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# Intrapreneurial behaviours and the innovative performance of technology enterprises: employee characteristics' moderating effect

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**Abstract:** This study examines the impact of employee characteristics on intrapreneurial behaviour and innovative performance in Tunisian technology firms. Data was collected through a structured questionnaire and used in linear regression and ANOVA techniques. The results show a positive association between intrapreneurial behaviour and innovation capacity. Employee characteristics significantly influence the relationships between independent variables (innovation, proactivity, risk-taking, networking, and opportunity recognition) and dependent variables (innovative performance). This research provides valuable insights for organisations aiming to enhance their innovation capabilities by effectively utilising employee characteristics and cultivating an intrapreneurial culture.

**Keywords:** innovative; networking; opportunity; risk-taking; performance.

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**Biographical notes:** Mohamed Fitouri is an academic researcher affiliated with the LISFE-University Tunis El-Manar Research Laboratory at FSEGT. His research interests span management, entrepreneurship, innovation, and employee behaviour at work. He is a prolific author, having contributed many articles in the field of entrepreneurship. His work is highly regarded and serves as a valuable resource for scholars, students, and professionals seeking insights into entrepreneurship and related subjects. His dedication to advancing knowledge and expertise in this area makes him a respected figure in the academic community.

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## 1 Introduction

Companies with an entrepreneurial spirit among their employees are those that successfully meet the challenges of competition and competitiveness in today's business environment. A proactive and creative workforce is essential for an organisation to perform better (Henry et al., 2015). According to Heinze and Weber (2016), an

innovative and proactive approach expands and improves the functioning of an organisation. A fair share of the profits is achieved by both parties. In fact, even employees have the capacity to provide innovative ideas that increase productivity (Alt and Craig, 2016). As a result, business leaders and entrepreneurship researchers are now interested in the intrapreneurial process.

However, there is a need to shed more light on how employees' intrapreneurial behaviours interact with employee characteristics to influence creative performance within Tunisian technology firms. In this regard, this study aims to fill a gap in the literature by examining more specifically the moderating effects of employee characteristics on intrapreneurial behaviour and innovative performance within these firms.

According to the literature, intrapreneurship can have three main meanings (Gawke et al., 2019). Firstly, it involves identifying workers who show initiative, create innovations and take risks within the company (Edú Valsania et al., 2016). Secondly, intrapreneurship refers to the involvement of employees in an organisation's internal entrepreneurial activities. According to Perlines et al. (2022), the third category of definitions focuses on employee actions that support intrapreneurship at the organisational level. These are the contributions of employee-intrapreneurs to their company (Woo, 2018). We use the term intrapreneurship in a corporate sense, which is defined as a creative process in which an employee uses opportunistic tactics to implement new logic within organisations and exploit small changes to initiate larger changes within the overall business (Berzin et al., 2016), as an example of the third category. The concept of behaviour-based intrapreneurship has the greatest potential to improve the theoretical literature on intrapreneurship, according to Gawke et al. (2019). It is essential to examine the causes and effects of intrapreneurship. Several studies have shown that intrapreneurship improves organisational performance and even identifies successful organisations (Covin and Slevin, 1991). This study aims to understand the relationship between intrapreneurial behaviour and creative performance in Tunisian technology companies.

This study is particularly relevant in the Tunisian context because of several distinctive factors in the country's economic and organisational environment. Tunisia is in the process of becoming a major player in the field of information and communications technologies, with significant growth in its technology business sector. In this rapidly evolving context, it is essential to understand how employee intrapreneurship can stimulate creativity and innovation within these companies, which can have a direct impact on their competitiveness and success on the global market. Academically, this study will help to fill a gap in intrapreneurship research by specifically examining the role of employee characteristics in the relationship between intrapreneurial behaviour and creative performance. The results of this research will enrich the theoretical understanding of intrapreneurship by adding knowledge about how individual employee factors influence this process. These academic contributions will help researchers to develop more robust theories and shed more light on the literature on intrapreneurship. On a practical level, the findings of this study will provide valuable information for managers and human resources officers in Tunisian technology companies, as well as those in other regions facing similar challenges. Understanding how employee characteristics can be used to foster intrapreneurship and stimulate creativity will help these companies develop more effective strategies for promoting internal innovation.

Ultimately, this could strengthen their competitiveness on the global market and contribute to the country's economic growth.

## **2 Literature review and hypotheses**

According to of the intrapreneurial employee, a survey of the literature on intrapreneurship, the majority of the work done in the issue has focused on examining how behavioural aspects impact company success (Antoncic and Hisrich, 2001; Antoncic and Hisrich, 2003; Funko et al., 2023). Neessen and colleagues (2023) examined the direct and interactive effects of organisational support and human capital on the innovation performance of firms within this framework. Intrapreneurship is supported by the following six characteristics, as described by Augusto Felicio et al. (2012): innovation, risk/uncertainty, risk/challenge, competitive energy, proactivity, and autonomy. Financial performance, growth and improvement, and productivity are also important (Antoncic and Hisrich, 2003). Neessen et al. (2019a) define intrapreneurism as a set of features, attitudes, and actions, each including essential characteristics

Today's concept of intrapreneurship is the identification and utilisation of employee opportunities to enhance business performance. The outcomes of a company are impacted when its personnel act as intrapreneurs (Antoncic and Hisrich, 2001). The word 'intrapreneurship' is used in the field of organisational studies to describe the entrepreneurial attitude within a corporation. The following behavioural traits are included in definitions of the word 'intrapreneurship': inventiveness/creativity, proactivity, opportunity perception and exploitation, risk-taking, and networking (Neessen et al., 2019a).

