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Driving innovation in the third millennium: A measurement tool for assessing innovative leader

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ABSTRACT. La leadership è essenziale per promuovere l'innovazione e la creatività all'interno delle organizzazioni di oggi, in continua evoluzione. Pertanto, la necessità di leader in grado di guidare l'organizzazione verso l'innovazione è divenuta fondamentale. Nato da questa esigenza, l'*Innovative Leader Test (ILT)* è stato progettato per misurare le caratteristiche personali e le competenze distintive che determinano il comportamento innovativo del leader. Viene presentato lo studio di validazione del test, condotto su un campione di 660 manager di organizzazioni private e pubbliche italiane. Le analisi fattoriali esplorativa e confermativa hanno evidenziato un modello a 7 fattori. Sono state inoltre testate la validità concorrente e predittiva del ILT che si è rivelato un nuovo strumento valido e affidabile per valutare le dimensioni chiave del leader innovativo.

SUMMARY. Leadership is essential in building and fostering innovation and creativity within today's ever-changing organizations. Thus, the need for innovative leaders capable of driving innovation and innovative behaviour has become paramount. The study presents a new self-report tool, namely the Innovative Leader Test (ILT) that consists of 28 items and is aimed to measure the core set of characteristics and competencies that are distinctive in determining leader's both innovative behavior and capacity to lead organization toward innovation. To assess the factorial validity of the seven ILT scales covering personal traits (Openness to change), capabilities (Anticipation, Self-reflection and Self-regulation) and competencies (Problem solving, Knowledge sharing and Change involvement), an exploratory factor analysis, reliability analyses and confirmatory factor analyses were performed (N = 660). Alpha values and confirmatory factor analysis provided good reliability of the scales and model fit indices (CFI = .96, SRMR = .04) for the seven factors structure. Concurrent validity was examined by analyzing the relationships between ILT dimensions, transformational leadership, and work engagement and found positive significant correlations. Finally, the extent to which ILT factors predict specific innovation outcomes, namely innovative work behavior and reputation as an innovator, was demonstrated through correlation and regression analyses. Overall, results indicate that the Innovative Leader Test is a valid and reliably self-report measures assessing the key dimensions of innovative leader. Both theoretical and practical implications are discussed, as well as limitations and indications for future research.

Keywords: *Innovative leader, Agentic capabilities, Innovative work behavior, Innovative leadership assessment, Innovative leadership skills*

INTRODUCTION

The theme of innovation is nothing new for the survival and development of organizations nowadays. In the current era of continuous technological and business change, the main resource for competitiveness is based on innovation. Work has become more knowledge-based and less rigidly defined, performed in a complex and constantly changing environment. Given the importance of innovation for the success and survival of most organizations, understanding the skills and attributes required to achieve success in change and innovation management is crucial. In this framework, leadership is regarded by some scholars as one of the most influential predictors of innovation within organizational contexts (Mumford, Scott, Gaddis & Strange, 2002; Yukl, 2009).

For decades, most studies on innovation management focused on employees in the belief that one way for organizations to become more innovative is to capitalize on their employees' ability to be innovative (de Jong & Den Hartog, 2007). Several other studies focused their attention on contextual factors that impact employees' work environment, showing that leadership is one of the most critical factors when it comes to achieving individual and organizational innovation (Engelen, Schmidt, Strenger & Brettel, 2014). The most recent literature in the field considers the role of leadership as crucial in building the process, structures and in promoting innovation and creativity within organizations (Chan, Liu & Fellows, 2014; Wipulanusat, Panuwatwanich & Stewart, 2017). While much has been written about the attributes of effective leadership for innovation (i.e., Yukl, 2009), limited literature is available regarding the specific attributes of successful innovation leaders, so the core questions about characteristics and behaviors of innovative leader which foster individual innovation still remain widely under-explored (de Jong & Den Hartog, 2007; Eisele, 2017).

The need for leaders capable of promoting and governing change in organizations is so relevant that it has been acknowledged, among others, in the outlined principles of the recent international standard ISO 56002 (2019) on *Organizational Innovation Management,* which mentions the need for future-oriented leaders. Hence, to contribute to the definition of an innovative and future-oriented leader, our research aims to identify the leader's core competencies and characteristics required to achieve innovation.

Thus, the *Innovative Leader Test (ILT)* was purposely designed to address this gap, to achieve the definition of a core set of leader's characteristics and competencies that are distinctive in determining his/her innovative behavior and, consequently, his/her ability to lead employees and organization toward innovation. ILT is a self-report test grounded on an integrated configuration of traits, competencies, and capabilities and seven dimensions, as described below. Accordingly, the objective of the study is threefold: (1) to introduce the instrument, its construction and psychometric properties; (2) to assess concurrent validity by exploring the relationship between innovative leader factors and other competing measures; (3) to verify ILT relationship with innovative behaviors by exploring relationship between its factors and several organizational outcomes.

The theoretical background of innovation leadership

In most research studies, the terms innovation and creativity are often used interchangeably so that several research focus mainly on the creative or idea generation stage of innovation (McAdam & McClelland, 2002; Mumford, 2000). However, unlike creativity, innovation also includes the implementation of ideas (Janssen, 2000; Scott & Bruce, 1994) and, according to West and Farr, is "the intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization or wider society" (West & Farr, 1990, p. 9). Therefore, to identify the determinants of innovative leader's behavior, it is not enough to reason in terms of leaders' creativity, but attention must be paid on the individual characteristics that enable them to promote and to implement what has been devised.

Most studies on organizational innovation have attempted to link leadership style to organizational innovation (i.e., Zacher, Robinson & Rosing, 2016). Transformational leadership (TFL) has frequently been showed as a determinant of organizational innovation in a number of studies (i.e., Sethibe, 2018). Transformational leaders, as change agents, are expected to inspire and intellectually stimulate their followers. By acting as a model for subordinates, communicating the vision (inspirational motivation), providing and eliciting new challenging ideas to stimulate rethinking old ways of doing things (intellectual

stimulation), transformational leaders may activate the followers' creativity potential (Avolio, 1994; Bass & Riggio, 2006). Likewise, also charismatic leadership (Chang, 2018) as well as participative and supportive leaders have been found to enhance creativity and innovation (Tung & Yu, 2016). Thus, the literature review shows not only that transformational leadership as the widely studied leadership style associated with innovation, but also the multiplicity of approaches to the study of innovation leadership. In a recent systematic literature and content analysis review, Fuad and colleagues (Fuad, Musa, Yusof & Hashim, 2022) found that 44% of studies on innovation leadership consisted of multiple leadership skills, while 36% used transformational leadership.

As described above, innovation leadership has to keep up with the complexity and speed of innovation (Rosing, Frese & Bausch, 2011). Furthermore, the plurality of approaches to the study of innovation leadership makes its unambiguous operationalization complex, as well as the identification of the underlying dimensions. Considering that different leadership styles are required at different levels and innovation processes (Haapaniemi, 2017), to drive innovation more effectively a mix of cross-cutting leadership competencies becomes more useful than a single style (Fuad et al., 2022; Rosing et al., 2011). This challenge oriented our research towards defining a heterogeneous core profile of characteristics, competencies and capabilities of the innovative leader with the ultimate goal of providing a tool to measures them.

