



Contextualizing the effects of job complexity on creativity and task performance: Extending job design theory with social and contextual contingencies

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The dynamic nature of work underscores the necessity of reassessing the effect of job design by considering the role of employee proactive behaviour and distinct work contexts. This study identifies creativity as a critical proactive behaviour that differentially explains the effect of job complexity on task performance across varying levels of growth need strength (GNS), supervisor support for creativity (SSC), and task interdependence. Our analysis supports the mediating role of creativity in the relationship between job complexity and task performance. The tests of conditional indirect effects show that the moderating role of GNS is positive only when task interdependence is low. By contrast, SSC positively moderates the effect of job complexity only when task interdependence is high. These findings suggest the necessity of considering task interdependence in applying job design theory to explain the proactive behaviour and task performance of employees in emerging forms of work.

Practitioner points

- This study shows that creativity explains how job complexity affects task performance.
- Growth need strength accentuates the effect of job complexity on employee creativity and performance only when task interdependence is low.
- Supervisor support for creativity positively moderates the effect of job complexity on employee creativity and performance only when task interdependence is high.

Job complexity, which refers to the intrinsically motivating and challenging properties of a job, has been investigated for over three decades primarily through the application of the job characteristics model (JCM; Hackman & Oldham, 1976, 1980). Researchers have recently called for an expanded consideration of the motivational, social, and contextual features of job design and the possibility of reshaping job design theory by incorporating the relational aspects of work and emerging demands for proactive behaviours (Grant & Parker, 2009; Humphrey, Nahrgang, & Morgeson, 2007). Morgeson, Dierdorff, and Hmurovic (2010) maintained that ‘aspects of the occupational and organizational context can constrain or enable the emergence of different work design features as well as influence the relationships between work design features and various outcomes’ (p. 351).

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This study addresses these calls to expand job design theory in two ways. First, we identify creativity as an intermediate outcome of job complexity that accounts for the effect of job design on task performance. We further propose that the mediating role of creativity in the job complexity–performance relationship is contingent upon the relevant individual and situational characteristics, which may reflect motivational and social features surrounding a job (Morgeson *et al.*, 2010). In line with JCM (Hackman & Oldham, 1980), a meta-analysis of the early job design literature showed that the effects of job complexity on work-related attitudes and outcomes are contingent upon one's growth need strength (GNS; Fried & Ferris, 1987). We identify GNS as an individual disposition that enhances the job complexity–creativity–performance relationship. With regard to social context, we focus on supervisor support for creativity (SSC) as a social surrounding that accentuates the mediating role of creativity because of its pertinence to creative processes and importance in constructively dealing with the challenges of complex tasks (West, 2002; Zhang, LePine, Buckman, & Wei, 2014; Zhou & Hoever, 2014). Support from leaders is critical in shaping employee reactions to complex tasks because leaders manage the expectations, norms, and reward systems; leaders also provide socio-emotional support for followers, thereby allowing room for proactive and spontaneous behaviours beyond formal role expectations (Dineen, Lewicki, & Tomlinson, 2006; Unsworth, Wall, & Carter, 2005). Although such supportive social and relational surroundings in relation to task design have been neglected, they are a critical component of job design that is non-redundant with the motivational characteristics of a job (Humphrey *et al.*, 2007). In terms of Edwards and Lambert's (2007) typology of mediation models, our model corresponds to the first stage of moderation, in which the moderating effect applies to the first stage of the mediated effect of job complexity on task performance through creativity.

Second, we investigate the validity of job design theory and its moderating contingencies under different levels of task interdependence, which has been recognized as a highly meaningful dimension that connects a person to others in the workplace (Oldham & Fried, 2016). The relational and social perspectives on job design highlight that the work of contemporary employees is characterized by their growing interdependence in task processes and goal achievement. This trend is evidenced by the prevalence of teams and increasing emphasis on collaboration and knowledge sharing in various functions, such as new product development and marketing (Tannenbaum, Mathieu, Salas, & Cohen, 2012). By contrast, the ubiquitous applications of powerful mobile and information technologies have generated opposite forces that enable many workers to fulfil their task requirements and goals without interacting with others. This trend intensifies the independence of these workers and liberates them from the physical and social constraints of the workplace (Katz & Margo, 2014; Lee & Mather, 2008; Sampson & Reardon, 2011). For example, current field operators and salespeople who are fully responsible for a customer or a geographic region can resolve customer complaints and close a sale by themselves with the assistance of technology. These opposite forms of work reorganization render distinct task interdependence contexts that have long been neglected in the job design literature: 'Developing work design theory that incorporates the role of occupational context is currently an important need. . . work design literature has largely ignored influences stemming from occupational factors' (Morgeson *et al.*, 2010, p. 353).

To address this gap and the impending need to consider the role of occupational contexts, we draw on the notion of situation strength (Mischel, 1977) and propose that the two opposing directions of work reorganization (i.e., low and high task

interdependence) yield strong and weak situations for workers (Ozer, Chang, & Schaubroeck, 2014). We go beyond the prior studies that compared findings from different samples to verify the generalizability of the theoretical model. We explicitly hypothesize that the levels of task interdependence change the magnitude of the moderating effects that involve job complexity. When task interdependence is high and social relationships or constraints become salient (Dierdorff & Morgeson, 2007), the moderating role of individual dispositions (i.e., GNS) becomes a less meaningful boundary condition for the job complexity–creativity–performance relationship, whereas the moderating function of social factors (i.e., SSC) is more pronounced, and vice versa. The overall theoretical framework is illustrated in Figure 1 and further elaborated below. The present theoretical propositions are empirically tested using multi-source data collected from 502 employees and 128 supervisors.

Theoretical background and hypotheses

The basic tenet of JCM is that enriched and complex jobs are intrinsically motivating and result in high task performance (Hackman & Oldham, 1980). JCM stipulates that challenging and complex jobs are characterized by high levels of five core characteristics, namely skill variety, task identity, task significance, autonomy, and feedback. The notion of job complexity is important in contemporary organizations because work becomes cognitively demanding and complex with the use of increasingly sophisticated, flexible technologies and shifts to knowledge-intensive work (Sung, Antefelt, & Choi, 2017). Therefore, job complexity may improve the task performance of employees by motivating them to generate innovative solutions that may be necessary to address the uncertainties and challenges that surround their tasks (Grant & Parker, 2009; Unsworth *et al.*, 2005).

