# Diffusion of innovation through individual and collective entrepreneurship
## An empirical investigation in SMEs

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## Abstract

**Purpose** – This paper aims to develop an original framework of innovation and to explore the complexity of association between individual and collective (team-based) entrepreneurship, and their simultaneous impacts on innovation in context of small and medium enterprises (SMEs).

**Design/methodology/approach** – An integral theoretical framework is developed to encourage innovation and the hypothetical relations are tested with the help of structural equation modeling (SEM) through AMOS. Data were gathered through survey technique and the questioners were distributed through email among 700 entrepreneurs from SMEs operating in five major industrial cities of Punjab province Pakistan.

**Findings** – The results of SEM analyses confirm that both the individual entrepreneur and the collective efforts of all the business members contribute to innovation in SMEs. Entrepreneur's personality traits have a direct positive impact on innovation while the centralized decision-making by entrepreneur is not associated with innovation. Centralized decision-making is found to be negatively associated with communication and have insignificant positive association with collaboration. Factors associated with the team-based entrepreneurship like communication and collaboration among members of the SME's contribute to the entrepreneurial orientation and collective entrepreneurship. Entrepreneurial orientation and collective entrepreneurship have direct positive impact on innovation in SMEs.

**Practical implications** – It is imperative for SMEs to encourage decentralized organizational culture and participative leadership to bring innovation into their products and processes and further to improve their competitive advantage.

**Originality/value** – To the best of author knowledge, present study is a first attempt that explores the complex association between individual and team-based entrepreneurship and further, empirically investigate the simultaneous impacts of these variables on innovation in context of SMEs.

**Keywords** Innovation, Small and medium enterprises (SMEs)

**Paper type** Research paper

## Introduction

Entrepreneurship is an emerging research field, and within a few decades, it has appealed a large number of scholars around the world (Déry and Toulouse, 1996; Busenitz *et al.*, 2003; Schildt and Sillanpää, 2004; Bruton *et al.*, 2008; Welter and Lasch, 2008; Hindle and Moroz, 2010; Audretsch *et al.*, 2016). A number of research scholars proclaim that entrepreneurship plays a central role in the economic development of a country. As per Schumpeter (1934) study, the entrepreneur is the main pillar of economic structure who plays a central role in the economic development by transforming innovation into a new, efficient and valuable product and service. According to (Bygrave and Hofer, 1992; Drucker, 2006; Gartner, 1990), innovation emerges from entrepreneurship. Widespread research studies focus on the role of an individual entrepreneur to bring innovation and a limited number of studies shed light on the importance of collective entrepreneurship (Stewart, 1989; Reich, 1987; Yan and Sorenson, 2003; Yan and Yan, 2016). In the present study, we have made an effort to fill the gap in existing literature by studying the simultaneous impact of individual and team-based entrepreneurship to bring innovation within a firm. The study explores the association between communication and collaboration within a firm and collective entrepreneurship. Further, we found controversies in literature in the context of centralized decision-making and innovation. Some scholars suggest a positive relationship between centralized decision-making and innovation (Jansen *et al.*, 2006; Cardinal, 2001), while others such as Yan and Yan (2016) proclaim that entrepreneur's centralized decision-making hurts innovation from both the individual and team-based efforts. These findings entail some further investigation that will explore whether the conflicting results are due to different cultural backgrounds, the nature of business environment or industry-specific characteristics.

In addition, previous studies (Stewart, 1989; Covin and Slevin, 1989; Bennis and Biederman, 2007; Yan and Yan, 2016) explore the association between collective entrepreneurship and innovation and proclaim that through team-based entrepreneurship, it is easy to develop and produce radical innovations within small and medium enterprises (SMEs). The present study tends to explore the interaction between the two types of entrepreneurship, i.e. individual and collective and innovation. A number of research studies support leadership imperative theory of Miller (1983) with empirical findings that the entrepreneur as an individual with his/her distinct personality traits has a direct contribution in the innovativeness of SMEs (Miller, 1983; Kickul and Gundry, 2002; Greve and Salaff, 2003). Apart from Lindgren and Packendorff's (2003) individualistic orientation of entrepreneurship theory, it is important to explore and investigate the collective dimensions of entrepreneurship because studying entrepreneurship as collective efforts and taking further step toward entrepreneurial teams lead to construct such an entrepreneurship framework that will allow us to have a more realistic image of the phenomenon. So primarily, the present study is aimed at investigating the entrepreneurship field for collective action and further demonstrating its importance for the innovation performance. To the best of our knowledge, the present study is the first empirical investigation on the nexus of entrepreneurship and innovation performance in the context of SME sector of Pakistan. Section 1 will review the relevant literature of our study and specify all the hypothesized relationships, Section 2 will describe the methodology to approach the objectives of the study; Section 3 will report results of the analysis; finally, Section 4 will cover the implications, limitations and the new dimensions originating from the research.

## Literature review

The following section will cover literature relevant to our study, encompass the individual entrepreneurship, team-based entrepreneurship and its importance to bringing innovation

in SMEs. After a brief review of the literature, we will present our hypotheses to examine the hypothetical relations of the research variables.

## The conceptual definition of innovation performance

Schumpeter (1934) describes the term innovation as:

> Any attempt carried out for the introduction of a new (or improved) product, a new method of production, an opening of a new market, exploitation of a new source of supply and the re-engineering of business management processes.