The innovation leadership scales in the literature

The relevance of leaders capable of driving change, together with the complexity of achieving an unambiguous measure of innovation leadership, make a direct measurement of leadership for innovation necessary (Eisele, 2017). The existing literature on innovation leadership reflects a high heterogeneity and plenty of overlap regarding the leadership competencies that facilitate innovation in organizational contexts (Fuad et al., 2022). Previous studies, using well-established leadership approaches, have produced a considerable collection of measures of leadership for innovation. De Jong and Den Hartog (2007) developed an inventory of leader behaviors that are likely to enhance employees' innovative actions, based on thirteen related leadership attitudes. The *Leadership for Innovation Scale* (Eisele, 2017) is a hetero-rating scale that focuses on how employees rate their leaders on innovation-related behaviors, while Vincent-Höper and Stein (2019) validated *Leader Support for Innovation Questionnaire (LSIQ)*, a measure of specific leadership behaviors that support employees' innovation activities. To develop their *Principal Innovation Leadership Scale*, Fuad and colleagues (2022) conducted a systematic literature review to identify the key leadership styles that will support innovation in the educational Malaysian context. However, measures on innovation leadership generally refer to hetero evaluation of leaders by employees and to the innovation process as a whole, not considering the multidisciplinary nature of leadership to the right extent.

The literature scales' review thus highlighted both different proxies of innovation leadership and the need for a universal reference framework and measurement tools that clearly detect leadership competencies capable of stimulating and facilitating the innovative behaviors.

THE PRESENT STUDY

Development of the Innovative Leader Test scales

In the instrument development and validation process, we considered previous measurement scales in the literature, as well as the main theoretical approaches identified for the study of innovation leadership (de Jong and Den Hartog, 2007; Eisele, 2017; Fuad et al., 2022; Yukl, 2009). For the purposes of the implementation of the *Innovative Leader Test*, we posited innovative leaders' characteristics as the set of traits, competencies and capabilities that predispose leader to innovative behaviors and actions towards the organization, which are considered functional in facilitating the innovative behaviors of his/her co-workers at various stages of the innovation process.

After literature review, the ILT was developed through the following steps: i) determination of the constructs that enable innovative leader in the examined context; ii) comparison with literature and integration of dimensions; iii) generation of items and construction of the instrument.

First, a series of three different focus groups of leaders considered as key innovators by their respective organizations

was conducted. Following the critical incident technique method (CIT, Flanagan, 1954), the key competencies and effective behaviors that enable leaders to address innovation and organizational change in their respective organizations were identified. Secondly, the results of the focus groups were analyzed by comparing them to the outcomes emerged by a substantial amount of research has produced on a wide range of individual-level factors considered to be antecedents of innovative behavior: taxonomy and review of leaders' behaviors (i.e., de Jong & Den Hartog, 2007; Yukl, 2002), overview of antecedents of individual innovation (i.e., Moussa, McMurray & Muenjohn, 2018), others innovation leadership scale (Eisele, 2017; Vincent-Höper & Stein, 2019). In addition, the literature explored was enriched by the theoretical framework of social cognition theory (Bandura, 1986) and by the related agentic capabilities (Bandura, 1999; Cenciotti, Borgogni, Consiglio, Fedeli & Alessandri, 2020). According to our idea, the more the innovative leader is capable of managing change and innovation in an agentic manner, the more effective he/she will be in his/her innovative action. Thereby, we have spotted seven dimensions namely: Openness to change, Problem solving, Anticipation, Self-reflection, Self-regulation, Knowledge sharing and Change involvement. Finally, a battery of items was identified by adapting it from the literature and customizing it for the purposes of this study, while Change involvement scale's items were specially generated following the Hinkin's criteria for the development of new scales (Hinkin, 1998). Both the adapted and newly generated items were shown to a panel of three experts in the field of innovation to assess their content validity. Based on the experts' feedback, some items were eliminated or modified and total of 28 items were finalized in this phase. In its main structure ILT presents seven different subscales measuring as many dimensions covering three individual domains of innovative leader, namely personal traits (Openness to change), capabilities (Anticipation, Self-reflection and Self-regulation) and competencies (Problem solving, Knowledge sharing and Change involvement); all ILT dimensions are already available in the literature, with the exception of change involvement.

Openness to change is a construct introduced by Wanberg and Banas (2000), who describe it through a list of variables, from participation in the process of change, to self-efficacy in the belief of the ability to change and the personal impact of change. In our research Openness to change is considered a trait that enables to initiate, manage and respond to change. A leader who is open to change welcomes new information, discards old assumptions and modifies his or her way of working when faced with new situations.

Problem solving appears as an antecedent of individual innovation and an essential ability for change management in a number of studies (Mumford et al., 2002; Scott & Bruce, 1994). Historically, a wide range of researchers have given attention to specific dimensions of cognitive style as antecedents of innovative behavior (e.g., Jabri, 1991; Kirton, 1976). Creative problem-solving has been pointed out as a critical determinant of effective leadership behaviors within innovative teams in several studies (i.e., Basadur, Runco & Vegaxy, 2000; Mumford et al., 2002) recalling how leaders must possess problem solving skills to effectively evaluate creative ideas. In Yukl's (2002) taxonomy of managerial practices Problem solving is defined as identifying work-related problems, analyzing problems in a timely but systematic manner, to identify causes and find solutions, and acting decisively to implement solutions to resolve important problems or crises. Hence, through this competence, the leader provides the necessary advice and support to co-workers regarding how they can adjust and refine their creative ideas to meet the needs of the organization (Desouza, 2011). In our model the innovative leader is a problem solver as he/she is able to recognize problems and act effectively in complex and rapidly changing scenarios.

Anticipation, Self-reflection and Self-regulation capabilities refer to a set of individual capacities, the agentic capabilities (Bandura, 1999), which enable people to motivate themselves, plan and manage their behaviors, develop their knowledge and adapt their actions in order to achieve personal and professional goals (Cenciotti et al., 2020). From an organizational innovation perspective, being able to anticipate provides the leader with an anticipatory view and helps him/her to foresee likely organizational needs and possible obstacles to change management. The Self-reflection capability facilitates leaders' learning through their direct successes and failures, allowing them to gain awareness and reinforcing the most effective behaviors towards innovation. Finally, the Self-regulatory capability enables leaders to lead themselves, regulating their emotional reactions so that they can direct and harness their energetic and emotional resources. Thus, they improve their job performance even under stressful conditions, fostering the achievement of favorable outcomes (such as organizational change or innovation).

The relational aspects of the innovative leader who drives followers towards innovation in our model comes through Knowledge sharing and the ability to involve in change.

Knowledge sharing competence is the way in which the leader, together with co-workers, can contribute to the application of knowledge, innovation and, ultimately, the competitive advantage of the organization where he/she operates. Knowledge sharing has been shown to increase the competitive capabilities of organizations, to retain intellectual capital thereby increasing the productivity (Lin, 2007) and to enhance employee creativity (Dong, Bartol, Zhang & Li, 2017; Lee, 2018). Knowledge sharing among members of the organization is not only about the effective reorganization and transfer of knowledge and information, but becomes an important resource that facilitates individual creativity, the creation of new knowledge and innovative ideas (Cabrera & Cabrera, 2005). Through Knowledge sharing, the innovative leader not only makes it easier for the employees to acquire knowledge and thus express creativity at their best, but also orients them towards a culture of information sharing, so that others can learn from it.

Change involvement competence is a new construct based on participative leadership that clearly emerged from the focus groups. It aims at intercepting the leader's behaviors that involve employees in the promotion and implementation of change to achieve future scenarios. In our research it describes the innovative leader's ability to involve co-workers, not only in envisioning attractive future situations, but also in fostering and carrying out the changes required to achieve such future scenarios. Aware that he/she cannot bring about any effective transformation in a complex environment alone, he/she aims at activating his/her network to have a higher probability of success.