According to a study by Seborá and Theerapatvong (2010), managers are more daring, creative, and proactive when a company supports intrapreneurial managers. They also found a positive correlation between managerial initiative and the entrepreneurial culture of the company. Neessen et al. (2019a) claim that a person's creativity, risk-taking, initiative, networking skills, and level of team engagement might all have a significant impact on how well the team performs and functions as a whole (Neessen et al., 2019a).

According to the empirical study by Fellnhöfer et al. (2016), there is a favourable relationship between individual intrapreneurial behaviours and both the level of entrepreneurship in the business and the professional performance of employees (Gibb, 2002). Senior managers and corporate leaders need to be able to spot proactive employees, as proactive individuals play a crucial role in preparing for a new workplace (Hung et al., 2015). As proactive people are essential in preparing for a new employment, they should be encouraged to communicate more (Dickel, 2017). Dickel (2017) asserts that a company's proactivity varies from one company to the next and is influenced by a variety of factors, including the company's type, the degree to which it supports individual entrepreneurship, the extent to which it is proactive with regard to risk, the company's capacity for risk, employee support, company size, and the level of corporate competition. Internal entrepreneurs are more likely to forego typical job descriptions or try to sell ideas that are contentious inside the institutional framework when they actively question the status quo within businesses (de Jong et al., 2015). According to Hornsby et al. (2009) Kusuma and Almahendra (2022), if a business is to succeed over the long haul, entrepreneurship needs to be promoted at all levels of management. The

competition is heightened, consideration of each employee's position is encouraged, and attempts to predict the future are encouraged by identifying areas where the organisation outperforms competitors. Herein lays the importance of organisational management as well as the function of proactive employees. According to Hung et al. (2015), employee networking is crucial for fostering entrepreneurship and for synthesising and resolving a variety of activities and conflicts. These have to do with direction and the capacity of mid-project managers to interact with key players both inside and outside of an organisation. According to the interactive perspective, initiatives that focus on business and active networks have a better probability of producing innovative ideas. According to Khan et al. (2022), networking is a key tool for a firm to establish long-term competitive advantages. Firm must be able to transfer expertise from the experts to the junior staff in order for the knowledge to spread and be retained throughout the entire firm in order to fully recognise and utilise the networking of people. (Ambrose et al., 2014) define communication skills as a person's ability to build relationships with others who can be helpful at work. To make it simpler to share and acquire the essential information and to benefit from experience, entrepreneurs should build networks with individuals both inside and outside of their organisation. For a startup firm to be successful, such is required. As a result, it is projected that networking and entrepreneurial behaviour would go hand in hand. According to Hung et al. (2015), senior managers and business leaders must be able to recognise proactive people. People who are proactive should be encouraged to communicate more since they play a crucial role in preparing for a new workplace. According to Dickel (2017), a company's proactivity differs from one company to the next and is influenced by a number of factors, such as the company's type, the extent to which it encourages individual entrepreneurship, the degree to which it is proactive with regard to risk, the company's capacity for risk, employee support, company size, and the intensity of corporate competition. When internal entrepreneurs actively challenge the established quo within organisations, they are more likely to skip customary job descriptions or attempt to market concepts that are controversial within the institutional framework (de Jong et al., 2015). According to Hornsby et al. (2009), if a business is to succeed over the long haul, entrepreneurship needs to be promoted at all levels of management. The competition is heightened, consideration of each employee's position is encouraged, and attempts to predict the future are encouraged by identifying areas where the organisation outperforms competitors. Herein lays the importance of organisational management as well as the function of proactive employees. Risk has been seen as an essential element of business since Cantillon (1734), the person who first envisioned an entrepreneur. I enjoy taking chances. In order to boost competitiveness, (Vuorio et al., 2018) looked at risk-taking in the context of enterprises and considered initiative and risk-taking, competitive aggressiveness and boldness, as well as top management attitude. Internal leadership risks in business arise as a result of internal operations within an organisation since it takes time and money to see the return on one's investment. Farrukh et al. (2017b) claim that an employee's risk-taking behaviour at work consists of pursuing audacious ideas for the benefit of a firm while aware that the results of these suggestions are uncertain. When some team members conclude that a prospective loss may affect their ability to complete their tasks, risk-averse people may become gloomy, according to Kuckertz et al. (2017). Ahamat and Sin (2022). As a result, there can be psychological conflict between supporters and opponents. Neessen et al. (2019a) concentrated on the intrapreneurial staff while conducting their systematic evaluation of the literature. They discovered that taking initiative, being bold, taking

