Routledge
Taylor & Francis Group

Economic Research-Ekonomska Istraživanja

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rero20

An augmentation for innovation: psycho-Tech innovative work behavior model through an intellectual risk-taking pathway

Majid Riaz, Umar Safdar, Muhammad Qasim & Naeem Akhtar

To cite this article: Majid Riaz, Umar Safdar, Muhammad Qasim & Naeem Akhtar (2023) An augmentation for innovation: psycho-Tech innovative work behavior model through an intellectual risk-taking pathway, Economic Research-Ekonomska Istraživanja, 36:3, 2256830, DOI: 10.1080/1331677X.2023.2256830

To link to this article: https://doi.org/10.1080/1331677X.2023.2256830

Published online: 09 Oct 2023.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA
2023, VOL. 36, NO. 3, 2256830
https://doi.org/10.1080/1331677X.2023.2256830

Routledge
Taylor & Francis Group

An augmentation for innovation: psycho-Tech innovative work behavior model through an intellectual risk-taking pathway

Majid Riaz[a], Umar Safdar[b], Muhammad Qasim[a] and Naeem Akhtar[a]

[a]Business Administration, National College of Business Administration and economics [NCBA&E], Lahore, Pakistan; [b]Research, innovation & Entrepreneurship Unit, University of Buraimi, Oman

ABSTRACT

Organizations require a dynamic and variant work environment to cope with the ever-changing high-tech global challenges, acute competition, and psychological issues. In addition, the covid-19 pandemic has caused devastation across the world. Lockdowns and government measures to restrict the spread of Covid-19 have far-reaching effects on the health and education sectors. Employees in the health and education sectors were surprised by the sudden crisis, which undermined conventional working procedures. Therefore, this study addresses two global issues: high-tech global challenges and covid-19 devastating effects on the health and education sectors. In the context of self-determination theory and theory of planned behavior, the psychological factors (e.g., psychological empowerment, Grit, paradox mindset, and harmonious Passion) and technological factors (for instance, Information and digital handling skills, Communication and collaboration skills and problem-solving skills) have been explored to augment the individual's innovative work behavior through a novel intellectual risk-taking pathway. Consequently, data comprising1611 responses collected through cross-sectional two-time lag from health and education sectors as well as multisource data obtained from their immediate seniors, reduce biases and provide practitioners and policymakers a new 'psycho-tech innovative work behavior model with the help of intellectual risk-taking pathway', which ultimately addresses the high tech global challenges and mitigates the effects of pandemics like Covid-19 and Omicron.

ARTICLE HISTORY
Received 30 August 2022
Accepted 30 August 2023

KEYWORDS
Psychological empowerment; harmonious passion; grit; paradox mindset; digital competence; intellectual risk-taking; innovative work behavior; and covid-19

JEL CODES
C12; C13; C42; C031; C033

1. Introduction

Organizations need a dynamic work environment to face high-tech global challenges, cut throat-competition, and psychological dilemmas. Organizations are rapidly updating their system to be relevant in the dynamic work environment (Afridi et al., 2020).

CONTACT Majid Riaz majidriaz@ymail.com

In the modern age, an organization faces various challenges, such as technological advancement, economic instability, rapid change in customer demands and stiff competition (Frank et al., 2015; Liu et al., 2020). Organizations should use innovation as a leading strategy to strive for challenges and to be relevant in the economy as (Afridi et al., 2020) stated that innovation is crucial for success. Since the seminal work of Joseph Schumpeter (1942), it has been widely believed that innovation is critical for long-term organizational performance and economic progress (Colombo et al., 2021). Innovation boosts the firm's competitive edge and performance by aligning the products with market changes (Damanpour & Wischnevsky, 2006). Hence, innovation enhances organizational performance besides boosting its capacity to face challenges.

Additionally, a pandemic like Covid-19, which has long-lasting effects, is dramatically affecting organizations throughout the globe (Bailey & Breslin, 2021). The Covid-19 outbreak has wreaked havoc across the world. Lockdowns and government initiatives to stop the spread of covid-19 have far-reaching effects on the health, education, social and economic systems. Health systems in low-to-middle-income nations are the most affected since they have fewer buffering resources and the ability to deal with pandemic shocks. Community quarantines, transportation, and border restrictions have widely influenced healthcare delivery and access, harming those needing specialized care the most. Conventional record-keeping and surveillance methods were compromised because available resources were used to perform Covid19-related duties. Local healthcare systems strengthened secondary care gate-keeping mechanisms *via* referral networks and deployed telemedicine services to minimize face-to-face consultations (Bayani & Tan, 2021). Overall, the Covid-19 pandemic placed a performance strain on healthcare workers, necessitating new strategies to address the consequences of Covid-19.