The validation study

The main goal of the present study is to define and validate the factor structure and the content validity of the *Innovative Leader Test (ILT).* Through reviewed literature and focus groups on innovation leadership we consider (1) Openness to change, (2) Problem solving, (3) Anticipation, (4) Self-reflection, (5) Self-regulation, (6) Knowledge sharing and (7) Change involvement as antecedents of the leader's innovative behavior. Hence, we expected that they represent seven different but related latent factors and each item will load on the corresponding factor. To assess concurrent validity, we expected that the constructs underlying innovative leader would be positively related with leadership styles that encourage creativity and stimulate followers to view problems in new ways and with leaders' positive job state of mind, namely transformational leadership (TFL) and work engagement (WE). Transformational leadership (Bass & Riggio, 2006) has widely been studied in the organizational innovation context and, mainly for its intellectual stimulations and inspirational motivation dimensions, it has been found to be positively correlated with innovative employee behaviors and innovation (Avolio, 1994; Bass & Riggio, 2006; Chen, Zheng, Yang & Bai, 2016; Rosing et al., 2011). Work engagement, defined as "a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption" (Bakker & Demerouti, 2008, pp. 209-210; Schaufeli, Salanova, González-Romá & Bakker, 2002), has been found to be an antecedent for employee innovative behavior, whereby highly engaged employees are expected to produce initiatives that will have an impact on innovation (Ariyani & Hidayati, 2018). Furthermore, work engagement has been shown to mediate the relationship between job characteristics and workers' innovation in several studies (e.g., Park, Song, Yoon & Kim, 2013).

Lastly, since innovative leaders are supposed to be motivated towards innovation in their job and acknowledged for this, we expected them to enact innovation-driven behavior and their social reputation at work to be affected by this. Thus, we expect ILT factors to be positively related with specific innovation outcomes, namely innovative work behavior and reputation as innovative. Innovative work behavior (IWB, de Jong & Den Hartog, 2010) is currently considered an outcome of innovative leaders and refers to a broad set of behaviors related to ideas generation, creating support for ideas and helping their implementation (e.g., de Jong & Den Hartog, 2010; Janssen, 2000; Scott & Bruce, 1994). Reputation as innovative refers to the leader's informal social reputation that may influence the image and expected results of innovative behavior (Yuan & Woodman, 2010). In the authors' opinion, those with a reputation for being innovative are also more likely to internalize the value of innovation and are more likely to believe that innovative behavior will benefit their work.

Accordingly, we derived our study hypotheses as follows:

Hypothesis 1: the *Innovative Leader Test* dimensions represent seven different but related latent factors of the same factorial structure;

Hypothesis 2: the *Innovative Leader Test* factors will be positively related to transformational leadership (TFL) and work engagement;

Hypothesis 3: the *Innovative Leader Test* factors will be positively related to innovative work behavior and reputation as innovative.

To this end, we carried out this study to test the factorial validity of the ILT. After an exploratory factor analysis (EFA) approach to assess the factor structure of the ILT, reliability analyses (corrected item-total correlations and Cronbach's alphas) and confirmatory factor analyses (CFA) were performed with a total sample of 660 employees (Hypothesis 1). Moreover, to verify the association of innovative leader factors with transformational leadership and work engagement (Hypothesis 2) correlations were investigated on the overall sample by using Pearson's r coefficient, while correlational and regression analyses were used to determine whether ILT factors predicted other relevant outcomes variables (Hypothesis 3) as reputation as innovative and innovative work behavior.

METHOD

Sample

Participants included 660 supervisors (managers and middle managers) with executive responsibilities working in private (47.6%) and public (52.4%) organizations. Questionnaires were collected in the period from November 2020 to June 2021, during which organizations were not in a changing time. Response rate was 82.5%. Females were 163 (24.7%), males were 495 (75%), while two people did not disclose their gender. Age varied from 20 to 66 years (M = 46.2, SD = 8.7). Participant education varied from high school (N = 131, 19.8%), to University degree (N = 449, 68%), to postgraduate (N = 80, 12.1%). Organizational tenure was 11-15 years for 35.1%, 16-20 years for 20.5%, 26-30 years for 18.0%, 21-25 years for 9.8%, 6-10 years for 8.8%, and 0-5 years for 7.8%.

Procedure

Participants (managers and middle managers) were contacted by their own companies via an e-mail, in which they were informed about the research purpose (validation of a new instrument on innovative leader) and invited to answer an online and anonymous questionnaire via a specific link or Qr code implemented on Qualtrics XM platform. Participation in the study was voluntary. Informed consent was obtained, and anonymity in line with the ethical standards of the American Psychological Association (APA), and according to the principles expressed in the Declaration of Helsinki. All responses to the survey were complete and, thus, no missing values were found. Descriptive statistics as well as skewness and kurtosis indices of items were assessed to check data normality.

Measures

In order to measure the hypothesized seven dimensions of innovative leader, items were formulated or re-adapted by two organizational psychologists on the basis of the existing literature reviewed. Statements were contextualized in the organizational setting by explicitly relating the item content to the work domain through appropriate lexical solutions. The Appendix gives all the scale items.

Openness to change: in order to measure this dimension, items were generated on the basis of Di Fabio and Gori (2016) *Acceptance of Change Scale* (*ACS*) and others existing in the literature on the construct (i.e., Sinval, Miller & Marôco, 2021). The statements were measured on a 7-point scale ranging from 1 = strongly disagree to 7 = strongly agree.

Problem solving: taking into account Jabri's scale (1991), as well as the *Problem Solving Inventory (PSI*, Heppner and Petersen, 1982), this scale consists of four items measured on a 7-point scale (ranging from 1 = strongly disagree to 7 = strongly agree) and refers to the problem solving abilities in everyday working situations (e.g., "when faced with a problem in my work, I define the essential alternatives and, whenever possible, broaden the choice options").

Anticipation, Self-reflection and Self-regulation: in order to measure these dimensions items were formulated or re-adapted starting from the *Work Agentic Capabilities* (*WAC*) questionnaire (Cenciotti et al., 2020). More specifically, anticipation items refers to the capability to anticipate events that are likely to occur and define one's future actions (e.g., "I foresee in advance the possible risks and opportunities of the work situation I will face"); Self-reflection items capture the capability to analyze one's direct experience and thus to learn

from past events (e.g., "at the end of each new job, I pause to reflect on what I have learnt from the experience I have just had"); Self-regulation items refers to the capability to regulate one's personal and emotional states (e.g., "I can remain calm even in difficult or conflict work situations"). The statements were measured on a seven-point scale ranging from 1 = never to 7 = always.

Knowledge sharing: items of this scale were generated with reference to the *Knowledge Sharing Behavior Scale* (*KSBS*) developed by Rajput & Talan (2017) that consists of 30 items measuring level of interaction, information and knowledge sharing behaviors. More specifically, items detect the leader's personal interactions aimed at sharing information, experiences and organizational innovations (e.g., "I regularly share my experiences and learnings with other colleagues"). They scored on a seven-point Likert scale ranging from 1 = strongly agree to 7 = strongly disagree.

Change involvement: items were newly generated starting from focus groups activities and critical incidents technique (Flanagan, 1954). This dimension refers to the leader capability to involve employees in the management, promotion and implementation of organizational change (e.g., "In facing a change in my organization I consider how to involve different stakeholders and collaborators"). Item responses were recorded on a 7-point frequency scale ranging from 1 = never to 7 = always.