Creativity as an intermediate outcome that links job complexity and performance

Although task performance was the target criterion in early studies of JCM (Fried & Ferris, 1987), recent studies have focused on the implications of job complexity for creative performance (Sung *et al.*, 2017). Job complexity has been analysed as a predictor of employee creativity, although researchers often draw on archival data, such as the *Dictionary of Occupational Titles* and Occupational Information Network (O*NET), to determine the job complexity levels of given occupations (e.g., Shalley, Gilson, & Blum,

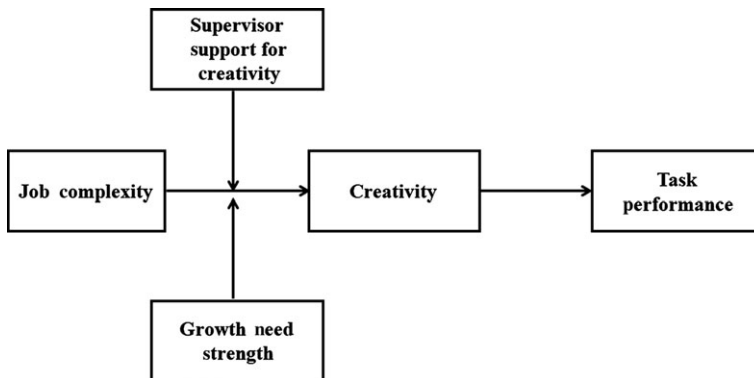


Figure 1. Conceptual framework.

2009; Tierney & Farmer, 2002). Drawing on the original formulation of JCM (Hackman & Oldham, 1980), the present study conceptualizes job complexity as the perceived levels of the five core job characteristics of employees. This conceptualization allows individual-level variations within the same occupational category. This approach provides a complementary and realistic explanation of the effects of job complexity on performance because individuals with the same function or profession (e.g., engineers, accountants, and salespeople) may experience different levels of complexities or challenges in their respective works.

Complex jobs provide substantial decision-making latitude and opportunities to use high-level skills, thereby urging employees to proactively identify the task challenges and explore new possibilities and alternative courses of action (Amabile & Conti, 1999; West, 2002). Performing these intrinsically motivating tasks also promotes risk-taking, set-breaking, and experimental behaviours among employees because such tasks generate sufficient attention and motivation to experiment with unorthodox approaches when resolving given challenges (Sung *et al.*, 2017). Therefore, complex jobs characterized by the five core job characteristics are likely to improve employee creativity.

Hypothesis 1: Job complexity is positively related to creativity.

Creative employees develop and present ideas on products, services, or procedures that are novel and potentially beneficial to their organization and can enhance their performance (Amabile & Conti, 1999). Contemporary organizations increasingly regard creativity as a path towards improved performance because it assists organizations to adapt to the rapidly changing technological and market environments (Baer & Oldham, 2006; Choi, Anderson, & Veillette, 2009). Studies showed that creativity is positively related to various employee outcomes, including supervisor- or co-worker-rated performance and objective performance (Zhang & Bartol, 2010). For example, Gong, Huang, and Farh (2009) reported that the creative performance of insurance agents is positively related to actual sales and supervisor-rated performance. These findings indicate that creativity can improve the overall task performance.

Integrating previous theoretical arguments and empirical findings, we propose that creativity mediates the effect of job complexity on task performance. Complex and challenging tasks may result in high levels of task performance because employees refine existing procedures and discover improved methods to deliver services and products. The successful performance of complex jobs also typically requires developing and incorporating novel and beneficial ideas (Unsworth *et al.*, 2005). Complex jobs tend to enhance the excitement of individuals towards their work activities and intrinsic interests to improve their task, thereby fostering creativity (Gilson, 2008; Humphrey *et al.*, 2007). This increased level of creativity may reveal the path towards the successful completion of complex jobs that require intricate and flexible thought processes (Sung *et al.*, 2017). Thus, we propose the following mediation hypothesis.

Hypothesis 2: Creativity mediates the relationship between job complexity and task performance.

Moderating role of growth need strength

Growth need strength refers to the internal expectations of individuals and their desires to grow and develop through their jobs, with particular interest in learning, extending, and improving what they do at work (Hackman & Oldham, 1980). Employees with high GNS

may positively respond to challenging and stimulating tasks; this assumption has received general empirical support (Fried & Ferris, 1987). Shalley *et al.* (2009) introduced GNS to the creativity literature and empirically proved its positive effect on creativity. GNS enhances the job-specific motivation of employees towards learning and self-development. In addition, creativity is an effective means of fulfilling high-order needs (Jackson & Shaw, 2005).

The present study isolates GNS as a moderator of the job complexity–creativity–performance relationship. To exhibit creative responses to complex tasks, individuals need internal desires to strive and learn because these needs enable them to persevere despite the challenges, inconsistent findings, and performance pressures (Gorman *et al.*, 2012; Shalley *et al.*, 2009). Employees with strong growth needs perceive task-related complexity and cognitive demands as opportunities to fulfil their developmental and learning needs. The proactive nature of GNS also induces approach- or promotion-oriented motivation (Johnson & Yang, 2010). Such motivational tendency renders individuals with high GNS to respond positively to complex jobs that enable them to search new possibilities and experiment with various alternatives, thereby achieving personal growth and learning. Somewhat unexpectedly, Shalley *et al.* (2009) reported a negative interaction between GNS and job complexity in predicting creativity using the O*NET database for evaluating job complexity. Nonetheless, given that the O*NET database provides a surrogate, occupation-level indicator of job complexity, the original arguments of JCM regarding the moderating role of GNS based on the individual-level perceptions of the five core job characteristics merit further investigation.

We propose that employees with high GNS view complex tasks as desirable challenges or opportunities for growth, whereas those with low GNS perceive the same tasks as threatening and stressful (Gorman *et al.*, 2012; Johnson & Yang, 2010). Accordingly, the perceptions of positive challenge among employees with high GNS may elicit spontaneous engagement in creative problem solving, such as developing proactive, problem-focused responses, and resolutions to the challenges that their work offers. The lack of appreciation for growth and learning among employees with low GNS urges them to avoid frustrations of dealing with the challenges of complex jobs. In this case, these employees withdraw work efforts, thereby leading to reduced creative engagement and performance. Given these arguments, we suggest the first-stage positive moderating role of GNS in the mediated relationship between job complexity and task performance as follows.