Similarly, due to the suddenness of the Covid-19 crisis, teachers and administrators were taken by surprise. They were obliged to rapidly create emergency remote learning programs to conduct learning recovery programs. However, numerous educational institutions took the initiative to enhance the distance educational experience using various techniques such as social media, email, telephone, and even the post office (Donely et al., 2020). So, in terms of the education sector, the overall picture shows that administration and teaching personnel were put under tremendous strain to deal with this problematic situation, which necessitated new solutions.

Owing to high-tech global challenges and pandemics like Covid-19, a massive change in work dynamics has been witnessed globally. Consequently, organizations need individuals who take the initiative for innovation (Hong et al., 2016). It is individuals who innovate, not organizations, so employees' Innovative Work Behavior (IWB) is of immense importance in improving the performance of the organizations (Afridi et al., 2020; Safdar et al., 2017) as (Fikri et al., 2020) explained that innovative workers love to think out of the box to handle their job tasks and innovatively solve problems. Innovative solutions for the issues, though, are a bit difficult for organizations, yet it does not mean that novel thinking of the innovative workers should be suppressed; rather, their trial and error approach based on innovative thinking should be encouraged and acknowledged by the top management (Cangialosi et al., 2020).

Amabile (1996) also states that to be innovative and effective; organizations must have a workforce capable enough to generate novel and worth implementing ideas that enhance the efficiency of the different processes like administration, production, services, and others (George & Zhou, 2001). So, to improve performance, organizations need innovative solutions (Liu et al., 2020; Waruwu et al., 2020); rather than creating any hurdles and sticking to the plans. Organizations should pave the way for initiatives of individuals who like to be innovative.

IWB is considered an extraordinary behavior with great importance for sustainable organizational performance (Weinek et al., 2020; Yidong & Xinxin, 2016) and for its significant value in organizational output (Odoardi et al., 2015; Shanker et al., 2017), that's why high-performing organizations acknowledge the employees with IWB (Schuh et al., 2018). Resultantly, IWB has become paramount in handling emerging challenges, enhancing competitiveness (Bos-Nehles et al., 2017) and reducing the effects of the epidemic of Covid-19.

There is harmony in the literature that key players can convert innovation input to sustainable innovation growth (Kijek & Kijek, 2010). Innovation input means financial spending for research and development (R&D), and persons who perform in the field are highly professional in the context of qualification, expertise, technical skills, and psychological strength (Galindo-Martín et al., 2019) as in prior research, innovation input explained as an investment in R&D along with intellectual, psychological, and technical well-off persons (Duran et al. 2016; Teece et al., 2009). In addition, many researchers describe that particular spending in R&D is not enough for effective innovation input; still, organizations have to deal with intellectuals, psychology of workers, and technical professionals efficiently to get the most output from the least input in an innovative way (Duran et al. 2016; Sirmon et al. 2011).

Individuals have various personality characteristics that can significantly impact their performance (Judge & Zapata, 2015; Paille et al., 2013). Such as, a self-confident person has faith in his success, and a person with a robust psychological mindset becomes more confident (Cangialosi et al., 2020; Supriyadi et al., 2020), along with additional technological skills that enhance input capacity (Bogers et al., 2022; Parthasarthy & Hammond, 2002) which leads to optimum innovation output. Technological skills are based not only on the usage of electronic gadgets and software but also include the number of complex mental and psychological skills and knowledge ethics that the organizational employees need to perform the tasks (e.g., Information and digital handling skills, communication and collaboration skills, digital and content creation skills, Safety skills, and problem-solving skills) more efficiently and effectively (Ala-Mutka, 2011). Therefore, an organization embraces cutting-edge technology and promotes digitally savvy employees, especially to meet the high tech challenges and to combat the effects of Covid-19 (Akpan et al., 2021).

Prior literature also supports the argument that IWB is influenced by various other factors, such as psychological (e.g., Psychological Empowerment, Grit, Paradox Mind Set, and Harmonious Passion) and technological factors (e.g., Information and data handling skills, Communication and collaboration skills, and Problem-solving skills) that strengthen the IWB (Agarwal, 2014b; Li & Zheng, 2014; Supriyadi et al., 2020). So, to compete for change in the modern world due to high-tech global challenges

and covid-19 effects, individuals must have technological skills and a strong psychological state of mind (Supriyadi et al., 2020).

Furthermore, the literature introduces another vital factor, Intellectual Risk-Taking (IRT), that can foster the IWB at the workplace (Dachner et al., 2017) and is supposed to effectively reduce the effects of the Covid-19 pandemic. Intellectual risk-taking (IRT) behavior of employees within the organization is very much essential to compete in the business world as IRT is referred to as engaging in adaptive learning behaviors (sharing tentative ideas, asking questions, attempting to do and learn new things) that place the learner at risk of making mistakes (Beghetto, 2009). In other words, IRT, unlike other forms of risk-taking behavior (sky diving), is considered adaptive because the benefits of engaging in IRT outweigh the consequences (Beghetto, 2009). So, IRT is also necessary for promoting higher-order thinking and learning about different issues (de Souza Fleith, 2000) to be resolved quickly and differently. Therefore, organizations need employees with IRT, as they love to do new things even if they are unsure.