Transformational leadership: items regard intellectual stimulation and inspirational motivation components of transformational leadership (Bass & Avolio, 1992), considered as predictors of creativity and change management. They have been adapted from the *Multifactor Leadership Questionnaire 6S* (Bass & Avolio, 1992, 2000). An example item is "I stimulate employees to tackle problems in an unconventional way". Alpha was: .83. Items scored on a seven-point Likert scale ranging from 1 = never to 7 = always.

Work engagement (WE): the positive and fulfilling state of mind that implies a persistent sense of well-being in one's work, namely work engagement (Schaufeli et al., 2002), was measured by the *Ultra-Short Work Engagement Scale* (*UWES 3*) where three items from the UWES-9 were selected, each or every dimension of work engagement: (1) "At my work, I feel bursting with energy" - vigor; (2) "I am enthusiastic about my job" – dedication; (3) "I am immersed in my work" - absorption (Schaufeli, Shimazu, Hakanen, Salanova & De Witte, 2017). Alpha was: .74. Item responses were on a 7-point Likert scale ranging from 1 = never to 7 = always.

Innovative work behavior (IWB): for IWB measurement, we used Janssen's (2000) scale as revised by Amir (2015) on a three-factor structure with 9 items consisting of idea generation (3 items, e.g. "generating new ideas"), idea promotion (3 items, e.g. "supporting and promoting your innovative ideas to others") and idea implementation (3 items, e.g. "introducing new ideas into his working environment"). Cronbach's alphas were .89, .80, and .90, respectively. Item responses were recorded on a 7-point frequency scale ranging from 1 = never to 7 = always.

Reputation as innovative (REP_IN): to measure REP_IN we used, by adapting it, Yuan & Woodman scale (2010) consisting of two items to which we added a third item ("I'm regarded as an innovator by my supervisors"). Alpha was: .87. Item responses were on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree.

Data analysis

To identify the underlying dimensions of the ILT an exploratory factor analysis (EFA), reliability analyses (corrected item-total correlations and Cronbach's alpha) and confirmatory factor analyses (CFA) were performed using maximum likelihood (ML) estimation procedures in Mplus 8.1 (Muthén & Muthén, 2017). To assess the closeness of the hypothetical model to the empirical data the appropriateness of the model fit, multiple goodness-of-fit indexes were used, including the ratio of the chi-square to degrees of freedom (χ^2/df), the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), the Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA). The appropriateness of the model fit was established with values of CFI higher than .90 (Bentler, 1990), SRMR and RMSEA values of .08 or less (Browne & Cudeck, 1992). Then, to properly determine whether the hypothesized seven-factor model showed the best fit to the data, it was compared with plausible competitive models differing in their factorial structure. These alternative models assumed a six-factor structure, obtained by combining two of the seven dimensions (i.e., Models 2, 3), a five-factor structure obtained by combining two dimensions twice (i.e., Model 4) or by combining three of the seven dimensions (i.e., Model 5), a four-factor structure obtained by combining two of the seven dimensions for three times (i.e., Model 6), a three-factor structure obtained by combining two pairs and a triad of

dimensions (i.e., Model 7) and a two-factor structure obtained by combining three and four of the seven dimensions (i.e., Model 8). Concurrent validity with transformational leadership and work engagement was verified using the Pearson's *r* coefficient, while to examine the extent to which innovative work behavior and reputation as innovative outcomes are predicted by innovative leader factors, linear regressions were conducted, with ILT dimensions as predictor variables and IWB and REP_IN as criterion variables. R^2 and *F*-statistics were used to respectively assess the fit of the models and statistical significance. Finally, to explore whether there were differences in the mean scores of the ILT dimensions across sub-samples of public and private organizations, analyses of variance (ANOVAs) were conducted.

RESULTS

Item analysis

Means, standard deviations, skewness, and kurtosis for each ILT item were calculated. Skewness resulted within normal parameters being included in the range of ±2 (Hair, Black, Babin & Anderson, 2010; Byrne, 2010). It varied between −.04 of the item SR_3 (item 24 in the Appendix list) to −1.39 of the item OPC_1 (item 1 in the Appendix list). Instead, the kurtosis tended towards non-normality, varying between −.05 of the item ANT_1 to 3.11 of the item REG_2. Therefore, we used maximum likelihood with robust standard errors (MLR) to test the factorial validity.

Factorial validity and reliability

The exploratory factor analysis (EFA) showed a factor structure with seven principal dimensions, with 63.6 % of total variance explained in line with our conceptualization. Indeed, all fit indices (see Table 1) and parallel analyses pointed to a seven-factor solution, composed by the latent dimensions capturing Openness to change, Problem solving, Anticipation, Self-reflection, Self-regulation, Knowledge sharing and Change involvement.

All items of the seven-factor model mostly loaded only onto the hypothesized factors (see Table 2), and factor loadings ranged between |.50| and |.79| (M = 5.6; SD = .8) for Openness to change, between |.35| and |.74| (M = 5.7; SD = .8) for Problem solving, between |.49| and |.74| (M = 6.0; SD = .7) for Change involvement, between |.40| and |.83| (M = 5.9; SD = .7) for Knowledge sharing, between |.34| and |.63| (M = 5.4; SD = .8) for Anticipation, between |.39| and

Table 1 – EFA model fit measures

Model	χ^2	*df*	RMSEA	CFI	SRMR	$\Delta\chi^2$ (Δdf)
1 Factor	1588.83 ***	350	.09	.68	.08	–
2 Factors	1168.16 ***	323	.08	.78	.06	420.66 (27)***
3 Factors	923.52 ***	297	.07	.84	.05	244.65 (26)***
4 Factors	672.80 ***	272	.06	.90	.04	250.71 (25)***
5 Factors	520.34 ***	248	.05	.93	.03	152.46 (24)***
6 Factors	430.36 ***	225	.04	.95	.03	89.98 (23)***
7 Factors	355.42 ***	203	.04	.96	.02	74.94 (22)***

Legenda. χ^2 = chi-square test of model fit; *df* = degree of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Squared.
*** p<.001

Table 2 – Exploratory factor analysis on the ILT: Factor loading matrix and correlations matrix

	Factors						
Items	**1**	**2**	**3**	**4**	**5**	**6**	**7**
OPC_1	.66*						
OPC_3	.68*						
OPC_4	.79*						
OPC_2	.50*						
PS_2		.70*					.18*
PS_1		.40*		.12*			.17*
PS_3		.35*		.19*	.16*		
PS_4		.74*					
CI_3			.58*				
CI_2			.57*				
CI_1			.74*				
CI_4			.49*		.14*		
KS_2				.83*			
KS_4	.20*			.51*			
KS_3				.57*		.10*	
KS_1			.23*	.40*			
ANT_1							.63*
ANT_4	.15*						.53*
ANT_3	.14*						.34*
ANT_2	.18*						.35*
SR_2					.74*		
SR_4					.65*		.24*
SR_1					.39*		.30*
SR_3					.70*		
REG_1						.71*	
REG_3						.66*	
REG_2						.72*	.25*
REG_4	.16*					.68*	

Legenda. OPC = Openness to change; PS = Problem solving; SR = Self-reflection; ANT = Anticipation; KS = Knowledge sharing; CI = Change involvement; REG = Self-regulation.

|.74| (M = 5.4; SD = .94) for Self-reflection and between |.66| and |.72| (M = 5.5; SD = .8) for Self-regulation. The revealed seven dimensions also correlated significantly and showed good values (from r = .26, p<.01, to r = .62, p<.01) (see Table 3).