Innovativeness is an organization-wide recognition of unique creation: an introduction of new products, processes or services and application of distinctive administrative systems, or any combinations of these factors that influence the overall firm performance (Bulut and Yilmaz, 2008). Innovative performance can be defined as the tendency of a firm to bring novelty in the product and production process, support new ideas and explore a creative solution to the complex issues (Raghuvanshi and Garg, 2018). By above conceptions, one can conclude that innovation performance comprises of an introduction of new products, searching out unique working methods and techniques, exploring new ideas to solve complex issues, identifying performance gaps, mobilizing support for innovative ideas and transforming innovative ideas into useful applications (De Jong and Den Hartog, 2007; Janssen, 2000; Yeoh and Mahmood, 2013).

## Individual entrepreneurship and innovation in the context of small and medium enterprises

A wide range of researchers (McClelland and Winter, 1969; Hull et al., 1980; Cuervo, 2005; Turkina and Thai, 2015; Yan and Yan, 2016) tend to analyze the characteristics of a successful entrepreneur to identify distinctive traits in their personality, and in this attempt they find that entrepreneurial behavior tend to have such characteristics: extroversion, desire for accomplishment, desire for independence, need for power, need for achievement, creativity, innovation, risk-taking, and proactive (Hussain, 2018). Further, most of the studies hold the opinion that centralized decision-making by the entrepreneur tends to benefit innovation, particularly exploitative innovation that is based on existing knowledge of the entrepreneur (Cardinal, 2001; Jansen et al., 2006). A more recent study by Yan and Yan (2016) postulate that with scarce resources held by SMEs, the entrepreneur's centralized decision-makings tend to bring more incremental innovation then radical. A large number of researchers explore the psychological characteristics of the successful entrepreneur to identify distinctive traits in their personality, which distinguish entrepreneurs from rest of the individuals in a society (Yan and Yan, 2016). The entrepreneurial behavior should have three characteristics that comprised of innovative, proactive and risk-taking that determine the capacity of entrepreneurs to change the way in which things are done, assume the uncertainty associated with change and take the initiative (McClelland, 1961; Kihlstrom and Laffont, 1979; Cuervo, 2005). Albeit, a large number of studies have examined different aspects of personality traits of entrepreneurs and innovation, the results of the studies are still mixed and inconclusive, and require further investigation (Zali and Chaychian, 2017). In the recent era, we find large-scale studies on the nexus of personality trait and business success (Rauch and Frese, 2007; Brandstätter, 2011; Leutner et al., 2014), but only a limited number of scholars explored the association between entrepreneur's personality traits and innovation performance in SMEs (Bello, 2017).

## Communication, collaboration and collective (team-based) entrepreneurship

In the current dynamic era, communication and collaboration within a firm enable it to be entrepreneurial and continuously innovative by exploring new markets. In entrepreneurship literature, communication and collaboration emphasize the creation of economic values based on novel and mutually generated ideas that emerge from the sharing of information and knowledge (Gupta and Govindarajan, 2000a, 2000b). According to Miles *et al.* (2005), knowledge creation and its proper utilization lead to innovation. It is obvious that effective knowledge management within a firm depends on its ability to communicate and collaborate inside the organization. In a collaborative environment, employees frequently share information with their colleagues that brings innovations in a given firm in a result of shared ideas. In the meantime, it is acknowledged that networks within the firm could be the basis for collective entrepreneurship in the context of decision-making process. Johannisson (2017) examines entrepreneurship in the context of a network. He stated that "entrepreneurs in owner-managed firms have to supplement internal resources in order to adapt to increasingly turbulent environments." In this sense, "the personal network of the entrepreneur supplies resources on conditions which do not conflict with the small business' need for flexibility." Collective entrepreneurship requires a network that allows for sharing and exchange of ideas and resources at the cognitive (e.g. team mental models, networked organizations), affective (e.g. social support) and behavioral (e.g. teamwork) levels. The collective capability of a firm depends on communication and collaboration in an entrepreneurial team. In fact, it has been found that innovative potential, along with collective capability, serves as the most important reasons for collective entrepreneurship (Antoncic, 2007). In his study, Reich (1987) advocates that a firm should put an end to the "myth of the entrepreneurial hero" and acknowledges collective entrepreneurship that emerges from synergetic contributions from employees, as the collective capacity to identify and respond to opportunities is an important component of collective entrepreneurship.

## Communication, collaboration and entrepreneurial orientation

Entrepreneurial Orientation (EO) can be defined as a strategic posture of a firm that displays its propensity to be innovative, that is, to generate novel ideas, proactive to beat competitors in recognition of new market opportunities, and open to take risk in exploration of new products, services, and markets (Covin and Slevin, 1991). Firm's ability to convert its innovative, proactive and risk-taking behavior into performance advantage is influenced by the amount and quality of knowledge exchange that takes place across all the employees of an organization. Entrepreneurial orientation can be defined as the firm's innovative, proactive and risk-taking behaviour, as well as its internal collective capability (Anderson *et al.*, 2015; Cho and Lee, 2018; Lumpkin and Dess, 1996; Miller, 2011; Thorgren *et al.*, 2012; Wales, 2016). The collective capability depends on the quality of knowledge exchange in the entrepreneurial team that is based on proper communication and collaboration. A high level of cross-functional communication and a close information flow play a critical role in sharing and integrating knowledge across different departments, which is considered as an important source of development of new and innovative products. So, internal collaboration and knowledge exchange across different functional boundaries boost the firm's innovativeness. To be proactive, communication and collaboration build up a firm's capability to identify new market opportunities by increasing the level of market intelligence generation and market responsiveness (Brettel *et al.*, 2015).