Hypothesis 3: GNS positively moderates the mediated relationship between job complexity and task performance in such a way that the mediated effect through creativity is stronger for higher levels of GNS.

Moderating role of supervisor support for creativity

Scholars have called for the inclusion of a relational perspective and the expansion of job design theory by considering social characteristics because JCM fails to consider the social aspects of work (Grant & Parker, 2009; Humphrey *et al.*, 2007). The present study introduces a social environmental factor as a critical moderating contingency of JCM. Support for creativity reflects the encouragement, expectation, and approval of creative efforts, thereby providing a psychological safety net against social risks and interpersonal tension (Shalley & Gilson, 2004). The overall perceptions of employees towards their work environment are strongly driven by their supervisors, who direct the former's

attention and interpret the situation (Martin, Guillaume, Thomas, Lee, & Epitropaki, 2016). A supervisor serves as the primary source of employee perceptions of support for creativity (Shanock & Eisenberger, 2006). SSC refers to the extent to which a supervisor provides recognition, respect, and supportive behaviour regarding creativity (West, 2002).

Supervisor support for creativity provides employees with the encouragement and assistance necessary for creativity and conveys normative expectations that creativity is valued by the organization (Tierney & Farmer, 2002). Such support from a leader operates as a social milieu that is favourable for creativity and may guide employees to spontaneously exert creative effort when they encounter challenging and complex tasks (West, 2002). SSC supplies additional inspiration for conceiving new methods of performing work, thereby further stimulating individuals whose high job complexity already encourages them to challenge routines. The constructive and supportive actions of leaders offer opportunities for employees to refine problems and consider non-traditional approaches to complete the task (Tierney & Farmer, 2002). SSC enhances employees' self-determination and personal initiative at work by highlighting creativity as an expected and valued aspect of performance. This situation accentuates the motivational processes that underlie the job complexity–creativity–performance link.

Moreover, supervisory encouragement of creativity can promote a climate of psychological safety in performing complex tasks characterized by multiple outcomes and unpredictable unfolding paths (Amabile, Conti, Coon, Lazenby, & Herron, 1996). Thus, SSC buffers employees from fear and anxiety that accompany the uncertainty of their creative endeavours (Edmondson, 2003). Psychologically safe situations tend to diminish potential risks associated with novel ideas and reduce evaluative concerns related to creative ideas (West, 2002). In this sense, SSC may supply psychological resources necessary for employees to successfully deal with complex jobs, which can result in a threat or stress rather than a challenge or opportunity, thereby strengthening the connection between job complexity and creative efforts (Zhang *et al.*, 2014). Consequently, SSC accentuates the role of creativity in explaining the job complexity–performance relationship. We used these arguments as bases to propose the first-stage positive moderating role of SSC in the mediated relationship between job complexity and task performance as follows.

Hypothesis 4: SSC positively moderates the mediated relationship between job complexity and task performance in such a way that the mediated effect through creativity is stronger for higher levels of SSC.

Task interdependence as a job-specific context

The context specificity of the relationship between job design and creativity has often been emphasized but rarely analysed (Ozer *et al.*, 2014; Thompson, Kirk, & Brown, 2006). Zhou and Hoever (2014) called for an investigation on how the effect of certain characteristics on creativity differs, contingent on variations across different performance contexts in which the actor is embedded. The analysis of this contextual contingency is critical because 'context can serve as a main effect on work design features or interact with work design features and other relevant constructs (e.g., traits, needs) to affect outcomes' (Morgeson *et al.*, 2010, p. 352). The present study focuses on the role of task interdependence as a critical job-related contextual contingency.

Task interdependence refers to the degree to which a person's task requires him or her to coordinate activities and exchange materials and information with others in the process of performing such task (Van der Vegt & Van de Vliert, 2005). High task interdependence is the result not only of formally prescribed positions and roles but also of patterned and repeated interactions among individuals that become relatively stable over time (Brass & Burkhardt, 1993). Task interdependence increases the connectedness of work activities and the possibility of workload sharing for a focal person. This situation necessitates or encourages task-related communication, coordination of work activities, and reciprocal interactions and resource exchanges with co-workers (Morgeson & Humphrey, 2006; Van der Vegt & Van de Vliert, 2005). Therefore, high task interdependence strengthens the role of the social surroundings in individual behaviour.

We draw on the notion of situation strength (Mischel, 1977) and propose that task interdependence determines the significance of situational and individual factors in shaping the effect of job design on individual performance. Studies on situation strength demonstrated that the effects of individual traits on behaviour decrease in strong situations because such situation becomes a powerful determinant of behaviour, thereby effectively constraining variations in individual behaviour (Meyer, Dalal, & Hermida, 2010). We extend the theoretical arguments and findings related to situation strength to the moderating effects of social situations and individual dispositions (Ozer *et al.*, 2014). In the present framework, the extent to which individual and social factors moderate the effect of job design on work outcomes may vary across different job contexts that are characterized by disparate levels of task interdependence (Dierdorff & Morgeson, 2007). We propose that high task interdependence (i.e., strong situation) attenuates the role of an individual disposition (i.e., GNS) and accentuates the importance of a social situation (i.e., SSC) as a moderating contingency.

Strong moderating effect of GNS under low task interdependence. From the situation strength perspective (Mischel, 1977), GNS as an individual disposition functions as a significant moderator of the relationship between job complexity and creativity under a low task interdependence context. The situation of high task interdependence is characterized by the intimate and continued social interactions and close connectedness of work activities. This strong situation enables the social surroundings to strongly affect or constrain behaviour, thereby restricting the range of plausible behavioural choices and suppressing the role of personal dispositions in shaping human behaviour (Meyer *et al.*, 2010). The role of GNS in moderating the effects of job complexity may become less significant in strong situations. By contrast, individual differences (e.g., GNS) may shape the behavioural consequences of job complexity under low task interdependence, which diminishes the normative pressure or social regulations of individual behaviour.

Hypothesis 5: The moderating effect of GNS on the relationship between job complexity and creativity is stronger when task interdependence is low than when it is high.