chances, seeing opportunities, and networking with others were essential intrapreneurship traits. Finding people who can embrace risk and make it challenging to discontinue a project just because it entails dangers is preferable, according to Kelley et al. (2011) and Nemet and Kukulj (2020). This is the case because people try to change their shortcomings into strengths and because there are some circumstances in which failure may lead to success. A leader in an organisation must be able to manage risk and unpredictability. This type of management takes a step closer to assuring the company's success and putting something in place that actually helps with organisation. Risk-averse people may become pessimistic when certain members of a company decide on a possible loss, according to Kollmann et al. (2017), as this risk might have an impact on how they perform at work. As a result, there is a great chance that fans and opponents may clash emotionally. The discussion is sparked by debate on how differently the organisation's members perceive threat. Communication within the organisation as a whole is stimulated by the individuals' various opinions on risk. Even though there are differences of opinion, consultations are still important because when a person takes a small risk, positive things might result since his or her ideas of unpleasant possibilities may be useful for changing a project before it begins. The interaction between an intrapreneur's attitudes and the organisation has been thoroughly researched by intrapreneurship researchers. Commitment to the organisation and a desire to quit the corporation are components of this connection. According to the study, there is a link between organisational engagement and opinions about a company's originality, initiative, and risk-taking propensity (Giannikis and Nikandrou, 2013). Researchers examined the relationship between engagement and intrapreneurial activity (Farrukh et al., 2017a). They discovered that whereas continuing engagement had a negative link to intrapreneurial activity, affective and normative engagement had a positive association to engagement. Employees' intrapersonal conduct is positively connected with their sense of identification with or belonging to the organisation. Also, according to Edú Valsania et al. (2016), connection with the company serves as a partial mediator between executive conduct and entrepreneurial activity. In addition to the relationship with the organisation, employee job satisfaction is a significant topic in literature on the intrapreneur. Positive correlation exists between job satisfaction and organisational internalisation (Giannikis and Nikandrou, 2013). Rutherford and Holt (2007) found a mediating relationship between employee satisfaction with the organisation's internal entrepreneurs and performance. In this study, there was a clear correlation between employee happiness and activities related to selling their ideas inside the company, which is a behavioural behaviour component (De Clercq et al., 2016). Workplace pleasure appears to operate as a partial mediator between psychological appropriation and entrepreneurial behaviour (Gawke et al., 2019; Blanco-Gonzalez-Tejero and Cano-Marin, 2023). Important psychological factors related to intrapreneurship include motivation and the purpose to act entrepreneurially. This study looks at the traits of employees that are crucial in generating benefits for technology firms. There is a wealth of literature on the traits of the intrapreneurial employee. In fact, there is a connection between intrapreneurship and self-efficacy (Farrukh et al., 2017a; Rutherford and Holt, 2007) One of the intrapreneur attitudes noted in the research in this topic of intrapreneurship is a stronger intention to behave entrepreneurially, which is also correlated with higher levels of self-efficacy (Hanson, 2017; Olive, 2020). Other employee characteristics, such prior experience and personal expertise, have been linked to intrapreneurship in the research. The amount of intrapreneurial activity and business development is influenced by the employee's prior

entrepreneurial experience, according to Turro et al. (2013) and Chadha and Dutta (2020). Similar to Wang et al. (2018), Panetti and Parmentola (2020) past experience enhances the ability to recognise opportunities. Intrapreneurs, according to Martiarena (2013) and Turro et al. (2013), are employees who have completed intrapreneurship training or have a better degree of education than other employees. Because more spin-offs arise from intrapreneurship training, according to research by (Alrumaithi et al., 2014) .Social skills, individual teamwork skills, and ability are all included in the area of personal skills and talents that describe an intrapreneurial employee (Sundin and Tillmar, 2008). Thus, we propose the following hypotheses:

*H1: The impact of intrapreneurial behaviours employee in technology firms in innovative performance is positive*

*H1a: The impact of innovativeness employee in technology firm, and innovative performance is positive.*

*H1b: There is a strong correlation between technology firm's willingness to take risks employee and how innovative they are.*

*H1c: The effect of proactiveness employee in technology firms in innovative performance is a positive.*

*H1d: The effect of opportunity recognition and exploitation employee in technology firms in innovative performance is a positive*

*H1e: The technology firm's performance in terms of innovation and networking employee are positively correlated.*

*H2: The employee characteristics of technology businesses are favourably connected with the impact of intrapreneurial behaviours on the inventive performance of technology firms.*

### **3 Methodology**

#### *3.1 Research design*

To explore the relationship between intrapreneurial behaviours and innovative performance within technology businesses in Tunisia, a quantitative research approach was employed. This approach aimed to systematically collect and analyse data to establish empirical connections between the variables of interest. The study utilised a research questionnaire as the primary data collection tool, allowing for the acquisition of relevant insights directly from the participants.

#### *3.2 Sample selection*

The participants in this study were selected using a purposive sampling technique. This deliberate sampling method was chosen to ensure that the selected participants possessed relevant experience and knowledge related to intrapreneurship and innovative performance within technology firms. By targeting individuals with expertise in the subject matter, the study aimed to obtain valuable and insightful responses.

### *3.3 Data collection*

The study was conducted in 2023 with the participation of 204 employees working in technology companies in Tunisia. To collect primary data, a specifically developed research questionnaire was used as the main data collection tool. The research questionnaire was carefully designed to capture a wide range of intrapreneurial behaviours and their potential impact on innovative performance within the companies studied. The questions were designed to provide a detailed understanding of how specific behaviours contribute to companies' overall innovative performance. The questionnaire included specific questions designed to assess employee behaviour in terms of initiative, creativity, risk-taking and contribution to organisational innovation. For example, questions were asked about the frequency with which employees propose new ideas, their ability to identify opportunities for improvement, their involvement in innovative projects, and their perception of the impact of their actions on the company's overall success.

### *3.4 Research instrument technique*

To establish a deep understanding of the intricate connections between independent (intrapreneurial behaviours) and dependent (innovative performance) variables, this study employed an in-depth survey instrument technique. Through this technique, participants were encouraged to provide comprehensive responses, offering insights into the various aspects of intrapreneurial behaviours and their potential influence on innovative outcomes.

### *3.5 Data analysis*

The collected data was analysed using statistical techniques to determine the relationships and patterns within the dataset. Specifically, this study employed linear regression analysis to address the core research question, which is focused on the impact of intrapreneurial behaviours on the innovative performance of technology enterprises. The linear regression analysis helped quantify the strength and direction of the relationships between the variables of interest (Smith et al., 2020).

In addition, the analysis of variance (ANOVA) technique was utilised to explore any potential variations or differences in innovative performance based on different sets of intrapreneurial behaviours. ANOVA provides a way to compare means across multiple groups, allowing for a more comprehensive understanding of the impact of specific behaviours on innovative outcomes (Johnson et al., 2022).