## Collective (team-based) entrepreneurship and innovation in the context of small and medium enterprises

Innovation performance cannot be led by a single entrepreneur/owner, and to view an entrepreneur/owner as a single driver of innovation activities leads to a strong individualistic assumption about entrepreneurship (Miller, 1983; Reich, 1987; Man *et al.*, 2002) that ignores the collective efforts made by all the members of an entrepreneurial team. To some extent, it maybe possible that this assumption may create such an individualistic culture that will favor individual efforts and contributions and ignore the collective efforts and contributions made by all the business members (Reich, 1987). Management scholars proclaim that collective action lies at the heart of management sciences and remind us that a collective action perspective in these sciences "cannot ignore the entrepreneurial process at the origins of the organizational processes" (Brechet and Desreumaux, 1999). While, the scholars in the field of entrepreneurship seem to ignore the notion of collectivism, as most of the scholars place an undue focus on a stereotypical entrepreneur, lone and heroic (Ben-Hafaïedh, 2017). Along with an individualistic orientation of entrepreneurship theory and the practical need for role models in the society (Lindgren and Packendorff, 2003), it is important to study entrepreneurship in collective perspective and explore its collective dimensions because viewing entrepreneurship as team-based, and then taking another step toward entrepreneurial teams, will lead to construct such an entrepreneurship framework that will allow us to have a more realistic image of the phenomenon. So, the present study primarily aims at searching the entrepreneurship field for collective action and further demonstrating its importance for the innovation performance.

## Entrepreneurial orientation and innovation in the context of small and medium enterprises

In recent literature, Entrepreneurial Orientation (EO) has been recognized as one of the most important factors for firm growth, profitability and competitiveness. Further, in an attempt to avoid the adverse effects of short product life cycle and innovative efforts made by the competitors, and to compete in a dynamic environment with continuously changing customers' priorities, it is important for a firm to adopt EO proactively. Miller (1983, p. 771) defined an entrepreneurial firm as "a firm that engaged in product market innovation, undertakes somewhat risky ventures, and is first to come up with "pro-active" innovations, beating competitors to the punch." Miller's definition provides the basic understanding of the underlying field of entrepreneurial firms and acts as a groundwork for the development of unified EO construct. Furthermore, it formalizes the prime components attached to the firm's forward-looking behavior regarding product market innovation (innovativeness) to take proactive initiatives (proactiveness) and a firm's propensity to bear the corresponding risks (risk-taking). A wide range of literature adopts the definition and formal conceptualization of Miller, and it is also supported by a large number of empirical findings. A more recent study conducted by Arunachalam *et al.* (2018) proclaims that the three aspects of EO (innovativeness, proactiveness and risk-taking) act as catalysts to the continual development of product innovations. According to Rubera and Kirca (2017), entrepreneurial firms are those which are creative in nature and support new ideas and consider environmental dynamics as opportunities rather than threats. Further, along with a high enthusiasm to depart from already existing patterns and practices, these firms also show high willingness to initiate joint innovation development activities with their partners (Lumpkin and Dess, 1996). Proactiveness stimulates such a robust culture that gives a competitive edge to outperform competitors and boost the firm's ability to grab new opportunities by knowing the newer needs of customers. It also increases the likelihood of

the firm to become a pioneer in serving customers' new needs by initiating strategic actions and to gain first-mover advantages (Conant *et al.*, 1990). Proactive firms are those that are future orientated and have a propensity to identify new trends in the market to find out substitutes for their products which are going at the end of their life cycles (Lumpkin and Dess, 1996). Finally, a firm's risk-taking propensity enriches the firm's willingness to experiment with new ideas and learn from failures. It is a firm's critical capability to actively serve the dynamic needs of the customer at the marketplace (Day, 2011). Moreover, the strategy to allocate substantial resources to deal with the uncertain consequences of creative actions increases the introducing speed of new products and ideas (Eisenhardt, 1989). The three-dimensional EO activities have a significant positive association with the innovation output of firms while venturing into uncertain arenas. Innovativeness provides the intent, proactiveness provides the direction, and risk-taking provides the will (Arunachalam *et al.*, 2018). So, it is argued that taken together, firms with higher levels of EO will have greater success in the level of innovations they generate.