Subsequently, a CFA was conducted on the posited seven factor model (i.e., Model 1) and its fit was compared with several alternative models by testing the changes in chi-square values (see Table 4). The seven-factor model demonstrated the best fit with the data, providing support for our first hypothesis and for the factorial validity of the ILT questionnaire. The goodness-of-fit indices showed a good fit of the model to the data. Although the chi-square was significant, the other goodness-of-fit indices showed satisfactory and good values (χ^2/df = 1.83, p<.001; CFI = .96; TLI = .94; SRMR = .04; RMSEA = .04). Factor loading of the seven-factor model ranged between |.58| and |.76| for Openness to change, between |.50| and |.81| for Problem solving, between |.59| and |.74| for Change involvement, between |.58| and |.74| for Knowledge sharing, between |.62| and |.74| for Anticipation, between |.62| and |.79| for Self-reflection and between |.64| and |.82| for Self-regulation. Correlations between factors were also found to be good, ranging from .27 to .75 (see Figure 1).

Despite the reduced number of items, each dimension presented an adequate reliability statistic (Cronbach's alphas and item-total correlations): Openness to change (four items, Cronbach's alpha = .77, item-total correlations ranging from .51 to .63), Problem solving (four items, Cronbach's alpha = .79, item-total correlations ranging from .48 to .69), Anticipation (four items, Cronbach's alpha = .77, item-total correlations ranging from .53 to .64), Self-reflection (four items, Cronbach's alpha = .82, item-total correlations ranging from .55 to .70), Self-regulation (four items, Cronbach's alpha = .83, item-total correlations ranging from .77 to .81), Knowledge sharing (four items, Cronbach's alpha = .78, item-total correlations ranging from .50 to .62) and Change involvement (four items, Cronbach's alpha = .79, item-total correlations ranging from .51 to .67). The ILT factors showed all significant good correlation indices (see Table 5) with the measure used to assess concurrent validity (transformational leadership, work engagement,) and hypothesized outcomes (innovative work behavior, reputation as innovator).

To test Hypothesis 3 we used multiple regressions to examine how innovative leader factors related to outcomes relative to innovation. Table 6 shows the results of two regression equations in which innovative work behavior

Table 3 – Factor correlations and reliability

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Openness to change	(.77)						
(2) Problem solving	.42**	(.79)					
(3) Change involvement	.40**	.59**	(.78)				
(4) Knowledge sharing	.36**	.53**	.57**	(.75)			
(5) Anticipation	.50**	.62**	.56**	.48**	(.77)		
(6) Self-reflection	.37**	.54**	.49**	.40**	.59**	(.82)	
(7) Self-regulation	.38**	.42**	.37**	.26**	.46**	.33**	(.83)

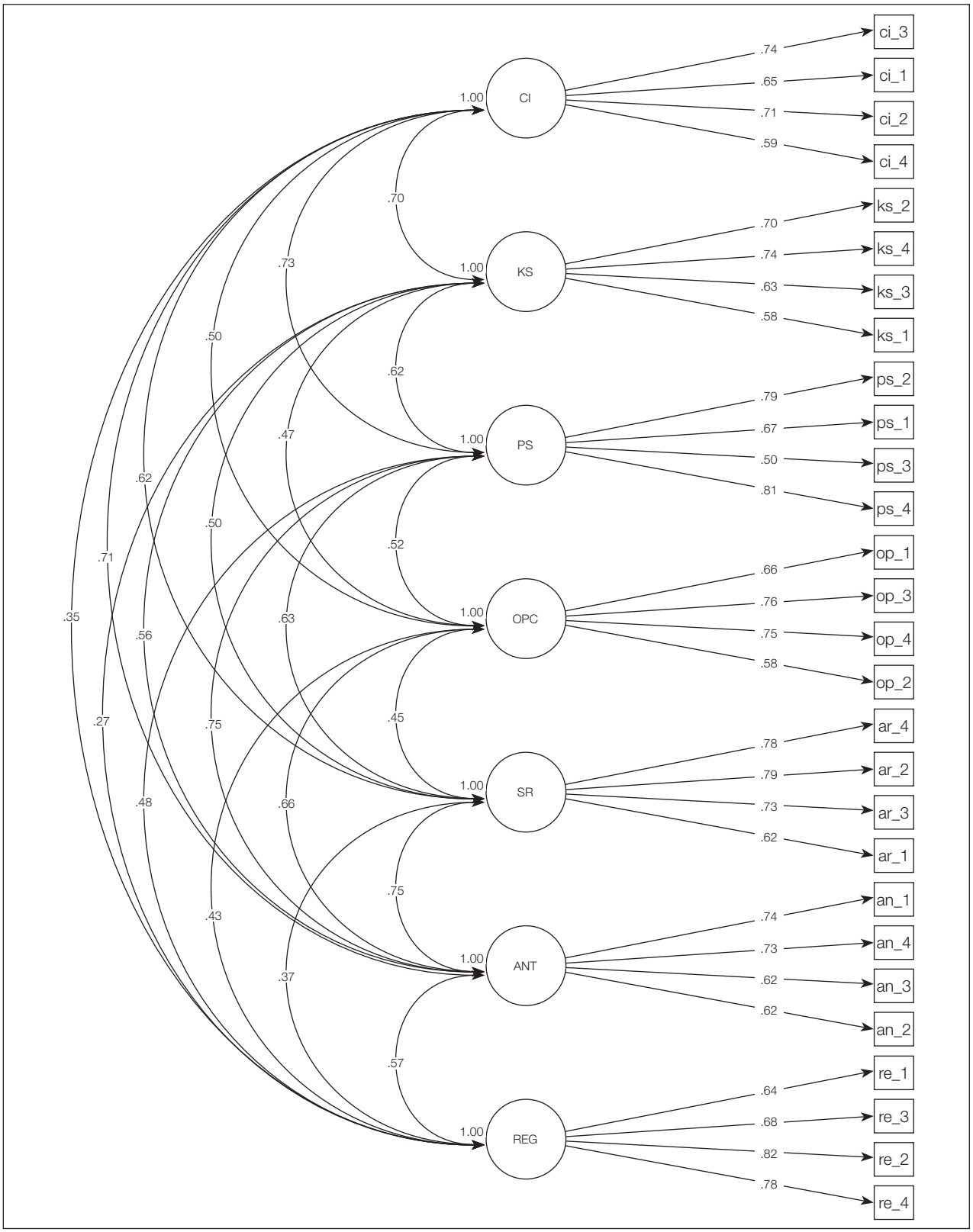
Note. Coefficient alpha reliability estimates are presented in brackets along the diagonal.
** p<.01

Table 4 – Confirmatory factor analysis on the ILT: Model comparisons

Model	χ^2	*df*	*p*	RMSEA	CFI	TLI	SRMR	Model comparison	$\Delta\chi^2$	Δdf	*p*
M1: 7-Factor model	502.25	329	<.001	.03	.96	.95	.04				
M2: 6-Factor model PS+OPC, SR, ANT, KS, CI, REG	748.12	335	<.001	.05	.89	.88	.05	M2-M1	245.87	6	<.001
M3: 6-Factor model PS+ANT, KS, CI, SR, REG, OPC	614.31	335	<.001	.04	.93	.91	.04	M3-M1	112.06	6	<.001
M4: 5-Factor model KS + CI, PS, OPC, SR+ REG, ANT	1186.71	340	<.001	.07	.78	.76	.07	M4-M1	684.46	11	<.001
M5: 5-Factor model OPC+ANT+PS, KS, CI, SR, REG	810.34	340	<.001	.06	.88	.87	.05	M5-M1	308.09	11	<.001
M6: 4-Factor model OPC, PS+ANT, KS+CI, REG+SR	1150.55	344	<.001	.07	.79	.77	.07	M6-M1	648.30	15	<.001
M7: 3-Factor model PS+OPC, SR+ANT+REG, CI+KS	1328.76	347	<.001	.08	.75	.72	.07	M7-M1	826.51	18	<.001
M8: 2-Factor model ANT+SR+OPC+PS, KS+CI+REG	1506.65	349	<.001	.09	.70	.68	.08	M8-M1	1004.4	20	<.001

Legenda. OPC = Openness to change; PS = Problem solving; SR = Self-reflection; ANT = Anticipation; KS = Knowledge sharing; CI = Change involvement; REG = Self-regulation; χ^2 = chi-square test of model fit; *df* = degree of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Squared.