Strong moderating effect of SSC under high task interdependence. We propose that the function of social factors (e.g., SSC) becomes salient in strong situations (e.g., high task interdependence). For example, the innovative behaviour of scientists in research teams was strongly predicted by relational aspects (e.g., support for innovation, leader-member exchange quality), whereas that of technicians mostly working alone

was strongly predicted by job descriptions rather than by social cues (Scott & Bruce, 1994). These contrasting patterns demonstrate the shifting importance of social factors towards individual performance in different job contexts (Meyer *et al.*, 2010). The present study expands this line of thinking by investigating the importance of a social factor (i.e., SSC) as a moderating contingency in differing task interdependence contexts. We hypothesize that the moderating role of SSC is stronger when task interdependence is high than low. The reason is that the former represents a stronger situation than the latter, thereby activating the function of a social, relational factor.

Hypothesis 6: The moderating effect of SSC on the relationship between job complexity and creativity is stronger when task interdependence is high than when it is low.

Method

Sample and data collection procedure

To test the current hypotheses, we contacted alumni of a leading engineering school in South Korea who occupy high managerial positions in diverse industries. Of the ten alumni contacted, eight executives agreed to collaborate in our data collection conducted in 2011. These executives assisted us in distributing survey packets to randomly selected employees and their supervisors. The survey packets included a covering letter that explained the purpose of the study and guaranteed the confidentiality of their responses.

The participants voluntarily completed the questionnaires during their working hours and directly returned them to the researchers on site. Of the 580 employees who received the questionnaire, 520 participated in this study, resulting in a response rate of 89.7%. Supervisor ratings were obtained for 510 of the 580 employees in the initial sample (response rate = 87.9%). After excluding the cases that lacked matching supervisor ratings, the final analysis sample included 502 pairs of matched responses (i.e., 502 employees and their 128 supervisors) with an overall response rate of 86.6%. This final sample was drawn from eight organizations that represent various industries: 257 employees (51.2% of the entire sample) from a large manufacturing company, 84 employees (16.7%) from three professional service companies, 83 employees (16.5%) from a distribution company, 55 employees (11%) from two information technology companies, and 23 employees (4.6%) from a finance company.

The final sample of 502 employees showed an average age of 33.4 ($SD = 6.5$) years and included 133 women (26.5%) and 369 men (73.5%). The educational levels of the employees varied from high school (19.3%), bachelor's degree (72.5%), to graduate degree (8.2%). The supervisor sample included 69.5% males, and their average age was 41.2 ($SD = 6.1$) years. The educational levels of the supervisors varied from high school (7.8%), bachelor's degree (83.6%), to graduate degree (8.6%). The majority of the participants (243 employees, 48.4%) were responsible for general management and various administrative support functions, such as planning, auditing, and controlling. The remaining participants held responsibilities for professional services (94 employees, 18.7%), research and development (81, 16.1%), production (65, 13%), and sales (19, 3.8%).

Measures

To avoid common method bias, the employees were instructed to report their demographics, job complexity, GNS, SSC, and task interdependence, whereas their

supervisors were asked to rate the employees' creativity and task performance. All items, except for demographic data, were rated using a 7-point scale that ranges from 1 (strongly disagree) to 7 (strongly agree). The questionnaires were presented in Korean. The scale items, which were originally developed in English, were translated into Korean following standard back-translation procedures (Brislin, 1986).

Job complexity

We adopted the full set of 15 items ($\alpha = .81$) from the Job Diagnostic Survey (JDS; Hackman & Oldham, 1980) to assess the challenges and complexity of the jobs. Average scores were computed for each set of three items that represent skill variety ($\alpha = .81$), task identity ($\alpha = .80$), task significance ($\alpha = .84$), autonomy ($\alpha = .80$), and feedback ($\alpha = .87$). Then, the scores on the five job characteristics were averaged to form an overall job complexity index (Baer, Oldham, & Cummings, 2003). Thus, complex jobs are those that provide job incumbents with independence, opportunity to use a variety of skills, information concerning their performance, and opportunity to complete an entire and significant piece of work. Sample items include 'The job gives me considerable opportunity for independence and freedom in how I do the work' and 'The job itself is highly significant or important in the broader scheme of things'.

Growth need strength

We adopted six items from Hackman and Oldham (1980) to assess the GNS of employees to avoid redundancy or content overlap within the GNS items. In the current analysis, we used a five-item scale ($\alpha = .85$) for GNS because one of the six items showed a low factor loading (below 0.40). The sample items include 'Considering all the things that are personally important to you in a job, how important is it for you to have a job with. . . (a) stimulating and challenging work, (b) opportunities to learn new things, and (c) opportunities for personal growth and development'.

Supervisor support for creativity

To measure SSC, we adopted the 10-item scale ($\alpha = .94$) from the KEYS instrument that is designed to assess the climate for creativity (Amabile *et al.*, 1996). The sample items include 'My supervisor is open to new ideas', 'My supervisor values individual contributions to projects', and 'My supervisor shows confidence in our work group'.

Task interdependence

The participants reported their job-specific context with respect to the task interdependence using the six-item scale ($\alpha = .82$) developed by Morgeson and Humphrey (2006). The sample items include 'My job activities are greatly affected by the work of other people' and 'My job depends on the work of many different people for its completion'.

Creativity

Direct supervisors reported the participating employees' creativity using a six-item scale ($\alpha = .92$) drawn from Zhou and George (2001). Considering the burden of supervisors

rating multiple employees (i.e., an average of 3.92 employees per supervisor), the current creativity measure included six items with the highest factor loadings from the original scale validation study. The sample items include ‘This employee comes up with new and practical ideas to improve performance’ and ‘This employee suggests new ways of performing work tasks’.

Task performance

We used the five-item scale ($\alpha = .85$) adopted from Podsakoff and MacKenzie (1989) to evaluate the task performance of the current participants. Direct supervisors rated such items as ‘This employee fulfils all responsibilities required by his/her job’.

Control variables

In our analysis, we controlled for the age and gender of employees because previous studies reported significant associations between these demographic variables and creativity (e.g., Sung *et al.*, 2017; Zhang & Bartol, 2010). Female and older employees tend to be regarded (often stereotyped) as low in creative characteristics such as risk taking and flexibility as compared to their male and younger counterparts (Luksyte, Unsworth, & Avery, 2018). Age was measured in years. Gender was measured as a dichotomous variable coded as 1 for male and 0 for female. We also controlled for educational level because it reflects individual knowledge level, which is a positive predictor of creativity (Tierney & Farmer, 2002). Educational level was dummy coded as 0 for high school and 1 for bachelor’s or higher degree.

