

## **An Investigation of the Relationship between Thematic Thinking and Innovative Work Behavior among Managers: The Mediating Role of Open-mindedness**

**Rakhshan Ummar<sup>1</sup>, Sharjeel Saleem<sup>1\*</sup>, Muhammad Abrar<sup>1</sup>, Arfan Ali<sup>2</sup>**

<sup>1</sup>Lyallpur Business School, Government College University Faisalabad, Pakistan; <sup>2</sup>Department of Public Administration, Government College University, Faisalabad, Pakistan.

\*E-mail: [sharjilsaleem@gmail.com](mailto:sharjilsaleem@gmail.com)

Received for publication: 20 May 2019.

Accepted for publication: 06 August 2019.

### **Abstract**

There exists empirical evidence that thematic thinking through the mediation of innovativeness impacts employee performance. We, in an explorative manner, went further to understand the underlying mechanism which promotes innovative work-related behavior. We collected data from individuals at R&D assignments of various organizations where new ideas and products are developed. A total of 295 survey forms were collected, and the analysis was done using the PROCESS Macro for SPSS in order to test the mediation model. The results revealed that thematic thinking was positively linked to open-mindedness and innovative work behavior; also open-mindedness mediated the relationship between thematic thinking and innovative work behavior. This study has explored, tested, and empirically proved a novel relation in the local context of R&D related individuals (managers) working in diverse fields. The current research extends thematic thinking in the domain of cognition, innovation, and workplace behavior. It concludes that managerial decision making is elemental in performing innovatively. Practical and managerial implications, limitations, and future research directions are discussed to enrich the domain of thematic similarity further.

**Keywords:** Similarity, Thematic Thinking, Open-mindedness, Innovative Work Behavior

### **Introduction**

Managerial cognition is the micro basis of how the organizations finally shape and focus their strategic objectives. Technologies, competition, products, and services are rapidly changing, and it is well understood that sustainable competitive advantage is only possible through creation and management of knowledge to make better decisions (Porter, 1991). Managerial cognition is crucial as it is the building block of the organizations' knowledge base through which individual knowledge augments in a unique aggregate due to shared conditions; this is how knowledge is created in organizations as per Nonaka's theory of knowledge creation. Knowledge which is constructed at individual-level amplifies as unique organizational knowledge through social interactions, which is expressed in the theory of knowledge creation by Nonaka(1994).Therefore, a comprehensive analysis of how knowledge is created and combined for optimum performance is an unquenched thirst for researchers. One of the building blocks of knowledge creation is individual preference and discretion in appropriating between choices. These choices can be cognition and action, order and chaos, implicit and explicit, logic and emotions as described by Nonaka, Toyama & Konno, (2000) and the resulting blend of adoptions crafts a distinctive dynamic knowledge an organization depict in the ways it performs.

The similarity is an important cognitive factor which has an impact on many processes like identification, recognition, categorization, reasoning, and analogy (Ashby & Perrin, 1988; Hampton, 1998; Gentner&Markman, 1997; Goldenberg & Mazursky, 1999). The similarity is now recognized

to prevail in two distinct forms. One which is based on the model of contrast in which two or more entities are considered similar when they have more commonalities in their features (Gentner and Markman, 1997; Tversky, 1977); the other form of similarity follows a dual process model where two entities are considered similar as they perform complementary roles in a common theme (Wisniewski & Bassok, 1999; Estes, 2003) along with feature-based similarity.

Feature-based similarity entails taxonomic relations which simplify the perceptual world around individuals, and theme-based similarity implies thematic connections which allow individuals to perceive and predict expectations (Simmons & Estes, 2008; Estes, Golonka, & Jones, 2011). The critical distinction between taxonomic and thematic similarity is its relatedness. The thematic similarity is based on 'externally related entities' whereas; feature-based or taxonomic similarity is based on the 'internal common elements' between entities (Estes et al., 2011). Both forms of similarity and their characteristics are elemental in decision making. In addition, together with these two forms, both taxonomic and thematic similarity complete the picture of perceived similarity in order to make effective decisions (Froehlich, 2013).

This recently added concept of thematic similarity in organizational studies was introduced by firstly focusing on the idea generation and the 'idea itself.' The combination of concepts was debated as the starting point of creativity and innovation and supported in various works (e.g., Costello & Keane, 2000; Davidson, 1995; Wisniewski, 1997; Finke, Ward, & Smith, 1992). In the business domain, the work of Estes, Gibbert, Guest, & Mazursky (2012) directly linked thematically-related brand extensions with their evaluation. They concluded that concept combination in a thematic way mostly affected brand extension evaluations more positively as compared to the more traditional feature-based brand extensions. Later, Froehlich and Hoegl (2012) related thematic thinking at the individual level with creativity to express if similarity related perception is linked to creativity considering that concept combination of thematically-related entities could be a possible way to produce a creative output. Although the hypothesis, that thematic thinking is positively linked to innovativeness and creativity was not supported, the authors expressed that the results might be due to the choice of sample and scale. In the same stream of studies Froehlich, Hoegl, & Weiss (2015) contributed to thematic thinking by linking innovativeness as an outcome of thematic thinking, and the study supported a mediating role of innovativeness to improve performance in the research and development related work setting.