### Small and medium enterprises in the context of Pakistan

Literature proclaims that SMEs have a decisive role in the economic development of a country. This sector of the economy is not only important for generation of employment, alleviation of poverty, equal distribution of income, development of enterprises and the development of rural sector, but it also has a major contribution to the gross domestic product (GDP) of a country (Wu *et al.*, 2017). According to Khan (2015), in Pakistan, SMEs act as a catalyst to the structural changes and play a critical role in the macro-economic development and support sustainable growth. In Pakistan, SMEs are a prime sector and Pakistan's economy heavily depends on SMEs for industrial productivity, export earnings, foreign investments, jobs and its overall economic prosperity (Jan Khan and Khalique, 2014). The statistics of State Bank of Pakistan (2016) indicate that 99 per cent (3 million) enterprises in Pakistan are SMEs and they employ 78 per cent of industrial labor force. Pakistan's SME sector contributes 30 per cent to the GDP and 25 per cent to the export of manufacturing goods (Pakistan Economic Survey, 2016/2017). To improve SMEs' establishment and their productivity, Pakistan government has established various institutions and schemes such as Small and Medium Enterprise Development Authority (SMEDA), Small and Medium Enterprise Banks (SMEs Banks), Prime Minister's Youth Business Loan, Microloan Insurance Scheme, etc. As per Pakistan SMEs Policy (2007), small and medium enterprises are defined as follows (Table I):

After an in-depth study of the literature, we propose the following theoretical framework that presents possible relations among different variables developed on the basis of a rigorous study of the underlying field (Figure 1).

### Hypothesis development

On the basis of a rigorous examination of relevant aspects of entrepreneurship literature, we have developed following research hypotheses to test the hypothetical relations among

| Enterprise category | Employment size | Annual sales |
| --- | --- | --- |
| Small and medium enterprise (SME) | Up to 250 Employees | Up to Rs. 250m |
| **Source:** Pakistan SMEs Policy (2007) | | |

**Table I.**
SME definition

entrepreneurship and innovation that were depicted in the theoretical framework of the
study:

*H1.* Entrepreneurial personality traits are positively associated with innovation in
SMEs.

*H2.* Centralized decision-making is positively associated with innovation in SMEs.

*H3.* Centralized decision-making is negatively associated with communication.

*H4.* Centralized decision-making is negatively associated with collaboration.

*H5.* Communication is positively associated with entrepreneurial orientation.

*H6.* Communication is positively associated with collective entrepreneurship.

*H7.* Collaboration is positively associated with entrepreneurial orientation.

*H8.* Collaboration is positively associated with collective entrepreneurship.

*H9.* Entrepreneurial orientation has direct positive impact on innovation in SMEs.

*H10.* Collective entrepreneurship has direct positive impact on innovation in SMEs.

## Methodology
*Measurement scale (see Appendix)*
*Entrepreneurial traits* – To measure entrepreneurial traits, we applied a higher-order
construct adopted from (Eggers *et al.*, 2013), that is built by three lower order constructs
(risk-taking, innovativeness and proactiveness), all measured on three items.
*Entrepreneurial Orientation* – The scale for entrepreneurial orientation was adopted from
Tajeddini (2010), to measure the firm's tendency to involve in entrepreneurial orientation
activities. *Centralization* – Following the literature, we measured centralization by widely
used five-item questionnaire of Hage and Aiken (1967), regarding the extent to which the
decision-making authority is concerted at the firm's top-level management. *Collaboration* –
To measure the collaborative behavior among business members, we used six items scale
developed by Rahim (1983). *Communication* – To measure communication among the
business members, we adopted the eight-item scale developed by House and Rizzo (1972),
and three items were dropped due to poor factor loading. *Collective entrepreneurship* – To
measure collective entrepreneurial tendency of the respondent firms, we applied an eight-
item scale developed by Yan and Yan (2016). This scale was developed based on the
definition of collective entrepreneurship and previous studies of Yan and Sorenson (2003)
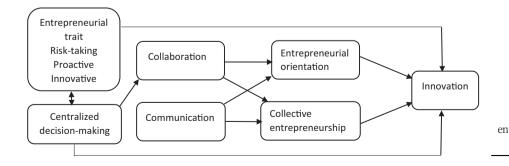


**Figure 1.**
Theoretical
framework for
individual and
collective
entrepreneurship for
SMEs

and Stewart (1989). *Innovation* – To measure the product, process and market-related innovations, we used five-item innovation scales developed by Kickul and Gundry (2002). Respondents were asked to indicate to what extent the business was engaged in the three listed types of innovation. All the constructs' items were measured by seven-point Likert scales, from strongly disagree to strongly agree.

## Data collection

In Pakistan, more than 85 per cent of the manufacturing companies can be classified as SMEs that have a great potential to promoting economic growth and competiveness (Jan Khan and Khalique, 2014). When we study the regional SMEs establishment of Pakistan, we come to know that Punjab has the largest share of 65.26 per cent, Sindh has 17.82 per cent, Khyber Pakhtoon Khwa (KPK) has 14.21 per cent, and Balochistan has 2.09 per cent share of the total 2.96 million establishment. The number of SMEs (manufacturing) in the country is over 400,000, whereas the number of all other units is less than 10,000. Hence, SMEs constitute more than 98 per cent of total number of manufacturing units (SME Base Line Survey, SMEDA Pakistan, 2019). On the basis of above figures, we took manufacturing SMEs as our population. Further, as mentioned above, comparing to other regions, Punjab had the largest share of 65.26 per cent in the total 2.96 million SMEs establishment; therefore, we decided to select this region as the sample frame of our study. Based on Pakistan Bureau of Statistics (2005) (Census of Manufacturing Industries-2013 District-Wise Report), we selected five major industrial cities of Punjab named Lahore, Multan, Faisalabad, Gujranwala and Sialkot as a sample frame. The Chamber of Commerce and Industry of each district maintained a register for listed (manufacturing, services and retail) SMEs in that region which provided holistic approach for sample selection. Simple random technique was applied to select sample and a total of 700 major registered SMEs were selected as the sample frame. The survey instruments were distributed through email among selected firms and target respondents of the survey were owners or top-level managers. A total of 480 survey instruments were returned with the response rate of 68.57 per cent, which is considered a good response rate in Pakistan. The sample distribution is depicted in Table II.