Results

We ascertained the empirical distinctiveness of the current measures prior to testing the hypotheses. We conducted a series of CFA using the Mplus 6 program (Muthén & Muthén, 2010). The Satorra–Bentler (SB) scaling method (Satorra & Bentler, 1994) was used in conjunction with maximum-likelihood estimation to deal with missing values and potential non-normality of the measures. In particular, the SB scaling method was adopted to adjust the chi-square statistics, standard errors, and fit indices for the amount of multivariate kurtosis in the data, thereby yielding less biased estimates of model fit and more accurate standard errors of the estimated parameters (Finney & DiStefano, 2006). Model fit was assessed using comparative fit index (CFI), the Tucker–Lewis index (TLI), and the root mean square error of approximation (RMSEA) based on the recommendations of Hu and Bentler (1998). To compare nested models, we calculated the differences in fit based on Satorra and Bentler (2010; see also Bryant & Satorra, 2012).

Table 1 shows that the hypothesized measurement model with six separate latent factors produced an acceptable fit to the data, $SB-\chi^2(974) = 3619.05, p < .001$; CFI = .90, TLI = .90, RMSEA = .06. This hypothesized factor structure fits significantly better than any alternative factor model ($p < .001$ for all SB scaled chi-square difference test). The results of the CFA support the distinctiveness of the six study variables for subsequent analyses. Table 2 displays the descriptive statistics and correlations among the study variables.

Table 1. Comparison of measurement models

Model	No. of factors	SB- χ^2	df	CFI	TLI	RMSEA (90% CI)	Δ SB- χ^2
Hypothesized model	6 factors: JC, GNS, SSC, TI, Cre, TP	3619.05	974	.90	.90	.06 [0.059, 0.070]	
Model 1	5 factors: JC, GNS + SSC, TI, Cre, TP	4544.57	979	.80	.76	.08 [0.072, 0.088]	613.63***
Model 2	5 factors: JC + GNS, SSC, TI, Cre, TP	4214.45	979	.84	.82	.07 [0.067, 0.077]	397.04***
Model 3	4 factors: JC + GNS + SSC, TI, Cre, TP	5865.37	983	.75	.73	.10 [0.096, 0.105]	1886.32***
Model 4	3 factors: JC + GNS + SSC + TI, Cre, TP	6161.21	986	.73	.72	.11 [0.100, 0.119]	2224.50***
Model 5	2 factors: JC + GNS + SSC + TI, Cre + TP	6592.26	988	.70	.67	.12 [0.112, 0.120]	2512.62***

Notes. JC = Job complexity; GNS = growth need strength; SSC = supervisor support for creativity; TI = task interdependence; Cre = creativity; TP = task performance; Δ SB- χ^2 = Satorra–Bentler scaled chi-square difference test; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation.
 *** $p < .001$.

Table 2. Means, standard deviations, and correlations among study variables

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Age	33.40	6.45									
2. Gender	0.26	0.44	-.30***								
3. Education	0.81	0.40	.06	.03							
4. Job complexity	4.59	0.62	.25***	-.15**	.08	(.81)					
5. Growth need strength (GNS)	4.97	0.90	.04	-.04	.21***	.46***	(.85)				
6. Supervisor support for creativity (SSC)	4.74	0.96	.07	-.01	.14**	.34***	.31***	(.94)			
7. Task interdependence (TI)	4.29	0.61	.05	-.06	-.03	.33***	.22***	.17***	(.82)		
8. Creativity	4.75	0.98	.07	-.07	.14**	.21***	.15**	.14**	-.02	(.92)	
9. Task performance	4.99	0.90	.17***	.01	.11**	.24***	.14**	.20***	-.03	.61***	(.85)

Notes. N = 502.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Reliabilities are on the diagonal in parentheses.

Hypothesis testing

Although the current level of theory and treatment of all variables was at the individual level of analysis, we conducted a series of hierarchical linear modelling (HLM) analysis to take into account the interdependence of employees rated by the same supervisor (Raudenbush & Bryk, 2002). In the current data, the proportions of the between-group variance for creativity and task performance were 20.2% and 26.7%, respectively, of the total variance (both $p < .001$). This significant group-level variance indicated the presence of the supervisor effect in the outcome variables and the need to employ a multi-level analytic procedure, such as HLM, to consider the nested data structure. In all the analyses, the predictors were group-mean centred to facilitate the interpretation of the HLM results (Hofmann & Gavin, 1998). We followed the bootstrapping procedure outlined by Preacher, Rucker, and Hayes (2007) to test the moderated mediation effects while avoiding problems prompted by the asymmetric and non-normal sampling distributions that often characterize mediated relationships (MacKinnon, Fairchild, & Fritz, 2007).

Mediating effect of creativity

Model 1 of Table 3 shows that job complexity is significantly related to creativity ($\gamma = .27$, $p < .001$), thereby supporting Hypothesis 1. We then tested the significance of the mediating effect of creativity in the relationship between job complexity and task performance using two methods. First, the Sobel test shows that job complexity has a significant indirect effect via creativity on task performance (point estimate = 0.13, Sobel $z = 3.95$, $p < .001$). Second, bootstrapping analysis confirms the Sobel test result and

Table 3. Results of hierarchical linear modelling (HLM) predicting creativity

Variable	Creativity					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	4.47***	4.48***	4.47***	4.48***	4.42***	4.41***
Age	0.01	0.01	0.01	0.01	0.01	0.01
Gender	-0.08	-0.08	-0.08	-0.07	-0.08	-0.06
Education	0.31**	0.30***	0.30***	0.31**	0.32**	0.32**
Job complexity	0.27**	0.23*	0.24*	0.33***	0.22*	0.28*
Growth need strength (GNS)		0.02	0.04	0.08		0.09
Supervisor support for creativity (SSC)		0.08	0.06		0.08	0.04
Job complexity × GNS			-0.10*	-0.15**		-0.19**
Job complexity × SSC			0.19*		0.15	0.19*
Task interdependence (TI)				-0.08	0.01	-0.05
Job complexity × TI				0.07	-0.07	-0.05
GNS × TI				-0.16**		-0.10
SSC × TI					0.03	0.01
Job complexity × GNS × TI				-0.24**		-0.39**
Job complexity × SSC × TI					0.15*	0.24*
Pseudo R-square	.04	.04	.05	.05	.05	.06

Notes. $N = 502$.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 4. Results of hierarchical linear modelling (HLM) predicting task performance

Variable	Task performance			
	Model 1	Model 2	Model 3	Model 4
Constant	4.23***	4.27***	4.25***	4.41***
Age	0.02	0.02	0.02	0.01
Gender	0.12	0.12	0.10	0.11
Education	0.10	0.10	0.10	-0.02
Job complexity	0.27**	0.26**	0.25**	0.14*
Growth need strength (GNS)		-0.05	-0.03	-0.05
Supervisor support for creativity (SSC)		0.09	0.07	0.04
Job complexity × GNS			-0.02	0.002
Job complexity × SSC			0.19*	0.13*
Creativity				0.50***
Pseudo R-square	.03	.04	.05	.19

Notes. *N* = 502.

p* < .05; *p* < .01; ****p* < .001.

exhibits the bootstrapped 95% confidence interval (CI) from 0.06 to 0.22, which does not contain zero. Thus, Hypothesis 2 is confirmed (Table 4).