The present study is an effort to explore more minutely those factors which elaborate how innovative work behavior is explained through open-mindedness and thematic thinking. The data collected in the current study empirically supports the newly developed relations. This is a theoretical development not only in the area of thematic thinking but also in innovation and creativity.

### **Model Development and Hypotheses**

Creativity which is dependent on idea generation is supported as a concept which is more effective when idea generation is constrained, i.e. creative cognition is found more active when new ideas are generated in a limited space known as bounded creativity approach supported by Costello and Keane (2000) among others. Similarly, ideas generated in a similarity-constrained environment are creative and more doable and innovative (e.g., Goldenberg & Mazursky, 1999; Goldenberg, Mazursky, & Solomon, 1999; Goldenberg, Lehmann, & Mazursky, 2001). Innovations are linked directly to the behaviors which individuals exhibit at the workplace, and one primary trait desirable for innovations is open-mindedness (Calantone, Cavusgil, & Zhao, 2002). There is an impressive number of studies which empirically demonstrated that a broad interpretation of challenges and an all-encompassing solution are positively linked to innovative behavior (Baker & Sinkula, 1999a, 1999b,

2002). Putting another way, it is the flexible approach of an individual when faced with new information which is the key to innovations. This theoretical explanation supports the conclusion made in previous research that open-mindedness leads to more innovative ways of performing at the workplace (Sinkula, Baker, & Noordewier, 1997).

An individual who perceives two entities more similar based on a thematic relation among them is considered as the one who prefers thematic thinking. This preference indicates that the incident stimulus is comprehended more broadly. This unconventional comprehension of similarity is due to making broader categories, and the same is expected to be reflected in many work-related decisions. Being open-minded means being consistent in an approach in which problems are solved with an open approach, in which individuals constantly challenge pre-held beliefs and do not make decisions to maintain status quo (Scott & Bruce, 1994). This consistent approach can be due to thematic thinking which is defined as a consistent preference for thematic relations while making decisions and where unusual integration is preferred rather than a traditional feature-based integration (Simmons & Estes, 2008). Thematic thinking so explained would also be incident on two important ways to approach a problem and decide appropriate action. Firstly, the attitude on incident information would be made in a global and broader way. Secondly, the decisions on ways of doing things at the workplace would also be unbiased, new, and constantly evolving. With these supporting theoretical links, we hypothesize that:

**Hypothesis 1.** Thematic thinking is positively related to innovative work behavior.

**Hypothesis 2.** Thematic thinking is positively related to an open-minded approach.

**Hypothesis 3.** Open-mindedness is positively related to innovative work behavior.

When Froehlich & Hoegl (2012) conducted their study on exploration of antecedents and outcomes of thematic thinking, they used the Kirton's Innovation Adaption Scale as in Kirton, (1976), the results in their analysis did not support a positive link of thematic thinking with innovation. This conceptual link was not supported, which indicates that there can be underlying mechanisms which mediate the theoretically constructed link apart from the needed change in sample and scale indicated by the authors. As thematic thinking here is debated to be positively linked to an open-minded approach due to the preference for relational, broader integration among entities, we build our argument that open-mindedness can be a mediating factor. Hence, we hypothesize,

**Hypothesis 4.** Open-mindedness mediates the relationship between thematic thinking and innovative work behavior.

## **Methodology**

### ***Sample and Procedure:***

Data were collected from the individuals working in research and development-oriented private and public sector organizations. There is convincing support on the choice of R&D related individuals for studies which focus on cognitive elements, creativity, and innovativeness in individuals. The first study directly linked to thematic thinking in the business context by Estes and colleagues (2012) was conducted in the firms who offered brand extensions and the neural and behavioral dissociation between feature-based and theme-based brand extensions were considered as a fundamental basis for the segregation of brands, on this basis the brand extensions were evaluated by participants of the study. The decisions on brand extensions are connected with new product development domain which is done in the R&D of the firms. The second study by Froehlich et al. (2015) was also conducted among the R&D related employees in software development firms. Another study by Froehlich, Gibbert, & Hoegl (2016) was conducted in idea suggestion and selection systems which are also related to the R&D of the business organizations. These studies endorse the appropriate sample chosen for the current study. The individuals who were contacted for their par-

ticipation in the study were actively involved in the development of new ideas for products. A diverse pool of participants was created by including organizations in the field of biotechnology, textile, pharmaceuticals, defense, chemicals, and agriculture.

The survey was conducted in two forms, paper and pencil based and online distribution of questionnaires. The survey was coupled with a cover letter in which the purpose of research and ethical considerations were conveyed to the participants. Hair, Black, Babin, & Anderson (2010) suggested that there should preferably be twenty respondents on each of the question asked from the respondents, and this condition was fulfilled. As the study comprised of a test of forced choice triads and ten items representing open-mindedness and innovative work behavior so the sample of 295 respondents was considered satisfactory. A total of 307 questionnaires out of 500 sent questionnaires were returned, and twelve survey forms were discarded due to incomplete information. Hence the overall response rate was 59%, which was a healthy response in the context of the study. Gender and age distribution of the respondents was as follows: 191 males and 104 females;  $M_{age} = 29$  to 39 years,  $SD = 6.30$ , range = 18-60 years.