Figure 1 – Results of confirmatory factor analysis on the ILT (N = 660)



Legenda. OPC = Openness to change; PS = Problem solving; SR = Self-reflection; ANT = Anticipation; KS = Knowledge sharing; CI = Change involvement; REG = Self-regulation.

Table 5 – Correlates of the seven ILT factors

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Openness to change	–										
(2) Problem solving	.42**	–									
(3) Change involvement	.40**	.59**	–								
(4) Knowledge sharing	.36**	.52**	.57**	–							
(5) Anticipation	.50**	.62**	.56**	.47**	–						
(6) Self-reflection	.37**	.54**	.49**	.41**	.59**	–					
(7) Self-regulation	.43**	.48**	.36**	.27**	.57**	.37**	–				
(8) Transformational leadership	.52**	.54**	.54**	.53**	.56**	.55**	.29**	–			
(9) Work engagement	.28**	.31**	.34**	.31**	.34**	.33**	.28**	.35**	–		
(10) Innovative work behavior	.53**	.26**	.32**	.31**	.40**	.33**	.24**	.46**	.34**	–	
(11) Reputation as innovator	.53**	.30**	.35**	.34**	.43**	.31**	.25**	.46**	.26**	.69**	–

** $p<.01$

Table 6 – Regression results in predicting innovation outcomes

	Innovative work behavior	Reputation as innovator
Parameter	Estimate	Estimate
Openness to change	.48**	.40**
Problem solving	.06	.02
Change involvement	.07	.07
Knowledge sharing	.07	.12*
Anticipation	.09	.16*
Self-reflection	.15*	.03
Self-regulation	.03	.03
Multiple R	.55**	.56**
R^2	.30**	.32**
Adjusted R^2	.30**	.31**

** $p<.01$; * $p\leq.05$

and reputation as innovative were regressed on the seven innovative leader factors. Results show how Openness to change and Self-reflection were positively related to innovative work behavior (beta weights respectively .48 and .15), while Openness to change, Anticipation and Knowledge sharing were positively related to reputation as innovative (beta weights respectively .40, .16 and .12). Others ILT factors were not significantly related to innovation outcomes examined.

Note, however, that when remaining ILT factors were entered into the regression for innovative work behavior (IWB) without Openness to change and Self-reflection (supplementary analysis not shown in Table 6), Anticipation and Knowledge sharing became significant predictors of IWB (R^2 = .18); likewise, when remaining ILT factors were entered into the regression without Openness to change, Anticipation and Knowledge sharing for reputation as innovator (REP_IN), Change involvement and Problem solving became significant predictors of REP_IN (R^2 = .15). These results support H3.

Finally, ANOVAs showed as the organization type has a significant effect for both Change involvement, $F_{(1, 659)} = 5.68$, p = .017, and Knowledge sharing, $F_{(1, 659)} = 7.27$, p = .007, but no significant effect for the other ILT dimensions. Specifically, the private organizations' sample showed higher levels of change involvement (M = 6.0; SD = .6) and Knowledge sharing (M = 6.0; SD = .6) than the public organizations' sample (M = 5.9; SD = .7 and M = 5.9; SD = .7 respectively).

DISCUSSION

This study provided substantial support for the ILT. Our first aim was to test the factorial and content validity of this instrument, aimed at measuring leader's core traits, capabilities and competencies needed to achieve innovation, namely Openness to change, Anticipation, Self-reflection, Self-regulation, Problem solving, Knowledge sharing and Change involvement. As expected, exploratory factor analysis and confirmatory factor analysis revealed a seven-factor structure that fit the data better than the alternative solutions with different numbers of factors. All seven scales, moreover, showed satisfactory reliability (i.e., Cronbach's alphas and item-total correlations). The second aim of the present contribution was to assess the concurrent validity of the ILT dimensions by analyzing the relationships between its seven subscales and variables used as criteria that we expected to be related with these characteristics of innovative leader. Hence, consistent with the literature (Bass & Riggio, 2006; Chen et al., 2016) the ILT dimensions were correlated with measures of transformational leadership and work engagement, all showing significant correlations and providing support for their connection with the leaders' intellectual stimulations and inspirational competencies, as well as their engagement.

The third objective of the study was to assess whether ILT factors predicted other outcome variables relevant for innovation in the organizations. Openness to change resulted as most relevant predictor for both outcomes, followed by Self-reflection as predictor of innovative work behavior, Anticipation and Knowledge sharing as predictors for reputation as innovative. Surprisingly enough, contrary to our expectations, Problem solving was not among the major determinants of innovation outcomes, while Self-regulation capability was found to be not distinctive in predicting outcomes even when the main predictors were removed from the regression. The Openness to change trait arises as a distinctive characteristic of the innovative leader; combined with it, different leader capabilities come into play leading to different innovation outcomes (e.g., Self-reflection capability for innovative work behavior, Anticipation and Knowledge sharing for reputation as innovative). All in all, the above results provided support for the criterion validity of the *Innovative Leader Test* and suggest that, together with Openness to change, leaders' agentic capabilities may play a significant role in enabling leaders to generate, promote and implement innovation at work and thus in being recognized as innovators at work. Lastly, ANOVA results confirmed some differences between private and public organizations, particularly with regard to the level of Change involvement and Knowledge sharing, which therefore emerge as practices that foster innovation and organizational change. Thus, it would be worthwhile to explore and confirm any other differences or similarities between these two types of work contexts, which often differ in terms of timing and approach to innovation.

Limitations and practical implications

This study contains several limitations that should be acknowledged and can be further developed in future research. First limitation derives from the self-report

nature of measures, which might raise questions of common-method variance (e.g., Podsakoff, MacKenzie, Lee & Podsakoff, 2003). Thus, while the best informants regarding the individual characteristics measured by the ILT questionnaire are managers (e.g., Anticipation, Self-regulation), future research would benefit from combining self-report with the perceptions that subordinates hold on managers' innovative behaviors. Furthermore, future research on innovative leaders should broaden the nomological network of innovation leadership to other correlates such as the degree of organizational change the company is facing or more objective results in terms of both objective such as using KPIs at employee and organizational level. Another limitation concerns the use of a cross-sectional design, that does not allow establishing the stability of the measure over time and clear relations of causality between innovative leader dimensions and other variables. Future studies should implement longitudinal designs to better address patterns of influence between innovative leader factors and other dimensions. Among them, the role of organizational change, if any, should be operationalized and considered as a predictor variable of innovation leadership. Finally, future studies should deepen the comparison between different sectors besides the public/private sector (e.g., business services, technology, health, education, law enforcement), to explore differences in their approach to innovation and to confirm the psychometric characteristics of ILT on larger samples across different work sectors and organizational contexts.