## Analyses and results

In the present study, we have used SEM technique as this technique is particularly suitable to test a multilevel theoretical framework and makes it possible to evaluate several relationships between observed and latent variables simultaneously (Bagozzi and Yi, 2012). As suggested by Anderson and Gerbing (1988), we used a two-step SEM approach. In the first step, we conducted confirmatory factor analysis (CFA) to assess the validity of the measurement model and the discriminant validity of individual constructs. In the second step, a structural model was developed to estimate the path coefficients for hypothetical relationships between the constructs.

## Measurement model validity

Before going to test hypothetical relationships between different variables of the study, we estimated the validity of all construct measures. For this purpose, confirmatory factor analysis (CFA) was carried out using the software solution AMOS 21. CFA results of measurement construct, entitled entrepreneurial traits, stated a good fit, goodness-of-fit indexes: ($\chi^2$/df = 7.71; goodness of fit index (GFI) = 0.987; comparative fit index (CFI) = 0.989; normed fit index (NFI) = 0.975; root mean square of approximation (RMSEA) = 0.039, $P < 0.05$. Results of CFA for centralized decision-making construct also showed a good fit,

| Variables | Items | Frequency | (%) |
|---|---|---|---|
| Gender | Male | 410 | 85.42 |
| | Female | 70 | 14.58 |
| Age of owner/manager | 20-30 years | 115 | 23.95 |
| | 31-40 years | 150 | 31.25 |
| | 41-50 years | 96 | 20.00 |
| | 51-60 years | 85 | 17.70 |
| | Above 60 years | 34 | 07.08 |
| Educational qualification | Matric | 120 | 25.00 |
| | Entre/Equal | 135 | 28.12 |
| | Bachelor/Equal | 98 | 20.41 |
| | Master/Equal | 75 | 15.62 |
| | Other Tech. Education | 52 | 10.83 |
| Respondent's status | Owner | 320 | 66.67 |
| | Manager | 160 | 33.33 |
| Regional distribution | Lahore | 229 | 47.70 |
| | Multan | 63 | 13.12 |
| | Faisalabad | 77 | 16.05 |
| | Gujranwala | 76 | 15.83 |
| | Sialkot | 35 | 07.30 |
| No. of employees | 1-100 | 396 | 82.50 |
| | 101-250 | 84 | 17.50 |
| Business age | 1-10 years | 181 | 37.70 |
| | 11-20 years | 234 | 48.80 |
| | Above 20 years | 65 | 13.50 |

Table II.
Sample descriptive statistic and distribution

Goodness-of-fit indexes: ($\chi^2$/df = 3.51; goodness of fit index (GFI) = 0.994; comparative fit index (CFI) = 0.995; normed fit index (NFI) = 0.993; root mean square of approximation (RMSEA) = 0.072, $P < 0.05$. Results of CFA for collaboration measurement construct also indicated a good fit, Goodness-of-fit indexes: ($\chi^2$/df = 2.61; goodness of fit index (GFI) = 0.987; comparative fit index (CFI) = 0.990; normed fit index (NFI) = 0.985; root mean square of approximation (RMSEA) = 0.058, $P < 0.05$. CFA results of measurement construct, entitled communication, showed a good fit, Goodness-of-fit indexes: ($\chi^2$/df = 4.31; goodness of fit index (GFI) = 0.989; comparative fit index (CFI) = 0.981; normed fit index (NFI) = 0.976; root mean square of approximation (RMSEA) = 0.080. $P < 0.05$. Results of CFA for entrepreneurial orientation measurement construct also indicated a good fit, Goodness-of-fit indexes: ($\chi^2$/df = 3.98; goodness of fit index (GFI) = 0.987; comparative fit index (CFI) = 0.983; normed fit index (NFI) = 0.978; root mean square of approximation (RMSEA) = 0.078. $P < 0.05$. Results of CFA for collective entrepreneurship measurement construct also indicated a good fit, Goodness-of-fit indexes: ($\chi^2$/df = 2.24; goodness of fit index (GFI) = 0.990; comparative fit index (CFI) = 0.993; normed fit index (NFI) = 0.988; root mean square of approximation (RMSEA) = 0.051. $P < 0.05$. Results of CFA for innovation measurement construct also specified a good fit, Goodness-of-fit indexes: ($\chi^2$/df = 3.86; goodness of fit index (GFI) = 0.984; comparative fit index (CFI) = 0.967; normed fit index (NFI) = 0.935; root mean square of approximation (RMSEA) = 0.077. $P < 0.05$. The standardized factor loading (SFL) of each items for all the constructs is exceeding the threshold value of 0.50, alpha coefficients of each measurement construct are also greater than 0.70 and statistically significant at a level of 5 per cent (Tables III-IX).