### **Measures**

#### *Thematic Thinking*

Thematic thinking was measured by the forced choice test of triads. This test is an established convention in cognitive psychology to measure the preference for thematic thinking. Multiple authors used the same test of triads (e.g., Lin & Murphy, 2001; Simmons & Estes, 2008; Froehlich & Hoegl, 2012). The test of triads was adapted and improved in the local context with the guidelines provided by Simon de Deyne. A publication in associative knowledge in priming studies by De Deyne, Navarro, & Storms (2013) catered the deficiencies of free probability dataset pointed out in previous studies. The adapted triad used in the current study consisted of 20 new triads and 20 existing triads. The triads test was tested in the pre-study, and it was found to depict a dual process model of similarity. The results revealed that there were three distinct groups of participants: the thematic group whose proportion for thematic choice was  $> .69$ , binomial  $p < .05$ ; a mixed group whose thematic choice proportion was between .31 and .69 (inclusive); and a taxonomic group whose thematic proportion was  $< .31$ , binomial  $p < .05$ . None of the respondents showed any concern on the triads, and so the thematicity scores of all participants were calculated through this test. A sample item from the test of the triad is as follows:



Where 'dog' is the main word and the choice 'cat' is taxonomic, whereas bone is a thematic choice.

#### *Innovative Work Behavior*

Innovative work behavior scale was adopted from a unidimensional scale, which was developed by Scott & Bruce (1994). The scale comprised of six items. A sample item from the scale is "I search out new technologies, processes, techniques, and/or product ideas." Participants rated themselves on a five-point Likert scale ranging from "1 = strongly disagree to 5 = strongly agree." Its reliability coefficient was 0.84.

### *Control Variables*

We used three controls in our analysis due to sufficient evidence in existing research on their pertinent role to cognitive style, thematic thinking and outcome variables, open-mindedness, and innovative work behavior. We controlled for *gender* (coded as 1=Male, 0=Female) and *age* (age group as per years) due to their relevance in cognitive psychological studies in organizations (e.g., Wechsler, 2009; Baer, 1997; Smiley & Brown, 1979; Blanchet, Dunham, & Dunham, 2001; Froehlich & Hoegl, 2012). We also controlled for one of the Big Five personality trait ‘*openness to experience*’ which was found consistent in relevance with creative cognition and innovativeness (Froehlich & Hoegl, 2012; George & Zhou, 2001). The scale for the personality traits was a shorter version comprising of ten questions for Big Five personality traits and has been proved reliable and valid in diverse contexts. The scale was established by Rammstedt & John (2007). The ten items had five reverse coded questions which were re-coded in the analysis as per the procedure of recoding into the same variable. We finally included only one personality trait ‘openness to experience’ in the analysis. Sample items included “I see myself as someone who is reserved,” “I see myself as someone who is generally trusting.” The items were anchored on a 5-point Likert scale ranging from “1 = strongly disagree to 5 = strongly agree.”

These controls were used so that a true impact of variables of interest could be analyzed and reported. The personality trait ‘openness to experience’ had a reliability coefficient of 0.737.

### *Data Analyses*

Before hypotheses testing, three important conditions were analyzed, keeping in view the preliminary requirements for robust regression and mediation analysis.

In the first step, the responses were confirmed to represent the constructs in the local context using maximum likelihood Confirmatory Factor Analysis (CFA) by using AMOS. We confirmed our conceptual model by comparing a three-factor model with an alternative one-factor model. In the one-factor model, we allowed all the items in three constructs to load on a single factor and later in another alternate model we combined open-mindedness and innovative work behavior and allowed them to load on a single factor. The latent variables were specified to correlate freely. The optimum fit indices criteria as suggested by Hair et al. (2010) for model fit, was rigorously followed. The model fit was determined using chi-square along with the degrees of freedom, comparative fit index (CFI), Tucker-Lewis index (TLI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA).

Secondly, both convergent validity and discriminant validity of the study constructs was assessed in detail. Convergent validity was determined by (a) Cronbach Alpha ( $\alpha \geq .7$ ) (Nunnally, 1978), (b) Composite Reliability ( $CR > 0.7$ ), and (c) Average Variance Extracted ( $AVE > 0.5$ ) (Hair et al., 2010). Discriminant validity was established by using Fornell and Larcker’s (1981) criterion, which states that the square root of AVE of all the constructs must be greater than respective inter-construct correlations.

Thirdly, as each survey was filled by one individual, the potential incidence of common method bias (CMB) was determined by comparison of a three-factor model, a single-factor model, and a model in which factors were loaded simultaneously on their latent variables as well as on a common latent factor (Podsakoff, MacKenzie, Podsakoff, 2003). Also, due care was exercised on various aspects of survey design as mentioned by Podsakoff, MacKenzie, & Podsakoff, (2012) to minimize CMB.

Pearson’s bivariate correlation and model 4 of the PROCESS Macro for SPSS developed by Preacher & Hayes (2013) were used for hypotheses testing.



## Results

### *Preliminary Analyses*

There were 12 questionnaires which we received in paper and pencil form with more than 50% missing data. These forms were discarded from the analysis as per suggestions extended by Hair et al.(2010). We also checked the multivariate outliers. Mahalanobis distance ( $\chi^2(3) = 16.27, p < .01$ ) revealed no outliers which were to be excluded from the analysis leaving us with a final sample of 295 out of 500 survey forms received either by hand or via email. In order to fulfill an important condition for multivariate regression, we inspected normality of the data, the univariate skewness and kurtosis values showed a range of .04 to .90 and -.02 to .25, respectively. These values were well below the suspicious values (i.e.,  $\geq 2.0$  for skewness and  $\geq 7.0$  for kurtosis) according to Curran, West, & Finch(1996).