### *3.6 Data analysis software*

The statistical analysis was performed using SPSS 26, a widely recognised software tool for statistical analysis. SPSS facilitated the regression analysis, enabling the calculation of coefficients, significance levels, and goodness-of-fit measures that help validate the research findings. Additionally, ANOVA was conducted to explore potential variations in innovative performance among different groups based on varying levels of intrapreneurial behaviours (Brown et al., 2018).

By employing a combination of linear regression and ANOVA techniques, this study aimed to provide a robust and well-rounded analysis relationships between intrapreneurial behaviours and innovative performance within technology businesses of the in Tunisia.

## 4 Research results

### 4.1 Purification of measurement items of innovativeness

On a scale of innovativeness we based the formulation of each of the five components of the Innovativeness Scale on the authors listed in our review of the literature (Alpkan et al., 2010; Ursachi et al., 2015; Neessen et al., 2019b). The component analysis conducted on the data demonstrates that these items are factorisable (KMO = 0.674 and Bartlett significant  $p < 0.000$ ), emphasises that innovativeness is a one dimensional factor, and finds that the five selected items collectively account for 79.16% of the construct's variance. Finally, the reliability coefficient is good with a Cronbach's alpha of 0.724. All of these results are shown in Table 1.

**Table 1** Results of purification of measurement items of innovativeness

<i>Items</i>	<i>Representation of quality</i>	<i>Factoring contributions</i>	<i><math>\alpha</math> without item</i>	<i><math>\alpha</math> from the scale</i>
Innov1	0.767	0.834	0.704	
Innov2	0.723	0.778	0.636	0.724
Innov3	0.749	0.764	0.842	
Innov4	0.736	0.837	0.854	
Innov5	0.714	0.756	0.669	
Value of the primary component		2.175		KMO = 0.674
Test de Bartlett		Significant		$p = 0.000$
Variation explained		79.16%		$N = 304$

### 4.2 Purification of measurement items of proactiveness

Length of the Proactiveness Scale We based the formulation of each of the five components of the Proactiveness Scale on the authors included in our literature review (Alpkan et al., 2010; Neessen et al., 2019b). These items are factorisable, according to the exploratory factor analysis done on the data (KMO = 0.651 and Bartlett significant  $p = 0.000$ ). Retained structure accounts for 72.20% of idea variation. The scale's reliability may also be seen to be rather good given that Cronbach's alpha is 0.825. These findings in Table 2 are supported by the factor analysis exploratory conducted on the collected data.

**Table 2** Results of purification of measurement items of proactiveness

<i>Items</i>	<i>Representation of quality</i>	<i>Factoring contributions</i>	<i>α without item</i>	<i>α from the scale</i>
Proa 1	0.862	0.874	0.724	0.825
Proa 2	0.821	0.797	0.734	
Proa 3	0.789	0.864	0.742	
Proa 4	0.765	0.838	0.757	
Proa 5	0.794	0.856	0.862	
Value of the primary component		2.256		KMO = 0.651
Test de Bartlett		Sig		<i>p</i> = 0.000
Variation explained		72.20%		<i>N</i> = 304

*4.3 Purification of measurement items of risk taking*

Leverage of Risk Taking Scale We based the formulation of each of the seven components of the risk taking scale on the authors listed in our literature review (Alpkan et al., 2010; Neessen et al., 2019). The results of the tests show that the data may be factored (KMO = 0.641 and Bartlett significant *p* = 0.000). 76.87% of the variation of the chosen items is explained by the factor analysis. With a Cronbach’s alpha of 0.828, the reliability coefficient is good. Table 3 provides examples of all these results.

**Table 3** Results of purification of measurement items of risk taking

<i>Items</i>	<i>Representation of quality</i>	<i>Factoring contributions</i>	<i>α without item</i>	<i>α from the scale</i>
Ris T 1	0.852	0.823	0.787	0.828
Ris T2	0.824	0.902	0.850	
RisT3	0.778	0.762	0.902	
Ris T 4	0.705	0.864	0.767	
Ris T5	0.764	0.812	0.888	
Ris T6	0.973	0.854	0.837	
Ris T7	0.877	0.697	0.778	
Value of the primary component		2.276		KMO = 0.641
Test de Bartlett		Sig		<i>p</i> = 0.000
Variation explained		76.87%		<i>N</i> = 304

*4.4 Purification of measurement items of the opportunity recognition and exploitation*

We based the formulation of each of the nine components of the opportunity recognition and exploitation scale on the authors identified in our literature review (Kuckertz et al., 2017). The exploratory factor analysis performed on the data demonstrates that these questions are factorisable (KMO = 0.666 and Bartlett significant *p* = 0.000), emphasises

that opportunity recognition and exploitation are indeed a single factor, and concludes that overall, retained components account for 74.24% of the construction variation. Finally, the reliability coefficient is good with a Cronbach's alpha of 0.872. Table 4 provides illustrations of all of these findings.

**Table 4** Results of purification of measurement items of opportunity recognition and exploitation

<i>Items</i>	<i>Representation of quality</i>	<i>Factoring contributions</i>	<i><math>\alpha</math> without item</i>	<i><math>\alpha</math> from the scale</i>
Opp 1	0.812	0.893	0.767	0.872
Opp 2	0.864	0.812	0.876	
Opp 3	0.723	0.823	0.908	
Opp 4	0.787	0.801	0.737	
Opp 5	0.707	0.767	0.898	
Opp 6	0.913	0.725	0.800	
Opp 7	0.837	0.745	0.745	
Opp 8	0.634	0.934	0.823	
Opp 9	0.719	0.807	0.817	
Value of the primary component		2.431		KMO = 0.666
Test de Bartlett		Sig		$p = 0.000$
Variation explained		74.24%		$N = 304$

#### 4.5 Purification of measurement items of the employees characteristics

We based the formulation of each of the eight questions on the Employees Characteristics Scale on the authors listed in our literature review (Augusto Felício et al., 2012).

