation of creativity shown in figure 3 illustrates the nested multiple levels of creativity, starting with intra-individual creative processes relating to neurology and cognition.

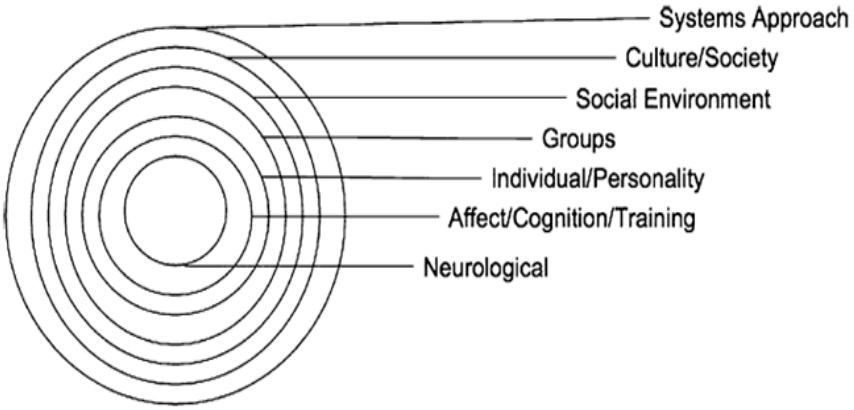

Figure 3: A simple systemic model of creativity, from Hennessey &Amabile (2010).

The model proposed by Hennessey and Amabile (2010) is broad and comprehensive. However, the relationships between the levels, the order in which the levels are nested and discriminant validity between each level has not been subjected to empirical investigation.

Sears and Baba (2011) proposed a recent theoretical multilevel model (c.f. figure 4). For this model, the authors adopt language pertaining to innovation rather than creativity, although there is little discernible difference between how the terms are employed.

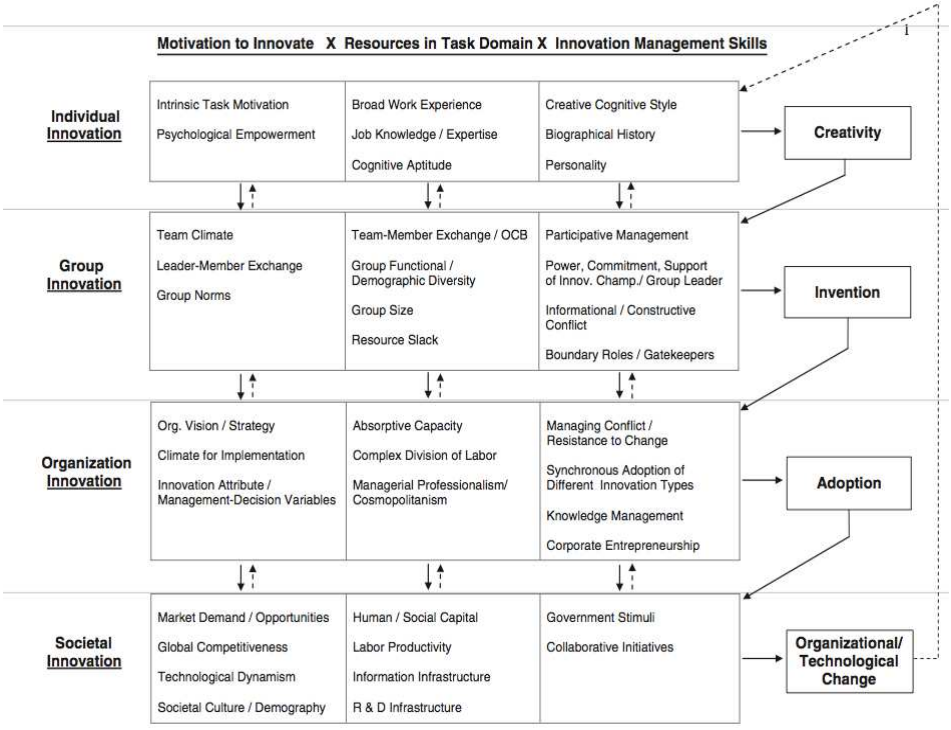

Figure 4: Four level innovation model proposed by Sears and Baba (2011), p4

In addition to modeling innovation at the individual, team and organizational levels, Sears and Baba (2011) introduce a fourth level - societal innovation. This acknowledges the impact of higher-level innovation drivers. Like the Propulsion Model of Creativity (Sternberg et al., 2002), this model outlines how the progression through the levels of individual to societal innovation leads to creativity, invention, adoption and change. Sears and Baba's (2011) model highlights the continued interest in a multilevel approach, and, crucially, exemplifies the lack of progression. Multilevel models are still rarely empirically tested.