### *Measurement Model*

Table-1 summarized the results of CFA, which was done on AMOS. The measurement model with two latent constructs (i.e., open-mindedness and innovative work behavior) showed a poor fit to the data ( $\chi^2(26) = 125.47, p < .01, \chi^2/df = 4.83, CFI = .91, TLI = .87, SRMR = .057, RMSEA = .114$ ). However, by applying a modification index the model fit became better and acceptable ( $\chi^2(25) = 90.86, p < .01, \chi^2/df = 3.63, CFI = .94, TLI = .91, SRMR = .049, RMSEA = .095$ ). The items showed significant factor loadings on their corresponding latent measures ( $M_{\text{standardized loadings}} = .71$ ; Range  $_{\text{standardized loadings}} [ .61 - .80 ]$ ). Next, to assess the discriminant validity, we compared two-factor model with a one-factor model, ( $\chi^2(27) = 295.20, p < .01, \chi^2/df = 10.93, CFI = .75, TLI = .67, SRMR = .102, RMSEA = .184$ ). But two-factor model showed a better fit to the data. Moreover, since the data were collected from a single source, so the risk of CMB was evaluated by comparing the two-factor model with a model in which items were allowed to concurrently load on their respective factors and a common latent factor model (Podsakoff et al., 2003). The comparison demonstrated that the two-factor model showed a better fit to the data than the common latent factor model (see Table 1). Besides that, the variance explained by common method factor was only 1.6%, which was considerably lower than the recommended threshold of 25% (Williams, Cote, and Buckley, 1989). Lastly, Parsimony Normed Fit Index (PNFI) was greater for the three-factor model (PNFI = .64) than the common factor model (PNFI = .61). Therefore, the final analysis was conducted with a two-factor model.

**Table 1. Comparison of Alternative Models**

	Model	Latent factors	$\chi^2(df)$	$\chi^2/df$	CFI	TLI	RMS EA	SR MR	Model comparison
1	Measure- ment model	Open minded- ness, innova- tive work be- havior,	90.86 <sup>***</sup> (25)	3.63	.94	.91	.095	.049	
2	One-factor model	General factor	295.20 <sup>***</sup> (27)	10.93	.75	.67	.184	.102	2 versus 1
3	Measure- ment model with com- mon me- thod factor	Open minded- ness, innova- tive work be- havior, CLF	88.89 <sup>***</sup> (24)	3.70	.94	.91	.096	.051	3 versus 1

Note. CLF = Common Latent Factor, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

### *Descriptive Statistics and Hypotheses Testing*

The means, standard deviations, Cronbach's alphas, composite reliability, average variance extracted, and correlations for all the study variables are summarized in Table-2. The values of Cronbach's alphas and composite reliability for all the study constructs were fairly above the acceptable cut-off of 0.60 and 0.70, respectively (Hair et al., 2010). This provided us with evidence of internal consistency and convergent validity. Convergent validity was further established since AVE values of all the constructs were greater than the recommended cut-off of 0.50 (Hair et al., 2010). Furthermore, we used Fornell and Larcker's (1981) more conservative criterion of comparing square root of AVE values against inter-construct correlations for establishing discriminant validity. The square roots of all AVE values were higher than their respective inter-construct correlations. Thus, discriminant validity was established.

Correlations among study variables showed that as expected, thematic thinking showed a significant and positive correlation with innovative work experience ( $r = .42, p < .01$ ) and open mindedness ( $r = .40, p < .01$ ) which also showed a significant correlation with innovative work behavior ( $r = .50, p < .01$ ). Thus, we received a preliminary evidence for hypothesis 1, 2, 3, and 4.

**Table 2 . Means, Standard Deviations, Reliabilities and Correlations (N = 295)**

Sr. No	Con-structs	M	SD	$\alpha$	CR	AVE	1	2	3	4	5	6
1	Thematic thinking	62.52	23.32	na	Na	na	Na					
2	Innova-tive work behavior	2.61	0.87	0.84	0.85	0.52	0.42**	<b>(0.72)</b>				
3	Open minded-ness	2.47	0.84	0.79	0.80	0.50	0.40**	0.50**	<b>(0.71)</b>			
4	Openness to expe-rience	2.65	0.92	0.73	0.74	0.59	0.31**	0.15**	0.08	<b>(0.77)</b>		
5	Gender	0.65	0.48	na	Na	na	0.04	-0.06	-0.04	-0.20	---	
6	Average Age	2.60	0.63	na	Na	na	0.58**	0.22**	0.36**	0.22**	0.10	---

Notes: na = Not Applicable. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

M = Mean, SD = Standard Deviation, CR=Composite Reliability; AVE=Average Variance Ex-tracted

Diagonal represents the square root of AVE; while below the diagonal the estimated correla-tions are represented.