This multilevel psycho-tech IWB model through the IRT pathway is supported by Self-Determination Theory (SDT) and the theory of planned behavior (TPB). Both theories give importance to socialization, such as relatedness with other people, which is the component of SDT. So, both theories overlap and are supposed to support the multilevel psycho-tech jointly IRT pathway model to enhance innovative work behavior. The present study has taken four Psychological factors (1) Psychological empowerment (PE), (2) Grit, (3) Paradox mindset (PMS), and (4) Harmonious Passion (HP). Furthermore, the digital competence scale of five dimensions (e.g., Information and digital handling skills, communication and collaboration skills, problem-solving skills, digital content creation, and safety) (Vuorikari et al., 2016) has been adopted. Three dimensions out of five have been taken as technological skills such as (1) information and digital handling skills (IDS), (2) communication and collaboration skills (CCS) and (3) problem-solving skills (PSS) to investigate their effects on IWB through an IRT pathway. However, digital content creation and safety are excluded in this study as these are not supposed to be linked with IWB.

The article discusses the importance of psychological factors and technological skills in improving individual innovation at work (IWB) through intellectual risk-taking (IRT). The following gaps in the existing literature have been identified; firstly, IWB is a complex phenomenon as individuals have to deal with many hurdles while turning their novel ideas into action (Afridi et al., 2020; Safdar et al., 2017). Therefore, it becomes essential to explore the psychological factors (e.g., psychological empowerment, grit, paradox mindset, and harmonious passion) and technological determinants of an individual's IWB. Secondly, organizations realized that IRT behavior among employees is significant for their growth and competitiveness, and IRT is not yet tested with IWB in the literature. It has been supposed here that IRT is essential in fostering IWB and targeting this gap. Thirdly, psychological capital is the positive organizational behavior of individuals at the workplace. Luthans and Youssef (2007) developed a psychological capital that exists in a person, such as self-efficacy, hope, optimism, and resiliency, to capture individuals' psychological capacity to

enhance the organization's performance. Still, these psychological factors are not enough to fully explore the complex phenomena of IWB as there are fewer empirical studies on what behaviors exactly researchers should present to enhance IWB (Abbas et al., 2017). including the need to explore the psychological factors and technological determinants of IWB, the significance of IRT behavior in fostering IWB, the need to explore new psychological determinants, and the importance of technologically related determinants of IWB. To address these gaps, the researcher proposes a new multilevel Psycho-Tech model through an IRT pathway to foster IWB at the workplace.

The remaining part of the paper is organized as follows. We review the literature and develop the hypotheses. We then describe the methods and procedures adopted to carry out this study. The statistical results are then presented, and the findings are then thoroughly discussed. The last section of the paper offers the study's implications, limitations, and future research recommendations.

2. Literature review and theoretical background

2.1. Psychological empowerment, IRT and IWB

Psychological empowerment is an intrinsic motivation revealed in four cognitions that indicate an individual's attitude towards his professional role: meaning, competence, self-determination, and impact (Spreitzer et al., 1999). Psychologically empowered employees consider their work circumstances as something they can alter through their actions (Spreitzer, 1995), which also fosters their creativity (To, Fisher, et al., 2015); as they share their ideology about the matter, they are not entirely sure. They give or recommend innovative solutions. According to researchers, psychological empowerment is vital for individuals who love to take initiative (Huang, 2012) and creativeness (Zhang & Bartol, 2010). So the current study proposes that psychologically empowered employees are more likely to be motivated & innovative, and they handle high levels of uncertainty effectively with greater capacity to overcome all obstacles without having the risk of failure because they have organizational support and feel autonomous while accomplishing tasks in a new way (Bain et al., 2001).

Beghetto (2009) defined IRT as 'Engaging in adaptive learning behaviors (sharing tentative ideas, asking questions, attempting to do and learn new things) that place the learner at risk of making mistakes or appearing less competent than others'. There is harmony in literature, and IRT is a potential predictor of creativity (Wan, Lee, et al., 2021; Wan, So, et al., 2021). Further, the link between IRT and creativity has been demonstrated quantitatively (Beghetto, 2009; Perry & Karpova, 2017). Therefore, individuals with IRT ability love to learn new things and share with others, even if there is a risk of mistakes and missteps.