Moderation by GNS

Hypothesis 3 posits a positive moderating role of GNS on the job complexity–creativity–performance relationship. We first tested whether GNS positively moderates the relationship between job complexity and creativity (Edwards & Lambert, 2007). The HLM results unexpectedly show a negative interaction between job complexity and GNS in predicting creativity ($\gamma = -.10, p < .05$; see Model 3, Table 3). A simple slope analysis confirms that the effect of job complexity on creativity is significant and positive when GNS is low or 1 *SD* below the mean ($b = .33, p < .01$) but non-significant when GNS is high or 1 *SD* above the mean ($b = .14, ns$) (see Figure 2, Plot A).

We then tested the moderated mediation hypothesis by analysing the patterns of conditional indirect effects (Preacher *et al.*, 2007). The results reported in Table 5 exhibit

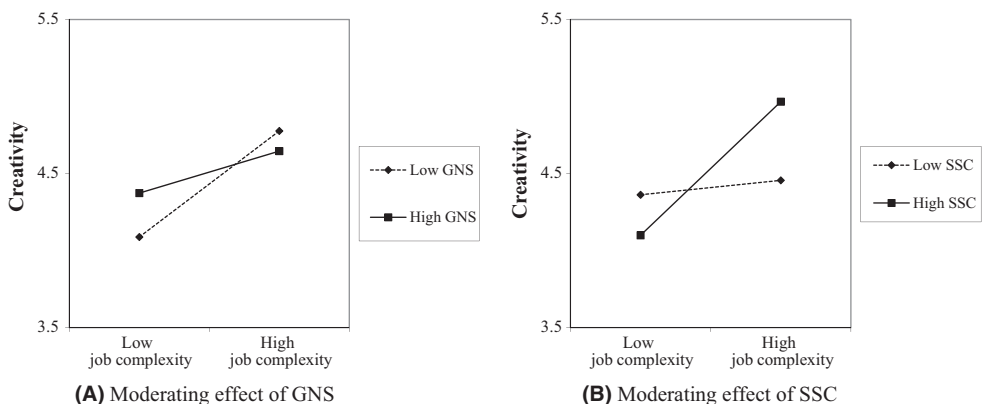


Figure 2. Two-way interaction of job complexity and two moderators on creativity.

Table 5. Bootstrapped moderated mediation results

Independent variable	Mediator	Dependent variable	Moderator	Moderator level	Conditional indirect effect	Product of coefficients			Bootstrapping bias-corrected 95% confidence interval	
						SE	z	p	Lower	Upper
Job complexity	Creativity	Task performance	Growth need strength	Lo (Mean - 1 SD)	0.170	.060	2.83	<.01	0.063	0.300
				Mean	0.138	.048	2.87	<.01	0.058	0.240
				Hi (Mean + 1 SD)	0.106	.058	1.83	ns	-0.017	0.212
			Supervisor support for creativity	Lo (Mean - 1 SD)	0.091	.053	1.72	ns	-0.009	0.195
				Mean	0.118	.044	2.68	<.01	0.048	0.196
				Hi (Mean + 1 SD)	0.144	.051	2.82	<.01	0.056	0.260

Note. Bootstrap sample size = 1,000. Coefficients in bold indicate significant mediation.

the significant *negative* moderating role of GNS. The conditional indirect effect of job complexity on task performance through creativity is significant and positive when GNS is low ($b = .17, SE = .06, p < .01$, 95% CI of 0.063 and 0.300) but non-significant when GNS is high ($b = .11, SE = .06, ns$, 95% CI of -0.017 and 0.212). Thus, the moderating role of GNS is significant. However, this pattern is contrary to our expectations, thereby indicating a negative moderating effect that refutes Hypothesis 3.

Hypothesis 5 proposes that the moderating role of GNS is pronounced in the context of low task interdependence because such job-specific context offers considerable room for the operation of individual dispositions (Mischel, 1977). Model 4 in Table 3 reports that the three-way interaction involving job complexity, GNS, and task interdependence is a significant, negative predictor of creativity ($\gamma = -.24, p < .01$). A simple slope analysis was conducted for this significant three-way interaction (Dawson & Richter, 2006). Under the condition of low task interdependence, job complexity positively relates to creativity when GNS is high ($b = .35, p < .05$) but not when GNS is low ($b = .18, ns$) (see slopes 3 and 4, respectively, in Figure 3). Thus, Hypothesis 3 regarding the positive moderating role of GNS based on the original JCM (Hackman & Oldham, 1980) is supported when task interdependence is low. Employees in relatively independent jobs (e.g., field operators and salespeople) may resort to their own internal drives (e.g., GNS) and seek opportunities to extend their abilities and behave creatively when they encounter challenges that involve complex tasks.

By contrast, the moderating role of GNS is completely reversed under high task interdependence: Job complexity positively relates to creativity when GNS is low ($b = .79, p < .001$) but not when GNS is high ($b = .02, ns$) (see slopes 1 and 2, respectively, in Figure 3). Employees working closely with their co-workers to address complex problems (e.g., new product development) should exhibit creativity regardless of their individual disposition (e.g., GNS), thereby inducing creative benefits for low GNS employees who may otherwise fail to exhibit creativity. These contrasting patterns present a need for a highly contextualized understanding and application of JCM.