Batey (2012) presented a multilevel model for the measurement of creativity. This framework synthesized previous efforts to develop taxonomies of creativity measurement, resulting in a three-dimensional matrix. The three axes are concerned with levels, facets and measurement approach (c.f. figure 5).

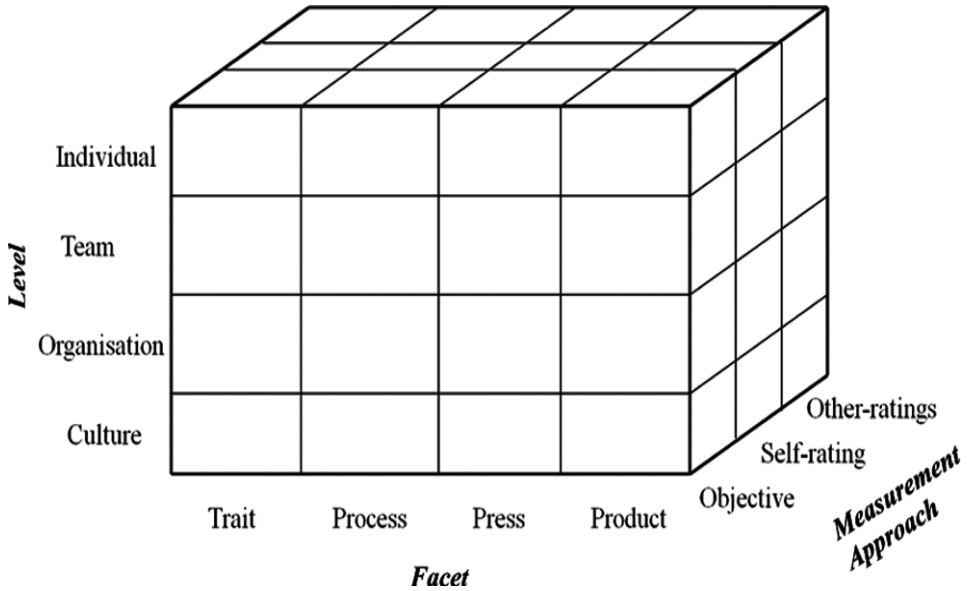

Figure 5: Multilevel model for the measurement of creativity proposed by Batey (2012), p59

The level of creativity is concerned with who is the focal point of analysis, broken down into four categories: individual, team, organization, and (national, regional or societal) culture. The facet of creativity is concerned with what is to be analyzed. This comprises four categories approximately corresponding to the 4Ps approach (Rhodes, 1987); trait characteristics (person), process, press, and product. The measurement approach concerns how creativity is to be assessed. Measurement may be objective (e.g., hard data), subjective in the form of ratings provided by the focal point of analysis (e.g., an individual or team), or subjective and external to the focal point of analysis (e.g., subject matter experts, judges, etc.).

The benefits of this multilevel measurement model is that it has broad coverage, considering who is going to be measured, what is going to be measured about them and how that measurement may be conducted. However, the model has not been used empirically.

The fundamental aspects of each theoretical multilevel model of creativity and innovation are presented in table 1.