Given that, to the best of our knowledge, this research is among the few that have studied innovative leader by bringing together elements such as traits, capabilities and competencies; moreover, it is the only one to have examined agentic capabilities as properties of the leader that, together with other traits and competencies, enable him/her to have an innovative behavior. In this regard, future research should deeply investigate the role of agentic capabilities as possible mediators between openness to change, cognitive leader capabilities (as determinants), innovation at work and other possible indicators (as outcomes).

Overall, it can be concluded that the ILT dimensions and related scales represent valid and consistent measures to determine a set of core characteristics of innovative leader, thus contributing to fill the gap in the literature on innovation leadership in organizations. This is especially relevant in today's organizations that require future-oriented leader, able to cope with innovation and to manage rapid organizational change. Furthermore, by identifying and measuring the innovative leader's characteristics, the *Innovative Leader Test* can help organizations in selecting and assessing the potential of leaders in change contexts, as well as in promoting the development of these characteristics. Likewise, it can assist leaders in self-assessment, in order to identify possible areas for growth and, consequently, to employ appropriate self-development strategies.

References

AMIR, M.T. (2015). Validation of innovative behavior as a multidimensional construct. *Jurnal Manajemen Teknologi*, *14* (01), 66-80.

ARIYANI, N. & HIDAYATI, S. (2018). Influence of transformational leadership and work engagement on innovative behavior. *Etikonomi*, *17* (2), 275-284. doi.org/10.15408/etk.v17i2.7427

AVOLIO, B.J. (1994). The "natural": Some antecedents to transformational leadership. *International Journal of Public Administration*, *17* (9), 1559-1581. doi.org/10.1080/01900699408524956

BAKKER, A.B. & DEMEROUTI, E. (2008). Towards a model of work engagement. *Career Development International, 13* (3), 209-223. doi.org/10.1108/13620430810870476

BANDURA, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

BANDURA, A. (1999). A social cognitive theory of personality. In L. Pervin & O. John (Eds.), *Handbook of personality*. Guilford Publications.

BASADUR, M.I.N., RUNCO, M.A. & VEGAXY, L.A. (2000). Understanding how creative thinking skills, attitudes and behaviors work together: A causal process model. *The Journal of Creative Behavior*, *34* (2), 77-100. doi.org/10.1002/j.2162-6057.2000.tb01203.x

BASS, B.M. & AVOLIO, B.J. (1992). Developing transformational leadership: 1992 and beyond. *Journal of European Industrial Training*, *14* (5), 21-27. doi.org/10.1108/03090599010135122

BASS, B.M. & AVOLIO, B.J. (2000). *MLQ: Multifactor Leadership Questionnaire*. Redwood City, CA: Mind Garden.

BASS, B.M. & RIGGIO, R.E. (2006). *Transformational leadership*. Psychology Press.

BENTLER, P.M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, *107* (2), 238. doi.org/10.1037/0033-2909.107.2.238

BROWNE, M.W. & CUDECK, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, *21* (2), 230-258. doi.org/10.1177/0049124192021002005

BYRNE, B.M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. New York, NY: Routledge.

CENCIOTTI, R., BORGOGNI, L., CONSIGLIO, C., FEDELI, E. & ALESSANDRI, G. (2020). The Work Agentic Capabilities (WAC) questionnaire: Validation of a new measure. *Journal of Work and Organizational Psychology*, *36* (3), 195-204. doi.org/10.5093/jwop2020a19

CHAN, I.Y.S., LIU, A.M.M. & FELLOWS, R. (2014). Role of leadership in fostering an innovation climate in construction firms. *Journal of Management in Engineering*, *30* (6), 06014003. doi.org/10.1061/(ASCE)ME.1943-5479.0000271

CHANG, Y.Y. (2018). Charismatic leadership in IT firms in Taiwan: An empirical study. *Asia Pacific Business Review*, *24* (1), 53-71. doi.org/10.1080/13602381.2017.1334416

CHEN, L., ZHENG, W., YANG, B. & BAI, S. (2016). Transformational leadership, social capital and organizational innovation. *Leadership & Organization Development Journal*, *37* (7), 843-859. doi.org/10.1108/LODJ-07-2015-0157

DE JONG, J.P. & DEN HARTOG, D.N. (2007). How leaders influence employees' innovative behavior. *European Journal of Innovation Management*, *10* (1), 41-64. doi.org/10.1108/14601060710720546

DE JONG, J. & DEN HARTOG, D.N. (2010). Measuring innovative work behaviour. *Creativity and Innovation Management*, *19* (1), 23-36. doi.org/10.1111/j.1467-8691.2010.00547.x

DESOUZA, K. (2011). *Intrapreneurship: Managing ideas within your organization*. Toronto: University of Toronto Press.

DI FABIO, A. & GORI, A. (2016). Developing a new instrument for assessing acceptance of change. *Frontiers in psychology*, *7*, 802. doi.org/10.3389/fpsyg.2016.00802

DONG, Y., BARTOL, K.M., ZHANG, Z.X. & LI, C. (2017). Enhancing employee creativity via individual skill development and team knowledge sharing: Influences of dual-focused transformational leadership. *Journal of Organizational Behavior*, *38* (3), 439-458. doi.org/10.1002/job.2134

EISELE, P. (2017). Assessment of leadership for innovation and perceived organizational innovativeness: Differences between self-reported individual and social creativity. *International Journal of Organizational Leadership*, *6*, 470-480. Available at: https://ssrn.com/abstract=3335744

ENGELEN, A., SCHMIDT, S., STRENGER, L. & BRETTEL, M. (2014). Top management's transformational leader behaviors and innovation orientation: A cross-cultural perspective in eight countries. *Journal of International Management*, *20* (2), 124-136. doi.org/10.1016/j.intman.2013.04.003

FLANAGAN, J.C. (1954). The critical incident technique. *Psychological Bulletin*, *51* (4), 327.

FUAD, D.R.S. M., MUSA, K., YUSOF, H. & HASHIM, Z. (2022). The development and validation of the principal innovation leadership scale in Malaysian secondary schools. *International Journal of Evaluation & Research Education*, *11* (1), 193-200. doi.org/10.11591/ijere.v11i1.22038

HAAPANIEMI, P. (2017). *Leadership in innovations of Finnish household goods producing companies*. Helsinki Metropolia University of Applied Sciences.

HAIR, J., BLACK, W.C., BABIN, B.J. & ANDERSON, R.E. (2010). *Multivariate data analysis (7th ed.)*. Upper Saddle River, New Jersey: Pearson Educational International.

HEPPNER, P.P. & PETERSEN, C.H. (1982). The development and implications of a personal Problem Solving Inventory. *Journal of Counseling Psychology*, *29* (1), 66. doi.org/10.1037/0022-0167.29.1.66

HINKIN, T.R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. *Organizational Research Methods*, *1* (1), 104-121. doi.org/10.1177/109442819800100106

JABRI, M.M. (1991). The development of conceptually independent subscales in the measurement of modes of problem solving. *Educational and Psychological Measurement, 51* (4), 975-983. doi.org/10.1177/00131644910510041

JANSSEN, O. (2000). Job demands, perceptions of effort-reward fairness and innovative work behaviour. *Journal of Occupational and Organizational Psychology*, *73* (3), 287-302. doi.org/10.1348/096317900167038

KIRTON, M. (1976). Adaptors and innovators: A description and measure. *Journal of Applied Psychology*, *61* (5), 622.