Moderation by SSC

Hypothesis 4 suggests a positive moderating role of SSC. Model 3 in Table 3 shows that the interaction between job complexity and SSC in predicting creativity is significant and

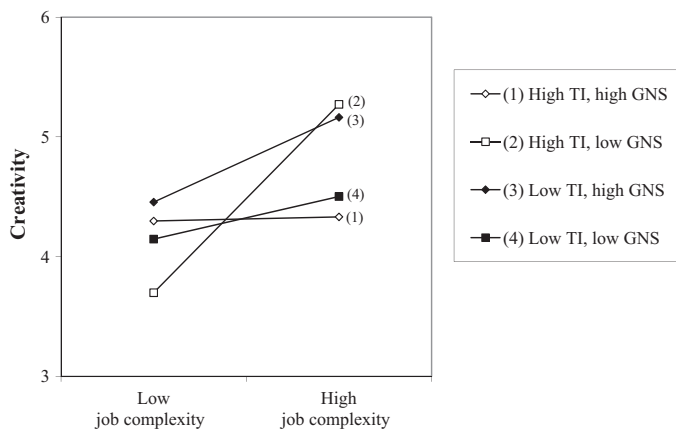


Figure 3. Three-way interaction of job complexity, growth need strength, and task interdependence.

positive ($\gamma = .19, p < .05$). The simple slope analysis depicted in Plot B of Figure 2 indicates that the relationship between job complexity and creativity is positive when SSC is high ($b = .43, p < .01$) but not different from zero when SSC is low ($b = .05, ns$). Table 5 also shows that the conditional indirect effect of job complexity on task performance via creativity is significant and positive when SSC is high ($b = .14, SE = .05, p < .01, 95\% \text{ CI of } 0.056 \text{ and } 0.260$) but non-significant when SSC is low ($b = .09, SE = .05, ns, 95\% \text{ CI of } -0.009 \text{ and } 0.195$). Thus, Hypothesis 4 is supported.

Hypothesis 6 posits that the moderating role of SSC is more pronounced in high than low task interdependence context, thereby generating a considerable need for and acceptance of supervisor interventions to coordinate the task process. Model 5 in Table 3 shows that the three-way interaction among job complexity, SSC, and task interdependence significantly predicts creativity ($\gamma = .15, p < .05$). Figure 4 depicts a simple slope analysis of this significant three-way interaction. When task interdependence is high, job complexity is positively related to creativity when SSC is high ($b = .43, p < .01$) but is negatively related to creativity when SSC is low ($b = -.15, p < .05$) (see slopes 1 and 2, respectively, in Figure 4). By contrast, under low task interdependence, the effects of job complexity on creativity are not different across high versus low SSC ($b = .29, \text{ and } .30, \text{ respectively, both } p < .05; \text{ regression coefficient difference: } t = .03, ns$) (see slopes 3 and 4, respectively, in Figure 4). The current analysis supports Hypothesis 6; that is, the moderating effect of SSC is accentuated by high task interdependence.

Discussion

The present study attends to the original formulation of JCM and extends it by identifying a proactive behaviour as a critical intermediate process that explains the effect of job complexity on performance (Grant & Parker, 2009). Apart from GNS, we isolate SSC as a social component of a job that promotes the effect of job complexity on creativity and task performance. We also theorize context-dependent patterns involving this expanded model of job design in varying levels of task interdependence. The empirical analysis supported most hypotheses but also revealed unexpected but interesting contrasts across the high and low task interdependence contexts. The following section highlights the

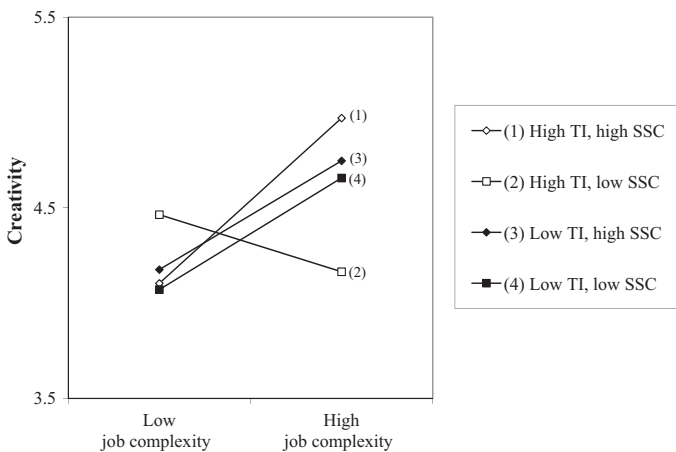


Figure 4. Three-way interaction of job complexity, supervisor support for creativity, and task interdependence.

critical theoretical implications of the current analysis along with the study limitations that indicate directions for future research.

Job complexity as critical job design factor

The present study shows that job complexity exerts a meaningful indirect effect on task performance through its direct effect on creativity. We reinstate the original JCM conceptualization of job complexity based on the five core job characteristics and operationalization based on JDS (Hackman & Oldham, 1980). This approach expands and complements existing studies on job complexity that are often based on archival occupational databases, such as DOT or O*NET (Avolio & Waldman, 1990; Judge, Bono, & Locke, 2000; Shalley *et al.*, 2009; Tierney & Farmer, 2002), or a shorthand measure of job complexity that typically focuses on cognitive demands and the unstructured or non-routine nature of a job (Baer & Oldham, 2006; Farmer, Tierney, & Kung-McIntyre, 2003; Man & Lam, 2003). In line with the re-emerging interest in job design with proactive and relational perspectives (Grant & Parker, 2009; Humphrey *et al.*, 2007), the present study confirms the validity of the individual-level conceptualizations of job complexity based on five core job characteristics to explain the proactive contribution and task performance of employees.

Positive moderating role of GNS under low task interdependence

Drawing on the original JCM proposition (Hackman & Oldham, 1976), we expected GNS to positively moderate the effect of job complexity on creativity and task performance. However, the current analysis showed a *negative* (rather than a positive) interaction between GNS and job complexity using the five core job characteristics. Similarly, Shalley *et al.* (2009) identified a negative interaction between GNS and job complexity towards creativity ($b = -.16, p < .01$) using the O*NET database for evaluating job complexity. These findings based on differing measures of job complexity that are incongruent with the original JCM model demand a certain degree of revision or extension of job design theory (cf. Grant & Parker, 2009; Humphrey *et al.*, 2007).