The results of the exploratory factor analysis performed on the tests show that the data are factorisable (KMO = 0.664 and Bartlett significant  $p = 0.000$ ). There is one dimension that may account for 83.1% of the concept's volatility. The value taken by the coefficient alpha, which is shown in Table 5 to be 0.839, suggests that the investment scale's reliability may also be considered to be satisfactory.

#### 4.6 Purification of measurement items of networking

We based the formulation of each of the seven components of the networking scale on the authors identified in our review of the literature (Augusto Felício et al., 2012).

The data's factorially exploratory analysis demonstrates that these items are factorisable (KMO = 0.636 and Bartlett significant  $p = 0.000$ ), emphasises that networking is a one-dimensional factor, and finds that the total variance of the selected seven items is 83.17%. Finally, the reliability coefficient is good with a Cronbach's alpha of 0.858. Table 6 provides illustrations of all of these findings.

**Table 5** Results of purification of measurement items of employees characteristics

<i>Items</i>	<i>Representation of quality</i>	<i>Factoring contributions</i>	<i>α without item</i>	<i>α from the scale</i>
EMP1	0.887	0.783	0.876	0.839
EMP2	0.874	0.921	0.808	
EMP3	0.713	0.732	0.708	
EMP4	0.765	0.843	0.837	
EMP5	0.787	0.867	0.798	
EMP6	0.876	0.756	0.867	
EMP7	0.737	0.815	0.723	
EMP8	0.724	0.821	0.793	
Value of the primary component		2.663		KMO = 0.664
Test de Bartlett		Sig		<i>p</i> = 0.000
Variation explained		83.10%		<i>N</i> = 304

**Table 6** Results of purification of measurement items of networking

<i>Items</i>	<i>Representation of quality</i>	<i>Factoring contributions</i>	<i>α without item</i>	<i>α from the scale</i>
NETW1	0.787	0.638	0.779	0.858
NETW2	0.774	0.869	0.758	
NETW3	0.813	0.864	0.828	
NETW4	0.965	0.756	0.847	
NETW5	0.887	0.723	0.869	
NETW6	0.776	0.834	0.767	
NETW7	0.837	0.845	0.777	
Value of the primary component		2.533		KMO = 0.636
Test de Bartlett		Sig		<i>p</i> = 0.000
Variation explained		83.17%		<i>N</i> = 304

*4.7 Purification of measurement items of innovative performance*

We based the formulation of each of the five components of the Innovative Performance Scale on the authors identified in our literature review (Alpkan et al., 2010)

The factor analysis conducted on the data demonstrates that these items are factorisable (KMO = 0.666 and Bartlett significant *p* = 0.000), emphasises that Innovative Performance is a one-dimensional factor, and finds that the five selected items collectively account for 72.27% of the construct’s variance. Finally, the reliability coefficient is good with a Cronbach’s alpha of 0.818. Table 7 provides illustrations of all of these findings.

**Table 7** Results of purification of measurement items of innovative performance

<i>Items</i>	<i>Representation of quality</i>	<i>Factoring contributions</i>	<i>α without item</i>	<i>α from the scale</i>
INNP1	0.699	0.628	0.769	0.818
INNP2	0.774	0.779	0.848	
INNP3	0.943	0.874	0.868	
INNP4	0.865	0.726	0.827	
INNP5	0.787	0.743	0.879	
Value of the primary component		2.244		KMO = 0.666
Test de Bartlett		Sig		<i>p</i> = 0.000
Variation explained		72.27%		<i>N</i> = 304

4.8 *The model’s adjustment metrics*

The subject of a factorially independent confirmatory factor analysis cannot be the monthly scales of each indicator. The purpose of a structural analysis is to clarify the many causal relationships between the various constructs. We study all the tools together to construct a model that we may use to name the intrapreneurial behaviours factors. This allows us to assess the reliability and validity. We conduct a confirmatory factor analysis by combining the measurements of the several variables that make up our research model. A confirmatory factor analysis is performed on the data to verify the structure of our model. Table 8 lists the model’s adjustment metrics.

**Table 8** Model’s adjustment metrics

	$\chi^2$	<i>ddl</i>	$Ddl/\chi^2$	<i>AIC</i>	<i>RMSEA</i>	<i>SRMR</i>	<i>NFI</i>	<i>NNFI</i>	<i>CFI</i>	<i>GFI</i>	<i>AFI</i>
M0	1767.96	20	88.39	1727.96							
M1	18.4	8	2.3	1.71	0.059 [0.08 0.0.107]	0.015	0.99	0.98	0.99	0.98	0.94

These various indices’ values are accurate and adhere to the restrictive criteria. This enables us to draw the conclusion that the collected data fits the proposed theoretical model well.

Table 9 shows the findings of the confirmatory factor analysis and the scale of measurement validity test for our model.

The constructor’s reliability is satisfactory as each dimension’s *ρvc* and *R* are more than 0.7 and 0.6, respectively. This means that all indicators are related to the latent variables they represent. The model’s scale of measurement is valid since the *Rh*’s of Validity (*ρvc*) for each dimension are greater than the square of the latent variable correlations.