The results for hypotheses testing are summarized in Table 3 without covariates. The results demonstrated that thematic thinking positively related to innovative work behavior ( $\beta = 0.016, SE = 0.002, p < .001$ ). This allowed us to accept hypothesis 1, which proposed that thematic thinking is positively related to innovative work behavior. The results further showed that thematic thinking positively associated with open-mindedness ( $\beta = 0.014, SE = 0.002, p < .001$ ). This supported hypothe-sis 2, which proposed that thematic thinking is positively related to an open-minded approach. Fur-thermore, open-mindedness significantly related to innovative work behavior ( $\beta = 0.413, SE = 0.055,$

$p < .001$ ), which hypothesized that open-mindedness is positively related to innovative work behavior. Lastly, the results demonstrated that open-mindedness mediated the relationship between thematic thinking and innovative work behavior ( $\beta = .006$ ,  $SE = .001$ , 95% CI [.004–.009]). Hypothesis 4 was accepted, which hypothesized that open-mindedness mediates the relationship between thematic thinking and innovative work behavior. But the mediation was partial since direct path (C') remained significant ( $\beta = 0.010$ ,  $SE = 0.002$ ,  $p < .001$ ). The total variance explained by the overall model, which included open-mindedness as mediator was 31%. Results for these analyses are given in Table 3 and also shown in Figure 1.

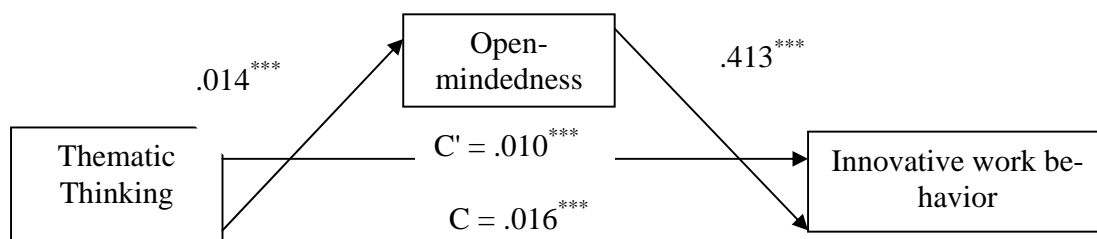
**Table 3. Results of the Analysis (Without Covariates)**

	Innovative Work Behavior				
	Coefficient $\beta^\dagger$	SE	Bootstrap 95% CI	Effect ratio	Hypothesis acceptance/rejection
<i>IV to mediator (Path a)</i>					
Thematic thinking $\rightarrow$ Open-mindedness	.014***	.002			H <sub>2</sub> accepted
<i>Mediator to DV (Path b)</i>					
Open-mindedness $\rightarrow$ Innovative Work Behavior	.413***	.055			H <sub>3</sub> accepted
Total effect of IV on DV (Path c)	.016***	.002			H <sub>1</sub> accepted
Direct effect of IV on DV (Path c')	.010***	.002			
Model R <sup>2</sup>	.309				
Total indirect effect of IV on DV through proposed mediator					
Thematic thinking $\rightarrow$ Open-mindedness $\rightarrow$ Innovative Work Behavior	.006***	.001	[.004, .009]	0.381	H <sub>4</sub> accepted

Note. N = 295; IV = independent variable; DV = dependent variable

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

<sup>†</sup>Tabled values are unstandardized regression coefficients.



**Figure 1. Results of the hypothesized research model**

Note: C shows total effect, and C' shows the indirect effect

The analysis was further rerun with relevant control variables to eliminate the possible alternative justification for the previous results. However, the interrelationships among the main study



variables remained significant. Therefore, we reported results in Table 3 without control variables for the sake of parsimony and ease of comparison with previous studies.

### **Discussion**

The preference for similarity among individuals is usually taxonomic, and individuals see the similarity in common features (Froehlich, 2013). As thematic thinking is a cognitive style in which individuals perceive similarity preferably in entities which are related through themes, it is expected that if the thematic similarity is preferred then new and more varied connections between entities can be established (Froehlich & Hoegl, 2012). The decisions will be made with a vision to accept new perspectives; the usual ways of relating entities would be based on broader and more global categories than merely local and narrow categories. It is also clear that if there is a tendency to prefer thematic relation among entities, the already held beliefs would be continuously challenged, which convince that thematic responding encourages open-mindedness. Open-mindedness is related to approaching a situation in which an individual's previously held beliefs are challenged, and individuals are open to believe and adopt new ideas, new ways, and form new beliefs. Thematic thinking is itself a preference for external relations connected via a theme rather than internal commonalities (Estes et al., 2012). This preference indicates that individuals process information in a non-traditional way. This non-traditional way is preferred as the brain processes relate among entities more easily (Estes et al., 2011). This tendency among individuals indicates that a fresh link is processed easily than a stable already known one, i.e. comprehending similarity preferably in common features only. It was hence contended in the theoretical development that with thematic thinking the relationships between forming new beliefs, new ideas, and new thoughts were positively linked. Thematic thinking was, therefore, hypothesized to be positively linked to open-mindedness. As Sinkula et al. (1997) suggested that open-mindedness is when information, that is incident to an individual is faced with a flexible approach. This flexibility is what the current study understand as open-mindedness. It is derived from having perspectives in relations and not just looking into internal features when deciding on similarity related decisions.