The current study that considers the job-specific context, such as task interdependence, provides a considerably sophisticated account of the role of GNS. The original theoretical expectation of GNS as a positive contingency in JCM is confirmed when task interdependence is low, in which GNS strengthens the positive effect of job complexity towards creativity. GNS, which is an individual proclivity towards self-development and learning through a job, operates when the job allows independent task engagement, thereby presenting a weak situation (Mischel, 1977). The role of GNS in promoting the effect of job complexity observed only in a less socially constrained situation may correspond to the fact that JCM and job design interventions (e.g., job enrichment, job enlargement) are introduced and applied to workers who mostly perform relatively simple and repetitive jobs alone (Oldham & Hackman, 2010). Under low task interdependence, job complexity may guide individuals with high GNS to realize their value towards personal growth and learning, thus affirming the principal idea of JCM (Hackman & Oldham, 1980).

By contrast, GNS can become a redundant personal resource towards work outcomes when the same outcome can be achieved through job characteristics and demands that can be effectively enforced to affect employee behaviour under the high task interdependence situation. High task interdependence signifies a strong situation that

imposes considerable social, normative pressure for employees to comply with job demands (Ozer *et al.*, 2014; Thompson *et al.*, 2006). In this context, the benefit or power of job design in eliciting intended task behaviour becomes strong for workers with low GNS who may not exhibit creativity without the presence of complex jobs imposed with social expectations from interdependent co-workers. Thus, when task interdependence is high, individuals with low GNS may accrue more substantial benefits from job complexity than those with high GNS (see Figure 3).

These contrasting patterns provide a nuanced understanding of the role of GNS and elaborate on the intricate functions of enriched jobs for individuals with disparate work values under different job-specific contexts. Apart from this elaboration of JCM, the present analysis offers theoretical and practical insights into employee creativity. Creativity-supporting work environments, such as job complexity, may benefit employees who lack an inclination towards creativity, such as low GNS (see Figure 2). Highly creative employees are immune to unfavourable conditions for creativity (e.g., unsupportive climate), whereas uncreative employees are directly affected by such detrimental situations, thereby exhibiting low creativity (Choi *et al.*, 2009). Employees with minimal personal resources for creativity (e.g., low GNS) may be strongly influenced by situational resources and job demands in support of creativity, thus accruing substantial benefit towards creativity (Unsworth *et al.*, 2005). When introducing creativity-targeted interventions, managers should understand whether these interventions synergistically activate the creative potential of employees based on desirable dispositions (e.g., GNS, creative ability, proactive personality) or operate as a redundant or substitutable resource that may fail to stimulate these employees.

Positive moderating role of SSC under high task interdependence

To integrate the social, relational aspects of work into JCM, we isolated SSC as a moderator of the proposed job design effect (Oldham & Hackman, 2010). The results confirmed such expectation; that is, the effect of job complexity on creativity and task performance is positive only when SSC is high. SSC may resolve a critical challenge associated with creativity, that is, social risks and the fear of others' negative reactions towards messages that challenge the status quo (West, 2002; Zhang *et al.*, 2014). The functions of job complexity towards proactive employee behaviour and task outcome are positive only with the presence of favourable social context but become nullified with its absence (see Figure 2, Plot B). In line with repeated calls to redesign JCM (Grant & Parker, 2009; Humphrey *et al.*, 2007), relational perspectives should be considered in further studies of job design theory.

The positive moderation by SSC on the relationship between job complexity and creativity is observed only when task interdependence is high. In this context, employees are closely connected and should coordinate their efforts, thereby increasing the significance of social factors. SSC is critical in reducing psychological tension and the threat of being different from others in strong situations. By contrast, when SSC is low under high task independence, job complexity negatively affects creativity, suggesting that the proposed benefit of job complexity can turn into a detriment in a negative social context.

The level of SSC is irrelevant with low task interdependence: Job complexity is positively related to employee creativity regardless of SSC. This pattern reveals that the implications of social context as a moderating contingency are negligible in weak situations. Accordingly, employees in this situation become independent agents who

perform relatively individualistic tasks with no demands for coordination or interaction with others. These contrasting patterns indicate the importance of considering the nature of job-specific contexts to fully understand the significance of social factors in shaping the job design effect on employee outcomes. The current analysis highlights a direction for the further conceptual elaboration and enrichment of job design theory, along with the development of practical interventions to promote employee creativity.

Study limitations and future research directions

The present findings should be interpreted with caution considering several limitations. First, all variables in the current study were measured simultaneously. Thus, common method effects that inflated relationships between study variables could be present. Furthermore, the causal direction among them cannot be ascertained because of endogeneity issue. For example, creative individuals are attracted or self-selected to complex jobs and are likely to view job complexity as an opportunity for flexible thinking (Sung *et al.*, 2017). Although present causal directions are consistent with existing theories (Humphrey *et al.*, 2007; Oldham & Cummings, 1996), future research with a longitudinal design can help verify causal relationships. Second, the current theoretical framework and empirical study omit a few intermediate psychological processes that are critical in explaining the proposed relationships. Thus, a productive avenue for future studies involves further conceptual and empirical elaborations of these potential intermediate psychological processes that account for the effect of job complexity and moderating roles of GNS and SSC. Lastly, this study offers limited explanations with regard to how individual and social factors exhibit different moderating functions under differing task interdependence situations. Given that various occupational and job contexts may vary in creativity requirement and situation strength (Mischel, 1977; Unsworth *et al.*, 2005), further investigation may employ fine-grained conceptualizations of contextual boundary conditions to enrich job design theory in new, emerging work contexts.

After several decades of dormancy, job design theory has recently re-emerged as a critical agenda for researchers who introduced a considerably broad, expanded conceptualization of job design (Humphrey *et al.*, 2007) and new perspectives that focus on increasingly relational and proactive aspects of work in contemporary organizations (Grant & Parker, 2009; Sung *et al.*, 2017). The present study highlights proactive, creative behaviour as an intervening mechanism that translates job complexity into performance. This emerging interest in job design has prompted calls to investigate the role of organizational contexts in shaping the idiosyncratic functions of job design towards employee outcomes (Morgeson *et al.*, 2010; Shalley *et al.*, 2009). In addition to GNS, which is included in the original JCM (Hackman & Oldham, 1976), we consider a social factor as a non-redundant contingency of work that shapes the effect of job design. We also theorize and empirically validate the distinct dynamics of job design theory across differing task interdependence situations, which generate intriguing theoretical and practical implications. The idiosyncratic functions of job design that are contingent on various individual, social, and job-specific contextual factors observed in the present study indicate the directions for further conceptual and empirical extensions of job design theory.

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Received 26 April 2016; revised version received 19 January 2018