**Table 9** Confirmatory factor analysis

<i>Items</i>	<i>Innovativeness</i>	<i>Proactiveness</i>	<i>Risk taking</i>	<i>Opportunity recognition and exploitation</i>	<i>Employees characteristics</i>	<i>Networking</i>	<i>Innovative performance</i>	<i>R<sup>2</sup></i>
Innov1	0.876							0.734
Innov2	0.765							0.763
Innov3	0.852							0.723
Innov4	0.789							0.709
Innov5	0.864							0.737
Proa 1		0.736						0.743
Proa 2		0.776						0.745
Proa 3		0.841						0.823
Proa 4		0.832						0.809
Proa 5		0.814						0.737
Ris T 1			0.799					0.643
Ris T2			0.763					0.876
RisT3			0.823					0.736
Ris T 4			0.809					0.712
Ris T5			0.837					0.814
Ris T6			0.843					0.696
RisT7			0.745					0.761
Opp 1				0.788				0.732
Opp 2				0.756				0.814
Opp 3				0.843				0.706
Opp 4				0.854				0.741
Opp 5				0.824				0.776
Opp 6				0.747				0.761
Opp 7				0.841				0.782
Opp 8				0.737				0.703
Opp 9				0.785				0.845
EMP1					0.778			0.686
EMP2					0.853			0.760
EMP3					0.822			0.748
EMP4					0.898			0.726
EMP5					0.807			0.803
EMP6					0.864			0.751
EMP7					0.783			0.724
EMP8					0.757			0.727
NETW1						0.876		0.748
NETW2						0.861		0.787

**Table 9** Confirmatory factor analysis (continued)

<i>Items</i>	<i>Innovativeness</i>	<i>Proactiveness</i>	<i>Risk taking</i>	<i>Opportunity recognition and exploitation</i>	<i>Employees characteristics</i>	<i>Networking</i>	<i>Innovative performance</i>	<i>R<sup>2</sup></i>
NETW3						0.882		0.745
NETW4						0.803		0.708
NETW5						0.745		0.718
NETW6						0.876		0.736
NETW7						0.780		0.713
INNP1							0.805	0.754
INNP2							0.851	0.784
INNP3							0.782	0.747
INNP4							0.703	0.741
INNP5							0.845	0.717
pvc	0.76	0.69	0.81	0.84	0.68	0.78	0.79	

**Table 10** Psychometric properties

	<i>Innovativeness</i>	<i>Proactiveness</i>	<i>Risk taking</i>	<i>Opportunity recognition and exploitation</i>	<i>Employees characteristics</i>	<i>Networking</i>	<i>Innovative performance</i>
<b>Innovativeness</b>	<b>0.76</b>						
<b>Proactiveness</b>	0.46	<b>0.69</b>					
<b>Risk taking</b>	0.36	0.26	<b>0.81</b>				
<b>Opportunity recognition and exploitation</b>	0.25	0.06	0.23	<b>0.84</b>			
<b>Employees characteristics</b>	0.13	0.05	0.22	0.42	<b>0.88</b>		
<b>Networking</b>	0.12	0.03	0.16	0.36	0.52	<b>0.78</b>	
<b>Innovative performance</b>	0.07	0.02	0.07	0.29	0.26	0.66	<b>0.79</b>

It appears that the measurement of the variables is accurate and reliable. In fact, the instrument-specific reliability coefficients exceed the generally accepted thresholds. Moreover, confirmatory factor analysis demonstrates that the indicators are well-defined measurements. As a result, the variable measurement may be kept for further analysis. Finally, the factor measurement scale has good psychometric properties (Table 10).

#### 4.9 The evaluation of the predecessors' hypotheses

We propose using linear regressions to investigate the relationships between the variable to explain, the inventive performance, and a set of explanatory factors. The purpose of

this method is to make it possible to assess the strength of the correlation between each independent variable and the dependent variable using a mathematical model. The test of links between previous innovation from employees and inventive performance. It is important to determine whether there is indeed a significant connection between employee innovativeness and creative performance. The results of the regression are used to corroborate or refute this link. This link is confirmed or disproved using the regression analysis's findings. The regression analysis's findings show that the relationship is significant and positive ( $F(1,80) = 8.519, p = 0.000$ ), with an explained variance of 9.7%. This means that employees who are inventive have a good impact on innovative performance (Table 11).

**Table 11** The correlation between innovative performance and innovativeness employee

<i>Dependent variable</i>	<i>R</i>	<i>R deux</i>	<i>F</i>	<i>ddl</i>	<i>Sig</i>
Innovative performance	0.312 <sup>a</sup>	0.097	8.516	1.80	0.005

<sup>a</sup>Values anticipated: (constantes), innovativeness employee.

The results of the regression analysis ( $R = 0.312, t = 2.918$ ) and, in particular, a significance level of 0.005 show that there is a strong positive correlation between staff innovation and inventive performance (Table 12).

**Table 12** Coefficients regression innovative performance and innovativeness employee

<i>Model</i>	<i>Coefficients not standard</i>		<i>Coefficients standard</i>		<i>Sig</i>
	<i>A</i>	<i>Erreur standard</i>	<i>Bêta</i>	<i>t</i>	
(constant), innovativeness employee	2.712	0.392		6.922	0.000
	0.286	0.098	0.312	2.918	0.005

<sup>a</sup>Dependant variable: innovative performance.

It is important to determine whether there is in fact a significant connection between employee proactivity and creative performance. The results of the regression are used to corroborate or refute this link. The regression analysis's findings show that the relationship is significant and positive ( $F(1,80) = 6.869, p = 0.011$ ) with an 8% explained variance. This means that proactive employees have a favourable impact on inventive performance (Table 13).

**Table 13** The correlation between innovative performance and proactiveness employee

<i>Dependent variable</i>	<i>R</i>	<i>R 2</i>	<i>F</i>	<i>ddl</i>	<i>Sig</i>
Innovative performance	283 <sup>a</sup>	0.080	6.869	1.80	0.011

<sup>a</sup>Values anticipated: (constantes), proactiveness employee.

The results of the regression analysis ( $r = 0.283$ ,  $t = 2.621$ ) and, in particular, a significivity of 0.011 show that there is a strong positive correlation between employee proactiveness and inventive performance (Table 14).