**Test of hypotheses**
The CFA results specified that our model is an acceptable measurement model, so we proceed to evaluate the structural model with the help of AMOS 21. Figure 2 depicts that the overall fit statistics indicate an adequate fit for the model, structural model goodness-of-fit indexes: ($\chi^2$/df = 17.72; comparative fit index (CFI) = 0.967; normed fit index (NFI) = 0.982; non-normed fit index (NNFI) = 0.941; root mean square of approximation (RMSEA) = 0.071; AGFI = 0.982). $P < 0.05$. Table X depicts the path analyses results for the main variables of the study that provide a partial support to hypothetical relationships of our study. As per SEM results, entrepreneurial traits are found to have a significant positive association with

| Measurement scale | Items | Standardized factor loading (SFL) | Alpha |
|---|---|---|---|
| Entrepreneurial traits | ET1 | 0.564 | 0.679 |
| | ET2 | 0.546 | |
| | ET3 | 0.654 | |
| | ET4 | 0.732 | |
| | ET5 | 0.746 | |
| | ET6 | 0.538 | |
| | ET7 | 0.675 | |
| | ET8 | 0.742 | |
| | ET9 | 0.737 | |

**Notes:** Goodness-of-fit indexes: $\chi^2$/df = 7.71; goodness of fit index (GFI) = 0.987; comparative fit index (CFI) = 0.989; normed fit index (NFI) = 0.975; root mean square of approximation (RMSEA) = 0.039. $P < 0.05$

**Table III.**
Construct measure and validity assessment (entrepreneurial traits)

| Measurement scale | Items | Standardized factor loading (SFL) | $\alpha$ |
|---|---|---|---|
| Centralized decision-making | CD1 | 0.675 | 0.698 |
| | CD2 | 0.653 | |
| | CD3 | 0.548 | |
| | CD4 | 0.639 | |
| | CD5 | 0.664 | |

**Notes:** Goodness-of-fit indexes: $\chi^2$/df = 3.51; goodness of fit index (GFI) = 0.994; comparative fit index (CFI) = 0.995; normed fit index (NFI) = 0.993; root mean square of approximation (RMSEA) = 0.072. $P < 0.05$

**Table IV.**
Construct measure and validity assessment (centralized decision-making)

| Measurement scale | Items | Standardized factor loading (SFL) | $\alpha$ |
|---|---|---|---|
| Collaboration | CB1 | 0.576 | 0.665 |
| | CB2 | 0.653 | |
| | CB3 | 0.632 | |
| | CB4 | 0.548 | |
| | CB5 | 0.687 | |
| | CB6 | 0.751 | |

**Notes:** Goodness-of-fit indexes: $\chi^2$/df = 2.61; goodness of fit index (GFI) = 0.987; comparative fit index (CFI) = 0.990; normed fit index (NFI) = 0.985; root mean square of approximation (RMSEA) = 0.058. $p < 0.05$

**Table V.**
Construct measure and validity assessment (Collaboration)

innovation in SMEs ($\beta = 0.02$, $p < 0.05$). Our study postulates that centralized decision-making has a negative association with collaboration but the results specify an insignificant positive association between two variables ($\beta = 0.70$, $p > 0.05$). We supposed that centralized decision-making has a negative association with communication, and the results also provide a support to our supposition ($\beta = -0.06$, $p < 0.05$). Our study suggests that there is a negative association between centralized decision-making and innovation in SMEs, but SEM results state that there is no any association between centralized decision-making and innovation ($\beta = 0.00$, $p > 0.05$). The SEM analysis also suggests positive

| Measurement scale | Items | Standardized factor loading (SFL) | Alpha |
| --- | --- | --- | --- |
| Communication | CM1 | 0.538 | 0.712 |
| | CM2 | 0.639 | |
| | CM3 | 0.612 | |
| | CM4 | 0.589 | |
| | CM5 | 0.615 | |

**Notes:** Goodness-of-fit indexes: $\chi^2/\text{df} = 4.31$; goodness of fit index (GFI) = 0.989; comparative fit index (CFI) = 0.981; normed fit index (NFI) = 0.976; root mean square of approximation (RMSEA) = 0.080. $P < 0.05$

**Table VI.**
Construct measure and validity assessment (Communication)

| Measurement scale | Items | Standardized factor loading (SFL) | Alpha |
| --- | --- | --- | --- |
| Entrepreneurial orientation | EO1 | 0.687 | 0.731 |
| | EO2 | 0.586 | |
| | EO3 | 0.664 | |
| | EO4 | 0.597 | |
| | EO5 | 0.574 | |
| | EO6 | 0.583 | |
| | EO7 | 0.677 | |

**Notes:** Goodness-of-fit indexes: $\chi^2/\text{df} = 3.98$; goodness of fit index (GFI) = 0.987; comparative fit index (CFI) = 0.983; normed fit index (NFI) = 0.978; root mean square of approximation (RMSEA) = 0.078. $P < 0.05$

**Table VII.**
Construct measure and validity assessment (entrepreneurial orientation)

| Measurement scale | Items | Standardized factor loading (SFL) | Alpha |
| --- | --- | --- | --- |
| Collective entrepreneurship | CE1 | 0.529 | 0.626 |
| | CE2 | 0.547 | |
| | CE3 | 0.652 | |
| | CE4 | 0.576 | |
| | CE5 | 0.535 | |
| | CE6 | 0.598 | |
| | CE7 | 0.612 | |
| | CE8 | 0.593 | |