The Social Cognitive Theory (SCT) as expressed by Bandura (1986), which explains the relationship of individual cognition, environment, and behavior, helps us to relate the current conceptual relations. SCT explains the impact of thematic thinking on behaving innovatively as new ideas which are coming from the environment are openly addressed, and action is taken in ways that support new products, services, procedures, and processes. The relationship of thematic thinking with innovative work behavior through the mediating role of open-mindedness can also be elaborated by the remarks of Shocker, Bayus & Kim (2004) that it is the complementarities among different products which increase the association between unrelated things; this association can be conceived of and implemented by open-mindedness and innovative work behavior. With the current study, we found that thematic thinking was not only positively linked to open-mindedness and innovative work behavior, but it is the open-minded approach of an individual which mediates this relationship. This new theoretical development is an extension in the domain of thematic thinking, which has tried to unfold the mechanisms which promote innovative work behavior at the individual level.

The results supported the proposed relations, and it was found that thematic thinking explained innovative work behavior through the mediating role of open-mindedness. A partial mediation occurred, and the indirect effect was 38% of the total effect as reported in the mediation analysis.

### ***Theoretical Implications***

Individuals with thematic thinking tend to perceive similarity among entities which complement each other in various scenarios (Estes et al., 2011). The main condition for the traditional simi-

larity concept is violated when two entities are considered similar, although they are not internally alike. This preference indicates that thematic thinking is related to think openly, where the traditional ways of internal commonalities as a condition is defied, and the status quo is challenged with acceptance to change. These conditions are previously established as important intervening factors for innovation and innovativeness (see Sinkula & Baker, 1999; Sinkula et al., 1997). Hence a new link was hypothesized as the underlying factor when thematic thinking is preferred for innovative work-related behaviors. As an advancement of theoretical conceptualization thematic thinking was tested to explain the construct of open-mindedness. The theoretical link was supported by empirical evidence. This positive link from thematic thinking to open-mindedness also advocates how knowledge created at individual-level builds up a culture of open-mindedness as Froehlich (2013) expressed the attachment of theory of knowledge creation on this individual-level cognitive style as a framework to operate at the organizational level. Our aim for the current study was to develop a framework to highlight the preferences and styles in the similarity-related context in which open-mindedness logically followed thematic thinking as it is one of the essential elements of learned behavior (Weir, 1963). Open-mindedness has already been established as a precondition for innovation because open-mindedness leads to those behaviors which are new, adapted for changed circumstances or learned as new beliefs. These behaviors are exhibited after rejecting or reconciling the old ones. Such practices promote innovative work behaviors which, as Baker & Sinkula (1999a) said, are necessary conditions for market-oriented businesses. The proposed mediation model was supported in our analysis and open-mindedness mediated the relationship between thematic thinking and innovative work behavior. The theoretical development of thematic thinking relatedness with open-mindedness opens up a lot of space for other desirable organizational outcomes to be tested in the future.

#### ***Practical Implications***

Although this study primarily aimed at testing and confirming the theoretically derived new hypothesized relationships of thematic thinking with open-mindedness and innovative work behavior constructs, the findings of the study not only add to the body of knowledge but has practical implications too.

It is not obligatory that all creative ideas which can be due to thematic thinking be converted into innovations, this is to a great extent dependent on how new ideas are received in the organization and what is the dominant logic in an organization. As expressed by Bettis & Prahalad (1995) unlearning and evolving as a complex adaptive system is a necessary condition for innovation. As a result, diversity in opinion emerges as a positive characteristic, that is why we contend that thematic thinking is a desirable unconventional cognitive style, which is usually not prevalent (Gibbert & Hoegl, 2011). Thematic thinking was empirically found related to open-mindedness, this is because thematic thinking is seeing the similarity among things in complementary roles, considering similarity among entities which are apparently and feature-wise not the same. This preference is characterized by an acceptance to change and to learn by revisiting the already held beliefs and learning by unlearning (Farrell, 1999). Thematic preference leads to open-mindedness, which affects innovative work behavior in a positive way directly as well as indirectly. Thus, thematic thinking leads to an open-minded approach, and open-mindedness is a great virtue for organizations who aim to be competitive with their innovative practices and products. To sum up, the newly developed positive link of thematic thinking with open-mindedness and innovative work behavior has indirect endorsement from previous studies.

#### ***Limitations and Future Research***

The current study has a few limitations which need to be addressed in future studies. The first limitation is that the study had many constructs which relied on self-assessment and percep-

tions. Human perceptions are vulnerable to many biases; these biases can be due to moods, affective states, personality types, and other demographic differences. The said bias can inflate or deflate the emotional expression of any human trait, character, or behavior. These biases were minimized in the current study by incorporating the test of forced triads. Any such authentic tests' scores are deemed fit to measure a perceived style with minimum bias, but there is still a margin to curtail the partiality of opinion from the respondents further.

Froehlich, Gibbert & Hoegl (2014) emphasized that themes need to be identified with care, as recognizing a theme correctly is the first step towards its understanding and impact on decision making. This leads to the requirement of devising a mechanism through which some standard questions or certain parameters could be developed to declare with a precision that a situation is a representative thematic theme. Previous work in published form and seminal authors can be contacted to refine this aspect.

The current study used a cross-sectional design which was chosen due to its management in less time, ease, and economic feasibility yet a longitudinal design will be suitable to predict causal relations precisely and with more conviction.

Many related constructs of cognitive psychology which have proven their worth in organizations are conducted in lab conditions. The local context lacks these experimental facilities, which can be resolved in future studies by carrying out many tests in lab conditions. With the current research as a first step towards conceptualizing cognitive style in organizations, proper planning can be initiated to establish labs in various academic institutes to facilitate the researchers in their attempt to comprehend managerial cognition and decision-making at large.