**Table 14** Regression coefficients for creative performance on employee proactivity

Model	Coefficients not standard		Coefficients standard		Sig
	A	Erreur standard	Bêta	t	
(constantes), proactiveness employee	2.971 0.279	0.338 0.106		8.794 2.621	0.000 0.011

<sup>a</sup>Dependent variable: innovative performance.

Checking whether there is a real connection between an employee's willingness to take risks and their inventive performance. The results of the regression and the significance of the regression coefficient are used to corroborate or refute this link. The results of the regression show that the relationship is significant and positive ( $F(1.80) = 6.787$ ,  $p = 0.085$ ). This means that an employee's willingness to take risks has a favourable impact on their ability to innovate. The Fisher test's probability  $p$  ( $p, 0.015$ ) is sufficiently reduced to support the hypothesis that the explanation variable and the explanation variable are related (Table 15).

**Table 15** The correlation between innovative performance and willingness to take risks employee

Dependent variable	R	R <sup>2</sup>	F	ddl	Sig
Innovative performance	273 <sup>a</sup>	0.070	6.787	1.80	0.015

<sup>a</sup>Values anticipated: (constantes willingness to take risks employee).

The results of the regression coefficients and, in particular, a significance level below .050 show that the relationship between employee risk-taking behaviour and inventive performance is favourable for the sample of employees. Also, the positive sign of the regression coefficient ( $= 0.273$ ) indicates that the positive relationship between the dependent and independent variables has been accepted (Table 16).

**Table 16** Regression coefficients for creative performance on willingness to take risks employee

Model	Coefficients not standard		Coefficients standard		Sig
	A	Erreur standard	Bêta	t	
(constants), willingness to take risks employee	2.871 0.269	0.334 0.108		8.694 2.621	0.000 0.015

<sup>a</sup>Variable dependant: innovative performance.

It is important to determine whether there is in fact a significant direct correlation between networking staff performance and creative output. The results of the regression are used to corroborate or refute this link. The regression analysis's findings show that the relationship is significant and positive ( $F(1.80) = 13.970$ ,  $p = 0.000$ ), with an explained variation of 15%. This indicates that networking personnel have a beneficial impact on creative output (Table 17).

**Table 17** Regression results on employee networking performance and inventive performance

<i>Dependent variable</i>	<i>R</i>	<i>R<sup>2</sup></i>	<i>F</i>	<i>ddl</i>	<i>Sig</i>
Innovative performance	273 <sup>a</sup>	0.070	6.787	1.80	0.000

<sup>a</sup>Values anticipated: (constantes networking employee).

The results of the regression analysis ( $r = 0.291$ ,  $t = 2.701$ ) and, in particular, a significance level of 0.013 show that there is a strong positive correlation between networking employee and inventive performance (Table 18).

**Table 18** Regression coefficients on the employee's networking performance

<i>Model</i>	<i>Coefficients not standard</i>		<i>Coefficients standard</i>		<i>Sig</i>
	<i>A</i>	<i>Erreur standard</i>	<i>Bêta</i>	<i>t</i>	
(constantes), networking employee	2.771	0.336	0.291	2.701	0.000
	0.258	0.103			0.013

<sup>a</sup>Dependent variable: innovative performance.

It is important to determine whether there is indeed a connection between employees' ability to see and take advantage of opportunities and their inventive performance. The results of the regression are used to corroborate or refute this link. The regression analysis's findings show that the relationship is significant and positive ( $F(1.80) = 6.679$ ,  $p = 0.010$ ) with an 18% explained variance. This indicates that employee opportunity recognition and exploitation has a beneficial impact on inventive performance (Table 19).

**Table 19** Regression results on opportunity recognition and exploitation employee and inventive performance

<i>Dependent variable</i>	<i>R</i>	<i>R<sup>2</sup></i>	<i>F</i>	<i>ddl</i>	<i>Sig</i>
Innovative performance	223 <sup>a</sup>	0.080	6.679	1.80	0.010

<sup>a</sup>Valeurs prédites: (constantes opportunity recognition and exploitation employee).

The regression analysis's results ( $r = 0.241$ ,  $t = 2.861$ ) and, in particular, a significivity of 0.017, show that there is a strong positive correlation between employees' ability to see and take advantage of opportunities and their performance in terms of innovation (Table 20).

**Table 20** Coefficients regression innovative performance on opportunity recognition and exploitation employee

Model	Coefficients not standard		Coefficients standard		Sig
	A	Erreur standard	Bêta	t	
(constants), opportunity recognition and exploitation employee	2.756	0.324		8.387	0.000
	0.252	0.101	0.241	2.861	0.017

<sup>a</sup>Variable dependent: innovative performance.

The linear regression analysis results will display three tables: Model Summary, ANOVA, and Coefficients. To see if Employees Characteristics has any effect on the relationship between intrapreneurial behaviours employee and *innovative performance*. First the R Square is **0.542** meaning that the independent variable explains 54% of the variation in the dependent variable (Table 21).

**Table 21** Model summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.736 <sup>a</sup>	0.542	0.501	1.30123

<sup>a</sup>Predictors: (constant).

The one-way ANOVA examines the means of the groups in question and evaluates whether any of them are statistically significantly different from one another. In this case, the one-way ANOVA shows significance (Sig. = **0.000**) (Table 22).

**Table 22** ANOVA

Model	Sum of squares	df	Mean square	F	Sig
Regression	44.321	4	22.807	16.765	0.000
Residual	38.432	23	1.657		
Total	82.753	27			

The resultat shows that there is a strong causal effect between the independent variable *Relationship* and the dependent variable *innovative performance* (P-value = **0.000**). Since the P-value is P-value  $\leq$  **0.05**, the relationship between intrapreneurial behaviours employee and *innovative performance* variables is significant (Table 23).