LEE, J. (2018). The effects of knowledge sharing on individual creativity in higher education institutions: Socio-technical view. *Administrative Sciences*, *8* (2), 21. doi.org/10.3390/admsci8020021

LIN, H.F. (2007). Knowledge sharing and firm innovation capability: An empirical study. *International Journal of Manpower*, *28* (3/4), 315-332. doi.org/10.1108/01437720710755272

McADAM, R. & McCLELLAND, J. (2002). Individual and team-based idea generation within innovation management: Organisational and research agendas. *European Journal of Innovation Management*, *5* (2), 86-97. doi.org/10.1108/14601060210428186

MOUSSA, M., McMURRAY, A. & MUENJOHN, N. (2018). Innovation in public sector organisations. *Cogent Business & Management*, *5* (1), 1475047. doi.org/10.1080/23311975.2018.1475047

MUMFORD, M.D., SCOTT, G.M., GADDIS, B. & STRANGE, J.M. (2002). Leading creative people: Orchestrating expertise and relationships. *The Leadership Quarterly*, *13* (6), 705-750. doi.org/10.1016/S1048-9843(02)00158-3

MUTHÉN, L.K. & MUTHÉN, B.O. (2017). *Mplus user's guide (8th ed.)*. Los Angeles, CA: Author.

PARK, Y.K., SONG, J.H., YOON, S.W. & KIM, J. (2013). Learning organization and innovative behavior: The mediating effect of work engagement. *European Journal of Training and Development*, *38* (1/2), 75-94. doi.org/10.1108/EJTD-04-2013-0040

PODSAKOFF, P.M., MacKENZIE, S.B., LEE, J.Y. & PODSAKOFF, N.P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88* (5), 879-903. doi.org/10.1037/0021-9010.88.5.879

RAJPUT, N. & TALAN, A. (2017). Knowledge Sharing Behavior Scale. *Global Journal of Enterprise Information System*, *9* (2), 127-131. Retrieved from https://gjeis.com/index.php/GJEIS/article/view/225

ROSING, K., FRESE, M. & BAUSCH, A. (2011). Explaining the heterogeneity of the leadership-innovation relationship: Ambidextrous leadership. *The Leadership Quarterly*, *22* (5), 956-974. doi.org/10.1016/j.leaqua.2011.07.014

SCHAUFELI, W.B., SALANOVA, M., GONZÁLEZ-ROMÁ, V. & BAKKER, A.B. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies: An Interdisciplinary Forum on Subjective Well-Being*, *3* (1), 71-92. doi.org/10.1023/A:1015630930326

SCHAUFELI, W.B., SHIMAZU, A., HAKANEN, J., SALANOVA, M. & DE WITTE, H. (2017). An ultra-short measure for work engagement: The UWES-3 validation across five countries. *European Journal of Psychological Assessment*, *35* (4), 577-591. doi.org/10.1027/1015-5759/a000430

SCOTT, S.G. & BRUCE, R.A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal*, *37* (3), 580-607. doi.org/10.5465/256701

SETHIBE, T.G. (2018). Towards a comprehensive model on the relationship between leadership styles, organisational climate, innovation and organisational performance. *International Journal of Innovation Management*, *22* (8), 1850021. doi.org/10.1142/S1363919618500214

SINVAL, J., MILLER, V. & MARÔCO, J. (2021). Openness Toward Organizational Change Scale (OTOCS): Validity evidence from Brazil and Portugal. *PloS One*, *16* (4), e0249986. doi.org/10.1371/journal.pone.0249986

TUNG, F.C. & YU, T.W. (2016). Does innovation leadership enhance creativity in high-tech industries? *Leadership & Organization Development Journal*, *37* (5), 579-592. doi.org/10.1108/LODJ-09-2014-0170

VINCENT-HÖPER, S. & STEIN, M. (2019). The Leader Support for Innovation Questionnaire (LSIQ): Development and validation of a measure for assessing leader support for innovation. *Leadership & Organization Development Journal*, *40* (8), 898-915. doi.org/10.1108/LODJ-03-2019-0137

WANBERG, C.R. & BANAS, J.T. (2000). Predictors and outcomes of openness to changes in a reorganizing workplace. *Journal of Applied Psychology*, *85* (1), 132. doi.org/10.1037/0021-9010.85.1.132

WEST, M.A. & FARR, J.L. (Eds.) (1990). *Innovation and creativity at work: Psychological and organizational strategies*. John Wiley & Sons.

WIPULANUSAT, W., PANUWATWANICH, K. & STEWART, R.A. (2017). Exploring leadership styles for innovation: An exploratory factor analysis. *Engineering Management in Production and Services*, *9* (1). doi: 10.1515/emj-2017-0001

YUAN, F. & WOODMAN, R.W. (2010). Innovative behavior in the workplace: The role of performance and image outcome expectations. *Academy of Management Journal*, *53* (2), 323-342. doi.org/10.5465/amj.2010.49388995

YUKL, G. (2002), *Leadership in organizations*. New York, NY: Prentice Hall.

YUKL, G. (2009). Leading organizational learning: Reflections on theory and research. *The Leadership Quarterly*, *20* (1), 49-53. doi.org/10.1016/j.leaqua.2008.11.006

ZACHER, H., ROBINSON, A.J. & ROSING, K. (2016). Ambidextrous leadership and employees' self-reported innovative performance: The role of exploration and exploitation behaviors. *The Journal of Creative Behavior*, *50* (1), 24-46. doi.org/10.1002/jocb.66

APPENDIX

List of items

Number of item	Description
1	[In dealing with my current work...] It's easy for me to think of new action plans
2	[In facing a change in my organization] I am careful to convey a sense of security to my employees.
3	After particularly difficult situations, I think back to my emotional reactions and how they affected my performance
4	I foresee in advance the possible risks and opportunities of the work situation I will face
5	I keep others informed about the news of our organization
6	[When faced with a problem in my work] I analyze it globally, before breaking it down into key elements
7	I can remain calm even in difficult or conflict work situations
8	[In dealing with my current work...] I quickly find ways to implement new ideas
9	I foresee in advance the kind of people I will be interacting with
10	In tense situations I can regulate my reactions without my performance being affected
11	At the end of each new job, I pause to reflect on what I have learnt from the experience I have just had
12	When I acquire new information, I tend to share it with other colleagues
13	[When faced with a problem in my work] I verify the implications resulting from the possible solutions
14	[In facing a change in my organization] I do not only consider my own goals, but also those I can assign to co-workers
15	[In dealing with my current work...] I am able to take an idea and turn it into a project of change
16	After a work success I try to identify what behaviors have allowed me to achieve it
17	I regularly share my experiences and learnings with other colleagues
18	I assign the goals according to the possible scenarios that I envisage
19	[In facing a change in my organization] I consider how to involve different stakeholders and collaborators
20	[When faced with a problem in my work] I prefer to ask questions asking "why", to develop an understanding of the problem
21	When faced with unexpected problems, I do not lose control
22	[In dealing with my current work...] I can easily imagine new future scenarios
23	[In facing a change in my organization] I pay attention to inform my superiors to involve them in my intent
24	After a work performance, I dedicate time to analyze any areas of improvement of my actions
25	I imagine in advance the possible consequences of my choice or decision
26	I direct my actions to facilitate the sharing of innovative policies at all levels
27	[When faced with a problem in my work] I define the essential alternatives and, whenever possible, broaden the choice options
28	In situations of intense stress I am able to manage negative emotions and not hinder my activity

Note. These items have been translated into English for this publication. Original items were in Italian.