### Conclusion

The current study found a positive link of thematic thinking with innovative work behavior through the intervening mechanism of open-mindedness among the individuals at various R&D organizations which are vigorously involved in the development of new products.

Thematic thinking is a supplementary concept to taxonomic thinking. It complements in the complete comprehension of cognition. It provides a complete representation of similarity-related mechanisms and builds up in unique ways due to culture, language, preferences, and styles. Its potential benefits in many fields of business are still open for more exploration and rewarding breakthroughs.

### References

- Ashby, F. G., & Perrin, N. A. (1988). Toward a unified theory of similarity and recognition. *Psychological review*, 95(1), 124. doi. 10.1037/0033-295X.95.1.124
- Baer, J. (1997). Gender differences in the effects of anticipated evaluation on creativity. *Creativity Research Journal*, 10(1), 25-31. doi. 10.1207/s15326934crj1001\_3
- Baker, W. E., & Sinkula, J. M. (1999a). Learning orientation, market orientation, and innovation: Integrating and extending models of organizational performance. *Journal of market-focused management*, 4(4), 295-308. doi. 10.1023/A:1009830402395
- Baker, W. E., & Sinkula, J. M. (1999b). The synergistic effect of market orientation and learning orientation on organizational performance. *Journal of the academy of marketing science*, 27(4), 411-427. doi. 10.1177/0092070399274002
- Baker, W. E., & Sinkula, J. M. (2002). Market orientation, learning orientation and product innovation: delving into the organization's black box. *Journal of market-focused management*, 5(1), 5-23. doi. 10.1023/A:1012543911149

- Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of social and clinical psychology*, 4(3), 359-373. doi.10.1521/jscp.1986.4.3.359
- Bettis, R. A., & Prahalad, C. K. (1995). The dominant logic: Retrospective and extension. *Strategic management journal*, 16(1), 5-14. doi.10.1002/smj.4250160104
- Blanchet, N., Dunham, P. J., & Dunham, F. (2001). Differences in preschool children's conceptual strategies when thinking about animate entities and artifacts. *Developmental psychology*, 37(6), 791. doi.10.1037/0012-1649.37.6.791
- Calantone, R. J., Cavusgil, S. T., & Zhao, Y. (2002). Learning orientation, firm innovation capability, and firm performance. *Industrial marketing management*, 31(6), 515-524. doi.10.1016/S0019-8501(01)00203-6
- Costello, F. J., & Keane, M. T. (2000). Efficient creativity: Constraint guided conceptual combination. *Cognitive Science*, 24(2), 299-349. doi. 10.1016/S0019-8501(01)00203-6
- Davidson, J. E. (1995). The suddenness of insight. In R. J. Sternberg & J. E. Davidson (Eds.), *The nature of insight* (pp. 125-155). Cambridge, MA: MIT Press.
- De Deyne, S., Navarro, D. J., & Storms, G. (2013). Better explanations of lexical and semantic cognition using networks derived from continued rather than single-word associations. *Behavior research methods*, 45(2), 480-498. doi. 10.3758/s13428-012-0260-7
- Estes, Z. (2003). A tale of two similarities: Comparison and integration in conceptual combination. *Cognitive Science*, 27, 911-921. doi. 10.1207/s15516709cog2706\_4
- Estes, Z., Gibbert, M., Guest, D., & Mazursky, D. (2012). A dual-process model of brand extension: Taxonomic feature-based and thematic relation-based similarity independently drive brand extension evaluation. *Journal of Consumer Psychology*, 22(1), 86-101. doi. 10.57740811001057
- Estes, Z., Golonka, S., & Jones, L. L. (2011). Thematic thinking: The apprehension and consequences of thematic relations. In *Psychology of learning and motivation* (Vol. 54, pp. 249-294). Academic Press. doi. 10.1016/B978-0-12-385527-5.00008-5
- Finke, R. A., Ward, T. B., & Smith, S. M. (1992). *Creative cognition: theory, research, and applications*. Cambridge, MA: MIT Press.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50. doi. 10.1177/002224378101800104
- Froehlich, J. K. (2013). *Thematic Similarity and Managerial Decision Making*. Vallendar: self-published.
- Froehlich, J. K., & Hoegl, M. (2012). Thematic ideation—Antecedents and consequences of individuals' thematic similarity recognition. *Creativity and innovation management*, 21(4), 443-456. doi. 10.1111/caim.12007
- Froehlich, J. K., Gibbert, M., Hoegl, M. (2014). *Using Thematic Thinking to Achieve Business Success, Growth, and Innovation: Finding Opportunities Where Others Don't Look*. Pearson Education.
- Froehlich, J. K., Hoegl, M., & Weiss, M. (2015). Thematic thinking and individual performance in research and development. *Journal of Product Innovation Management*, 32(6), 939-953. doi. 10.1111/jpim.12210
- Froehlich, J. K., Hoegl, M., & Gibbert, M. (2016). Idea selection in suggestion systems: a thematic similarity perspective. *R&D Management*, 46(5), 887-899. doi. 10.1111/radm.12154
- Gentner, D., & Markman, A. B. (1997). Structure mapping in analogy and similarity. *American psychologist*, 52(1), 45. doi. 10.1037/0003-066X.52.1.45