Author	Model name	Main focus	Key definitions	Individual level constructs	Team level constructs	Organisational level constructs	Main criticisms
Woodman, Sawyer & Griffin (1993)	Interactionist model of organizational creativity	Predicting creative outcomes	Creativity = "creation of a valuable, useful new product, service, idea, procedure or process by individuals working together in a complex social system" p.293	Cognitive style, knowledge, personality, intrinsic motivation	Group composition, group characteristics, group processes	No direct constructs - contextual influence mentioned	No clear operationalisation of creative outcomes. No differentiation of creativity and innovation. No consideration of effects of leadership or climate
Csikszentmihalyi (1999)	Systems model of creativity	The interaction between individual, domain and field	Creativity = an idea, act or product that changes an existing domain, or transforms an existing domain into a new one	Genes, talents, experience	Not team but 'domain'. Domain is community of practice, gatekeepers	Not organizational, but 'cultural system'. Cultural systems is knowledge, tools, values, practices	Not specific to organisational creativity and innovation. Difficult to apply practically. No empirical investigation
Hennessey & Amabile (2010)	Systemic model of creativity	Creativity	Creativity= "the generation of products or ideas that are both novel and appropriate" (p.570)	Neurological, emotion, cognition, training, personality	Groups	Environment, culture, society	Not specific to organisational creativity. No discrimination between team and group level
Sears & Baba (2011)	Multilevel model of innovation	Innovation	No specific definitions. View innovation as process not an outcome	Intrinsic motivation, work experience, knowledge, cognitive aptitude, cognitive style, biographical history, personality	Team climate, leader-member exchange, group norms, team member exchange, diversity, size, resources, participative management, team leader support, constructive conflict, boundary roles	Organisational strategy, implementation climate, absorptive capacity, division of labour, diversity, resistance to change, knowledge management, synchronous adoption of different innovation types, corporate entrepreneurship	No empirical support
Batey (2012)	Heuristic framework for creativity measurement	Measuring creativity	Creativity = "the interaction among aptitude, process and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context" (Plucker et al., 2004 p.90)	Facets: trait, process, press, product. Measurement approach: Objective, self-rating, other-ratings	Facets: trait, process, press, product. Measurement approach: Objective, self-rating, other-ratings	Facets: trait, process, press, product. Measurement approach: Objective, self-rating, other-ratings	Focused on measurement, not theoretical

Table 1: Fundamental Aspects of Theoretical Multilevel Models of Creativity and Innovation

The different theoretical multilevel models of creativity and innovation share fundamental features. Many consider individual, team and organizational level factors. There is also convergence regarding some of the key individual (e.g. personality) and team level factors (e.g. group diversity). However, there is also divergence across the models.

These different models arguably provide a broad and helpful multilevel visualization of creativity and innovation. However, the purpose of the models has rarely been to comprehensively inform individual or leadership behaviour, and even less to inform management processes and practices. To move beyond hypothetical representations of creativity and innovation more precise and empirically tested models are required. However, we will see that empirical efforts are inconsistent in approach, rarely reference the theoretical models we have presented and seldom measure creativity or innovation in accordance with the definitions presented earlier.

Empirical Multilevel Models of Creativity and Innovation

Despite increased publication of multilevel work in recent years (Costa et al., 2013), most organizational research still occurs at the individual level. Where there is empirical multilevel research on creativity and innovation, there is little consistency in terms of approach, methodologies and measures. Further, the empirical research does not stem from theoretical multilevel models. These issues make consolidating existing research into a parsimonious account problematic. In an effort to provide systematization to the presentation of the empirical multilevel models of creativity and innovation, we present the studies under three broad categories: studies that focus on the individual, studies that focus on teams, and studies that focus on organizational level factors.

Empirical Multilevel Models with an Individual Focus

The individual approach is the most common paradigm in creativity research (Batey & Furnham, 2006). Hirst, van Knippenberg and Zhou (2009) studied 198 employees nested within 25 R&D teams from a single multinational pharmaceutical organization, and found that there was a weak positive relationship between an individuals' learning orientation (a preference for learning and taking on new challenges) and supervisory ratings of individual creative problem solving. The authors found that the extent to which the team had high levels of team learning behaviors strengthened the relationship between individual learning orientation and individual creativity. That is, when the team context is supportive of learning, individual learning orientation leads to higher individual creativity.

Richter, Hirst, van Knippenberg and Baer (2012) studied 176 employees in 34 R&D teams in a single multinational organization, examining the relationship between individual creative self efficacy (belief in their ability to produce creative outcomes) and supervisor-rated individual creativity. They also explored how team level processes mediated this relationship. It was found that team members 'Knowledge of Who Knows What' and team diversity (regarding professional specialism) mediated the relationship between creative self-efficacy and creativity. That is, team members are rated as more creative when they have self-belief in their creativity, they know what their other team members do and they work within a professionally diverse team.