The resultat shows that that the moderator variable Employees Characteristics has an effect on the relationship between independent variable intrapreneurial behaviours and dependent variable *innovative performance*.

**Table 23** Regression coefficients in moderation analysis SPSS

	$\beta$	<i>Coefficients non standardisés</i>	<i>Coefficients standardisés <math>\beta</math></i>	<i>t</i>	<i>Sig</i>
Constant	11.564	0.852	0.516		
Innovativeness	0.633	0.753	0.403	2.456	0.014
Risk-taking	0.558	0.786	0.607	3.376	0.079
Proactiveness	0.653	0.820	0.521	2.345	0.005
Networking	0.664	0.829	0.528	1.946	0.020
Opportunity recognition and exploitation	0.423	0.867	0.576	2.436	0.004

## 5 Discussion

The results of this study underscore the importance of employee attributes as moderators in the relationship between employee intrapreneurial behaviours and organisational innovation performance. Employee attributes act as mediators in the relationship between the intra-entrepreneurial activities of employees and the performance of organisational innovation. These findings are consistent with other studies that suggest that employees who exhibit strong intrapreneurial behaviour within a company can contribute to improved innovation performance, including the creation of new products or services. Businesses with employees recruited through an intrapreneurship program have a better chance of success than those without employees, as innovation performance is weak for businesses with fewer employees. The ability to generate innovative ideas strengthens a company's ability to seize opportunities and gain competitive advantages. These findings are consistent with findings from previous studies (Hung et al., 2015; Neessen et al., 2019b). To foster growth in Tunisia's tech-based business sector, researchers should target the reasons for negative public perceptions associated with risk-taking and expand the concept of risk-taking. These findings support Almasri and Ahmad's study (2020), which demonstrated that encouraging employees to take calculated risks is key to boosting creativity. The results of this research are consistent with previous studies (Khan et al., 2022; Seborá and Theerapatvong, 2010), which have indicated that proactivity is defined as having a futuristic vision and exploring opportunities by studying current trends and anticipating future market demands. It is important to encourage proactive employees to change their behaviour and communicate more. This illustrates the relationship between the results of studies and how entrepreneurs motivate each other in the workplace. However, it also highlights how some workers have values that push them to take advantage of opportunities before others. The downside is that there are no vacancies for employees, indicating a lack of job opportunities and a lack of appreciation for the skills of employees that help them progress. The results of the study are therefore consistent with the predictions. The results of this study are consistent with previous research showing that employee networks can impact their participation and involvement in the company's strategic process (Khan et al., 2022). By combining references, familiarity and networks, communicating with others allows employees to explain strategic innovation opportunities more effectively. Finally, this conclusion is in line with previous findings that, in order to develop a new innovation, whether it is a new product,

method or organisation, an individual must be able to identify opportunities and use the tools and knowledge at their disposal to take advantage of them (Baczynska et al., 2016; Urbano and Turro, 2013).

## 6 Conclusions, future perspectives and limitations

In conclusion, this study examined the association between innovative performance and intrapreneurial behaviours within Tunisian technology companies, as well as the moderating impact of certain employee characteristics. The five attributes identified – innovation capacity, risk-taking, proactivity, networking, and the ability to identify and seize opportunities – explain intrapreneurial behaviours. The results indicate that a company's performance is positively influenced by the four attributes of intrapreneurial activities. As a result, performance improves and work practices are optimised when a company has innovators who are willing to take risks. Encouraging proactive employees to change their behaviour and communicate more is essential, as it improves their contribution to the company's strategy. Moreover, the ability to identify and exploit opportunities is closely linked to intrapreneurial practices. The implications of this study for existing literature in the field are substantial. By examining how intrapreneurial behaviours of employees influence the innovation performance of technology companies, this study helps to understand the key factors shaping success in this sector. The results highlight the need to foster an organisational culture conducive to intrapreneurship and innovation, as well as to promote specific attributes among employees in order to maximise their positive impact on performance. While this study provided important information, there are promising avenues for further research to improve our understanding. Longitudinal studies to examine how employee intrapreneurial behaviours and related attributes change over time, and how these changes influence the sustained performance of technology companies, would be beneficial. In addition, it would be useful to examine how individual attributes of leaders and their interaction with employees can shape intrapreneurial behaviour and performance. Finally, an in-depth investigation into perceived barriers to intrapreneurship among Tunisian tech companies could offer practical recommendations to foster an environment conducive to innovation and growth. Moreover, this study represents a crucial first step in understanding the impact of intrapreneurial behaviours on innovative performance within technologies companies. The findings highlighted the critical role of employee attributes, laying the groundwork for future research and its practical implications.

**Future lines of research:** In this regard, we recommend longitudinal studies to examine the evolution of employees' intrapreneurial behaviours over time and their ongoing impact on the performance of technology firms. Another promising research direction could be to explore the role of leadership attributes and their interaction with employees in shaping intrapreneurial behaviour and performance. In addition, it would be beneficial to conduct an in-depth investigation into the perceived barriers to intrapreneurship within Tunisian technology companies, in order to offer practical recommendations for fostering an environment conducive to innovation and growth.

**Limitations:** It is important to recognise that the sample size limited to Tunisian technology firms may restrict the generalisability of the results to a wider context. Future research could consider more diverse samples to improve external validity. Furthermore,

the use of self-reported data could introduce a potential bias in the results, and it would be wise for future studies to adopt mixed approaches or objective measures to mitigate this limitation. Furthermore, this study focuses primarily on associations, and to establish causal relationships, future research could consider experimental or quasi-experimental designs. Finally, the time frame of the study may not adequately capture long-term effects. Future studies with extended observation periods could offer a deeper understanding of the lasting impact of intrapreneurial behaviour.

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