- George, J. M., & Zhou, J. (2001). When openness to experience and conscientiousness are related to creative behavior: an interactional approach. *Journal of applied psychology*, 86(3), 513. doi. [10.1037/0021-9010.86.3.513](https://doi.org/10.1037/0021-9010.86.3.513)
- Gibbert, M., & Hoegl, M. (2011). In praise of dissimilarity. *MIT Sloan Management Review*, 52(4), 20.
- Goldenberg, J., & Mazursky, D. (1999). The voice of the product: Templates of new product emergence. *Creativity and Innovation Management*, 8(3), 157-164. doi. 10.1111/1467-8691.00132
- Goldenberg, J., Lehmann, D.R. and Mazursky, D. (2001) the Idea Itself and the Circumstances of its Emergence as Predictors of New Product Success. *Management Science*, 47, 69–84. doi. 10.1287/mnsc.47.1.69.10670
- Goldenberg, J., Mazursky, D., and Solomon, S. (1999). Toward identifying the inventive templates of new products: a channeled ideation approach. *Journal of Marketing Research*, 36(2), 200–210. doi. 10.1177/002224379903600205
- Hair, J. F., Black, W. C., & Babin, B. J. (2010). Anderson. RE, 2010. Multivariate Data Analysis. *New Jersey, Pearson Prentice Hall*.
- Hampton, J.A. (1998) Similarity-Based Categorization and Fuzziness of Natural Categories. *Cognition*, 65, 137–65. doi. [10.1016/S0010-0277\(97\)00042-5](https://doi.org/10.1016/S0010-0277(97)00042-5)
- Hayes, A. F. (2016). The PROCESS macro for SPSS and SAS. Retrieved from <http://processmacro.org/download.html>
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, 6(1), 1-55.
- Kirton, M. (1976) Adaptors and Innovators: A Description and Measure. *Journal of Applied Psychology*, 61, 622–9. doi. 10.1177/001872678003300401
- Lin, E. L., & Murphy, G. L. (2001). Thematic relations in adults' concepts. *Journal of experimental psychology: General*, 130(1), 3. doi. [10.1037/0096-3445.130.1.3](https://doi.org/10.1037/0096-3445.130.1.3)
- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization science*, 5(1), 14-37. doi. 10.1287/orsc.5.1.14
- Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and leadership: a unified model of dynamic knowledge creation. *Long range planning*, 33(1), 5-34. doi. [10.1016/S0024-6301\(99\)00115-6](https://doi.org/10.1016/S0024-6301(99)00115-6)
- Nunnally, J. (1978). *Psychometric methods*. New York. McGraw-Hill Book Co.
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual review of psychology*, 63, 539-569. doi. [10.1146/annurev-psych-120710-100452](https://doi.org/10.1146/annurev-psych-120710-100452)
- Podsakoff, M. Lee, & Podsakoff (2003) Podsakoff, PM, MacKenzie, SB, Lee, J.-Y., & Podsakoff, NP (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903.
- Rammstedt, B., & John, O. P. (2007). Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German. *Journal of research in Personality*, 41(1), 203-212. doi. [10.1016/j.jrp.2006.02.001](https://doi.org/10.1016/j.jrp.2006.02.001)
- Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of management journal*, 37(3), 580-607. doi. 10.5465/256701
- Shocker, A. D., Bayus, B. L., & Kim, N. (2004). Product complements and substitutes in the real world: The relevance of “other products”. *Journal of Marketing*, 68(1), 28-40. doi. 10.1509/jmkg.68.1.28.24032



- Simmons, S., & Estes, Z. (2008). Individual differences in the perception of similarity and difference. *Cognition*, 108(3), 781-795. doi. [10.1016/j.cognition.2008.07.003](https://doi.org/10.1016/j.cognition.2008.07.003)
- Sinkula, J. M., Baker, W. E., & Noordewier, T. (1997). A framework for market-based organizational learning: Linking values, knowledge, and behavior. *Journal of the Academy of Marketing Science*, 25(4), 305. doi. [0.1177/0092070397254003](https://doi.org/0.1177/0092070397254003)
- Smiley, S. S., & Brown, A. L. (1979). Conceptual preference for thematic or taxonomic relations: A nonmonotonic age trend from preschool to old age. *Journal of Experimental Child Psychology*, 28(2), 249-257. doi. [1016/0022-0965\(79\)90087-0](https://doi.org/1016/0022-0965(79)90087-0)
- Tversky, A. (1977). Features of similarity. *Psychological Review*, 84(4), 327. doi. [1037/0033-295X.84.4.327](https://doi.org/1037/0033-295X.84.4.327)
- Wechsler, S. M. (2009). Age and gender impact on thinking and creating styles. *European Journal of Education and Psychology*, 2(1), 37-48.
- Weir, E. C. (1963). The open mind: An essential in teaching and learning. In *The Educational Forum*, 27(4), 429-435. Taylor & Francis Group. doi. [1080/00131726309340718](https://doi.org/1080/00131726309340718)
- Wisniewski, E. J. (1997). When concepts combine. *Psychonomic Bulletin & Review*, 4, 167-183. doi. [10.3758/BF03209392](https://doi.org/10.3758/BF03209392)
- Wisniewski, E. J., & Bassok, M. (1999). What makes a man similar to a tie? Stimulus compatibility with comparison and integration. *Cognitive Psychology*, 39(3-4), 208-238. doi. [0.1006/cogp.1999.0723](https://doi.org/0.1006/cogp.1999.0723)