**Notes:** Goodness-of-fit indexes: $\chi^2/\text{df} = 2.24$; goodness of fit index (GFI) = 0.990; comparative fit index (CFI) = 0.993; normed fit index (NFI) = 0.988; root mean square of approximation (RMSEA) = 0.051. $p < 0.0$

**Table VIII.**
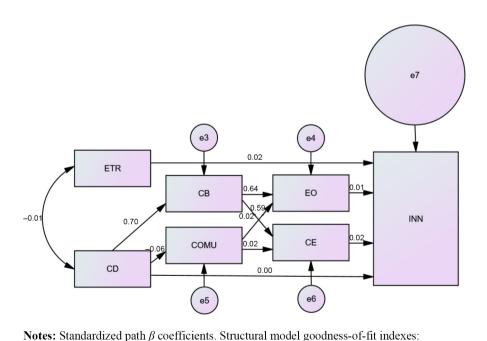Construct measure and validity assessment (collective entrepreneurship)

relationships between elements of the two sources of innovation in SMEs. Communication among business members was found to have a positive significant association with the entrepreneurial orientation ($\beta$ = 0.59, $p$ < 0.05), and in the meantime it was found to be positively associated with collective entrepreneurship ($\beta$ = 0.02, $p$ < 0.05). Collaboration among the business members has a positive association with entrepreneurial orientation ($\beta$ = 0.64, $p$ < 0.05), and it is also significantly associated with collective entrepreneurship ($\beta$ = 0.02, $p$ < 0.05).

Collective entrepreneurship is found to have a significant positive association with innovation in SMEs but the relationship is very weak ($\beta$ = 0.02, $p$ < 0.01). We have also

| Measurement scale | Items | Standardized factor loading (SFL) | Alpha |
|---|---|---|---|
| Innovation | INN1 | 0.653 | 0.695 |
| | INN2 | 0.587 | |
| | INN3 | 0.743 | |
| | INN4 | 0.648 | |
| | INN5 | 0.579 | |

**Notes:** Goodness-of-fit indexes: $\chi^2$/df = 3.86; goodness off **it** index (GFI) = 0.984; comparative fit index (CFI) = 0.967; normed fit index (NFI) = 0.935; root mean square of approximation (RMSEA) = 0.077. $p$ < 0.05

**Table IX.**
Construct measure and validity assessment (Innovation)



**Figure 2.**
Path diagram

**Notes:** Standardized path $\beta$ coefficients. Structural model goodness-of-fit indexes: ($\chi^2$/df = 17.72; comparative fit index (CFI) = 0.967; normed fit index (NFI) = 0.982; non-normed fit index (NNFI) = 0.941; root mean square of approximation (RMSEA) = 0.071; AGFI = 0.982); $P$ < 0.05

| From | Path | To | Standardized $\beta$ | $P$ value | Results |
|------|------|-----|------|------|---------|
| CD | → | COMU | −0.06 | * | *H3* Supported |
| CD | → | CB | 0.70 | 0.34 | *H4* Not Supported |
| CD | → | INN | 0.00 | 0.98 | *H2* Not Supported |
| COMU | → | CE | 0.02 | *** | *H6* Supported |
| CB | → | EO | 0.64 | * | *H7* Supported |
| COMU | → | EO | 0.59 | *** | *H5* Supported |
| CB | → | CE | 0.02 | *** | *H8* Supported |
| ETR | → | INN | 0.02 | * | *H1* Supported |
| EO | → | INN | 0.01 | *** | *H9* Supported |
| CE | → | INN | 0.02 | *** | *H10* Supported |

**Notes:** ***$p$ = 0.01; *$p$ = 0.05

Table X.
Path analyses

found a weak but significant positive association between entrepreneurial orientation and innovation in SMEs ($\beta = 0.01, p < 0.05$). Overall findings of the study support our presented model; eight out of ten hypotheses were empirically supported with the data of four hundred and eighty enterprises.

**Discussion**
The study aimed at exploring the association between individual and team-based entrepreneurship and their simultaneous impact on innovation in the context of SMEs. It cannot be presumed that either leadership imperative theory of Miller (1983) or the collective entrepreneurship theory of Reich (1987) and Stewart (1989) alone is able to offer a broad explanation to the sources of innovation for SMEs. So, the present study is intended to fill the gap in existing entrepr eneurship literature that either stresses on the individual entrepreneur's role to bring innovation or only focuses on the significance of team-based entrepreneurship. The results of SEM analyses unravel the contribution of the individual entrepreneur and also depict the importance of collective entrepreneurship to bring innovation in SMEs. Entrepreneur's personality traits have a direct positive impact on innovation, while opposed to the previous research finding (Yan and Yan, 2016), centralized decision-making has no significant association with innovation. Centralized decision-making has a negative association with communication among business members and has an insignificant positive association with collaboration. In line with previous research findings of (Stewart, 1989; Yan and Yan, 2016), collective entrepreneurship is positively associated with innovation. What is more, our findings suggest that collective efforts have a strong association with innovation than individual efforts. Factors associated with team-based entrepreneurship (communication and collaboration among business members of SMEs) contribute to entrepreneurial orientation and collective entrepreneurship and ultimately to bringing innovation in SMEs. On the other hand, the factors that are associated with individual entrepreneurship, like centralized decision-making, negatively influence the collective entrepreneurship. Also, centralized decision-making discourages both communication and collaboration among business members of SMEs, ultimately hindering the process of innovation by discouraging collective effort within the firm. Factors that center to collective entrepreneurship, i.e. communication and collaboration, also improve the entrepreneur's individual contribution to innovation by enhancing his/her knowledge about new markets, products, processes and technology.