Yoshida, Sendjaya, Hirst and Cooper (2013), studied 154 teams and found that individual creative performance, as assessed by managerial ratings, was highest when team mem-

bers felt a close relationship to their leader and in the presence of a supportive climate for team creativity. This indicates that individual creative performance is part of a complex system that includes leadership behaviors and team climate.

Sung, Cho & Choi (2011) conducted a longitudinal study via 40 executive interviews in a large Korean consumer products company to explore who is involved in the adoption and implementation stages of the innovation process, in a sample of 94 innovations. It was found that the employees who played major roles in encouraging the organization to adopt an innovation would also remain heavily involved in the implementation of the innovation, as employee-driven implementation was moderately and significantly correlated with employee-driven adoption. That is, individuals interact with different organizational innovation processes to influence the success of innovation. It may be argued that this study is not multilevel, as the relationships between levels were not subject to quantitative analyses.

These individually-focused empirical multilevel studies demonstrate that individual creativity does not occur in a vacuum. Rather, individual creativity unfolds within a complex system that includes the team and environment.

Empirical Multilevel Models with a Team Focus

Although much of the empirical multilevel research has focused on the individual, some studies have focused at the team level. Taggar (2002) studied individual and group creativity processes by asking 94 groups, comprised of 480 undergraduate students, to complete one 'management case study' task each week over a period of thirteen weeks, including decision making, generating options, or devising evaluation criteria. An external judge rated each group's report on their task workings and proposed solution. This rating provided the measure of group creativity. Each group member also rated the creativity of their other group members. Taggar (2002) found that domain knowledge and performance-relevant behaviours moderately and significantly related to individual personality traits (Extraversion, Conscientiousness, Agreeableness). The study also demonstrated that creative performance at the team level was not simply the aggregation of individual creativity. That is, team creativity is more than just the sum of individual creative parts. There is a unique contribution relating to team composition, behavior and dynamics.

Mohamed (2002) explored organization and team level antecedents of team innovation with a sample of 902 individuals from 150 teams from governmental departments within the United Arab Emirates. Team innovation was measured by self-reported engagement in the adoption of service, process, administrative, operational and system innovations. A number of antecedents were found to lead to higher levels of team innovation. Specifically, group satisfaction, positive managerial attitudes and decentralization all had positive moderate significant relationships with innovation, while diversity was weakly correlated with innovation. This study was not without limitations, in particular the measurement of innovation as adoption was esoteric and the two new scales devised for this study (group satisfaction and decentralization) were not subjected to rigorous analyses to determine their robustness.

Chen, Farh, Campbell-Bush, Wu and Wu (2013) focused on the role of team support for innovation, individual and team innovation performance and individual motivation in promoting innovation in a sample of 428 individuals in 95 R&D teams from 33 Chinese organisations across various industries. They found that perceived team support for innova-

tion climate was weakly, positively and significantly related to increased individual innovation performance as rated by the team leader. This led to increased team innovation performance as rated by a manager. Importantly, the relationship between individual innovation performance and team innovation performance demonstrated only a weak positive significant relationship. This indicated that team creative performance is not simply the aggregate of individual innovation performance. Instead, the positive, facilitating supportive team climate has a significant impact. This study also examined the relationship between team support for innovation and individual innovation performance. It was found that the pathway between team support for innovation and individual innovation performance was partially mediated by individual intrinsic motivation and role breadth efficacy (perceived capability of carrying out a broader set of work tasks extending beyond prescribed technical requirements). This indicates that team support for creativity is important for individual innovation performance, but that individual characteristics relating to intrinsic motivation and self-efficacy are influential components in the complex system of creativity that incorporates individual and team antecedents.

These team-focused empirical multilevel studies demonstrate some of the complex interactions between individual, team and organization. Given the divergence in methods and approaches adopted in these studies, it is not possible to draw firm conclusions.

Empirical Multilevel Models with a Focus on Management Practices and Organizational Level Factors

This section outlines multilevel studies that have examined management and HR practices, in addition to organizational factors like climate and culture. It is beyond the scope of this chapter to examine leadership studies.Instead of looking at what encourages creativity, what constrains individual creativity has also been explored taking a multilevel approach. Hirst, van Knippenberg, Chen and Sacramento (2011) studied 330 individuals in 95 teams in the Taiwan Customs Bureau, examining the impact of two aspects of managerial processes relating to bureaucracy (centralization and formalization) on individual creativity, as assessed by supervisory ratings. Centralization, where leaders adopt a centralized decision-making role, had a weak, significant negative relationship to creativity, whilst formalization, where there are high levels of bureaucracy, had a weak, significant negative relationship to creativity. The authors concluded that the findings from the study are inconclusive, due to the weak correlations observed.