*Research implications*
In line with the previous research findings, the present study proclaimed with the help of empirical evidence that the individual entrepreneur and team-based entrepreneurship contribute to innovation in SMEs. At the same time, the study exposed a mechanism that helps to understand the complexity in relationships between the two sources of innovation in SMEs. Factors that lead to collective entrepreneurship, i.e. communication and collaboration, boost the entrepreneur's individual contribution to innovation by enhancing his/her knowledge about new products, markets, processes and technology. Findings of this study provide empirical support to the collective entrepreneurship theory which suggests that collective entrepreneurial capability makes a significant and distinctive contribution to innovation. In contrast, the factors that are associated with individual entrepreneurship, like centralized decision-making by the entrepreneur, have a negative impact on collective entrepreneurship, as they hinder the process of communication and collaboration among business members which ultimately discourages innovation within the firm. So, one of the most important implications of this study is that the SMEs in pursuit of innovation should create such an environment that encourages communication and collaboration among business members, empowers all employees and promotes decentralized decision-making process. Consistent with the leadership imperative theory of entrepreneurship (Miller, 1983), the present study also confirms it empirically that the entrepreneur as an individual acts as a catalyst to bring innovation in small enterprises. So, the second practical implication for the entrepreneur is that he/she as a leader of a small business should neither underestimate his/her own potentials and downplay his/her efforts and nor should act as an only "organizing genesis" because the collective entrepreneurship has a significant contribution to innovation in SMEs. The third managerial implication generating form this study is that the SMEs who want to improve entrepreneurial orientation activities within the firm should do their best to promote communication and collaboration both horizontally and vertically and encourage decentralized organizational structure because such activities have a direct positive impact on entrepreneurial orientation activities within the firm. The study also suggests that entrepreneurial personality traits have a direct positive impact on innovative activities. So, another important implication for the entrepreneur is also generated that he/she should be proactive, innovative and risk-taker, as these traits also encourage innovation.

## Conclusion
Despite a number of implications originate from the present study, there are also some limitations associated with this research. First, the present study is based on cross-sectional data that makes it difficult to draw a causal relationship between investigated variables. So the future research can be based on the longitudinal approach for a better understanding of causal relationships between individual entrepreneurship, team-based entrepreneurship, and innovation in SMEs. Second, most of the data about each of the research variables are collected directly from entrepreneurs; in future, data about different variables may be collected from different sources, like data about factors that comprise of collective entrepreneurship should be collected from other members (employees) of an organization. Third, in our study, we used a sample of manufacturing SMEs only; in future research, the sample frame can encompass manufacturing, service and retail businesses that will improve the generalizability of the results. Fourth, the model used in our study comprises only a few factors related to individual entrepreneurship and team-based entrepreneurship; in future studies, more variables can be considered to explore the complex relationships between individual entrepreneurship, team-based entrepreneurship and innovation. Finally, the intervening impact of environmental and cultural factors on the association of collective

entrepreneurship and innovation may be studied in the future research. The present study sheds new light on the existing entrepreneurship literature that either advocates the individual entrepreneur's role in innovation (Miller, 1983) or only supports the collective entrepreneurship (Reich, 1987; Stewart, 1989; Yan and Sorenson, 2003). This study overcomes this weakness by exploring the complexity in relationships between the two major sources of innovation in SMEs. Further, the model in our study investigates the simultaneous impact of individual and team-based entrepreneurship on innovation and suggests that these two sources have important, but not complementary, contributions to innovation in SMEs. Findings of this study also confirm that the combined effect of individual and collective entrepreneurship on innovation is neither additive nor subtractive.

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## Further reading

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## Appendix

### Entrepreneurial orientation scale: Tajeddini (2010)

- EO1 – Relative to our competitors, our company has a higher propensity to take risks.
- EO2 – Relative to our competitors, our company has a higher tendency to engage in strategic planning activities.
- EO3 – Relative to our competitors, our company has a higher ability to identify customer needs and wants.
- EO4 – Relative to our competitors, our company has a higher level of innovation.
- EO5 – Relative to our competitors, our company has a higher ability to persevere in making our vision of the business a reality.
- EO6 – Relative to our competitors, our company has a higher ability to identify new opportunities.

### Entrepreneurial personality traits scale (Eggers *et al.*, 2013)

*Innovativeness*

- We highly value new product lines.
- We consider ourselves as an innovative company.
- Competitors in this market recognize us as leaders in innovation.

*Proactiveness*

- We work to find new businesses or markets to target.
- We consistently look for new business opportunities.
- Our marketing efforts try to lead customers, rather than respond to them.

*Risk-taking*

- We encourage people in our company to take risks with new ideas.
- We value new strategies/plans even if we are not certain that they will always work.
- To make effective changes to our offering, we are willing to accept at least a moderate level of risk of significant losses.

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