Un (2010) examined responses of team members involved in 202 product innovation projects in 42 large American technology firms to explore the impact of different organizational level and team level management practices on the team's ability produce incremental or radical innovations. The study used a sample of only 42, single item measurement and provided no clear rationale for how variables were entered into a regression. Taking these limitations into account "among the practices, career development appears to have the largest positive effect on radical innovations, while joint performance-based compensation appears to have a larger influence on incremental innovations than the other two practices" (p.12).

Ritala, Armila and Blomqvist (2009) interviewed 20 managers across various industries to explore the impact of individual and organizational antecedents on an organization's orchestration capacity, i.e. "the capability to purposefully build and manage inter-firm innovation networks" (p.570); the extent to which an organization has the capacity to initiate

and manage open, fluent and flexible communications between actors within innovation networks. Innovation orchestration capability has both individual and organizational level determinants. At the individual level, influencing, motivating and interpersonal skills help organizations to build networks for innovation and at the organisational level the climate should be collaborative, entrepreneurial and able to influence and envision the future.

If it proved challenging to provide a coherent conclusion to the 'team-focused' empirical section, the task is even harder for this section on managerial processes and organizational level factors. The three studies outlined here were methodologically and conceptually distinct. One study had inconclusive findings, another adopted an unusual design. Therefore, the only reasonable conclusion to this section is that more research is required.

The different empirical multilevel models of creativity and innovation defy simple summary. There have been a host of different approaches adopted. The divergence can be seen in whether the focus is more on creativity or innovation, whether the primary focus of the research may be considered individual, team or organizational, how creativity or innovation has been measured and which antecedent factors are considered. In short, there is no single strand or theme to emerge from the empirical multilevel research.

Summary, Conclusion and Recommendations

A defining characteristic to emerge from this examination of multilevel models of creativity and innovation is confusion. Confusion as to how creativity and innovation should be defined, measured, operationalized and interpreted, confusion as to how to apply multilevel model considerations to creativity and innovation research. While there is some overlap between elements of the theoretical models, confusion still abounds when comparing and contrasting the theoretical models. The picture for the empirical multilevel models is even more unclear. There is no way to parsimoniously draw together the findings from the different studies, as a broad overview or overarching framework is lacking. However the empirical nature of the studies begin to suggest specific recommendation at the individual, team and organizational level. Moreover, it is clear that the adoption of a multilevel paradigm has enabled researchers to take a more holistic view than was possible by focusing solely on one level. We now turn to practical considerations for researchers and practitioners.

When planning a multilevel research study there are a number of considerations for researchers. First, what constructs to focus on, and how will these be defined and measured? The fields of creativity and innovation both contain definitional inconsistencies. Definitions should be drawn from existing theoretical models and empirical research wherever possible. Measurement approach should be closely related to construct definition. Unique to multilevel research is the consideration of sample size at each level of analysis. Whilst a sample may be large at the individual level, if team level analyses are desired then the sample size should be appropriate for aggregating to the team level, or when individual level data is divided by team.

Second, the researcher should consider their statistical approach. Existing research has favoured either hierarchical linear modeling (HLM) or multilevel structural equation modeling (MSEM).

There are a number of considerations for practitioners and managers when interpreting and implementing multilevel research. First, consider that some relationships between variables may be overstated when research is summarised. Second, the effect sizes reported are often relatively small. This means that whilst those constructs may be significantly related, the power and importance of the relationships may be lower than it initially appears.

Third, consider that studies are often focused on a few countries and industries, limiting generalizability.

Overall, if creativity is the most fundamental of all human resources and innovation is vital to ensure that creative ideas are realised, then it is fundamental to be able to define, measure and operationalize these constructs. Whilst much progress has been made since the earliest studies, there is still more to be achieved. A multilevel approach currently offers the best promise of a holistic understanding of creativity and innovation.

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