Creativity is the development of unique and beneficial ideas, and it is a vital component of IWB (Amabile, 1988). IWB is different from creativity (Ho et al., 2019) because IWB is more than just coming up with new ideas; it is more about nurturing and implementing them (Amabile, 1988). So, here in this study, it is proposed that IRT has a relationship with IWB. Moreover, IRT can improve the association between PE and IWB.

Hypothesis 1_a: PE is positively related to IRT.

Hypothesis 2_a: PE is positively related to IWB.

Hypothesis 3_a: IRT mediates the relationship between PE and IWB.

2.2. Grit, IRT, and IWB

Everyone has grit, which is beneficial for life (Duckworth et al., 2007). Grit is the psychological concept representing positive psychology and describes consistency as an essential determinant of long-term success linked with the achievement of long-term targets of the organization (Duckworth, 2016; Von Culin et al., 2014). A growing corpus of psychological research shows that grit has a link with various behavioral concepts (Credé et al., 2017), such as creativity. A positive association between grit and creativity is found in the literature, which leads to generating new ideas during the process of innovation, and here gritty attitude is required to come up with novel ideas to solve unstructured problems (Grohman et al., 2017), despite the risk of being failed to solve the problem. Further, grit was considered challenging mainly in the past but not an obvious task (Bernardy & Antoni, 2021). However, preliminary research suggests that it may help achieve the typically ill-defined aims of innovation processes (Grohman et al., 2017; Mooradian et al., 2016). As innovation is a perpetual process, individuals working on it must have patience and persistence (Rousseau et al., 2013). So, innovation is risky and needs an individual's IRT.

Additionally, the relationship between IRT and creativity has been confirmed in various studies (Beghetto, 2009; Dewett, 2006; Eisenman, 1987; Perry & Karpova, 2017), and ultimately creativity leads to IWB. Therefore, this is hypothesized that IRT could improve the connection between grit and IWB. Hence, the following hypotheses have been suggested.

Hypothesis 1_b: Grit is positively related to IRT.

Hypothesis 2_b: Grit is positively related to IWB.

Hypothesis 3_b: IRT mediates the relationship between Grit and IWB.

2.3. Paradox mindset, IRT and IWB

The degree to which one accepts and is energized by conflict is a paradox mindset (Miron-Spektor et al., 2018), signifying the psychological ability to handle the paradoxes (Smith & Tushman, 2005). Further, individuals can adopt a paradox mindset to 'shift their expectations from rationality and linearity to accept paradoxes as persistent and unsolvable puzzles' (Smith & Lewis, 2011). Such situations allow them to broaden their knowledge and discover new things by figuring out how to deal with problems (Sleesman, 2019). In addition, adopting a paradox mindset promotes the growth of an overall capacity to investigate conflicting concepts and cognitive flexibility to seek out new solutions for problems (Liu et al., 2020). Furthermore, employees with a paradox mindset accept tensions, feel easy to tackle them, and grow at ease with anxiety (Rothenberg, 1979; Smith & Berg, 1986). Rather than being scared by

tensions, they seek innovative and effective ways to handle them regularly (Miron-Spektor, 2018).

Additionally, acceptance of tensions promotes awareness of one's ability to completely capture ambiguous and complicated reality configurations, leading to finding and implementing new ideas, despite the failure risk. As a paradox mindset, employees find out how to breathe with tensions and trace, investigate, and confront conflict to inspire new understandings rather than looking for consistency (Poole & Van de Ven, 1989). So, it is further proposed that the Paradox mindset has an impact on IRT and IWB. This study further hypothesizes that IRT could strengthen the paradox mindset and IWB relationship.

Hypothesis 1_c: Paradox mindset is positively related to IRT.

Hypothesis 2_c: Paradox mindset is positively related to IWB.

Hypothesis 3_c: IRT mediates the relationship between the Paradox mindset and IWB.

2.4. Harmonious passion and IRT

When a person performs an activity from the core of his heart without any external pressure, this can be regarded as 'Harmonious Passion' (H.P.), as people don't bother to involve themselves in activities for which they have internal motivation to perform instead they even don't consider the uncertainties attached to those activities (Vallerand et al., 2003). Further, with HP, the individual retains control over the action, even if it plays a significant role in their life (Forest et al., 2012), e.g., a teacher who has a deep love for teaching yet can do it without conflicting with other vital aspects of their life, such as family and friends. Therefore, HP is a motivating factor that motivates individuals to choose such activity, enhancing their satisfaction (Vallerand et al., 2003). There are numerous positive effects associated with this type of passion (Vallerand, 2010), such as creating thinking, implementing novel thinking without the fear of failure and sharing his opinions when he is unsure.

Furthermore, HP refers to a psychological enthusiasm for autonomous motivation and job satisfaction (Ho et al., 2018). It is an important indicator of IWB in the workplace (Luu, 2021; Salas-Vallina et al., 2020). Additionally, empirical research has established a link between autonomous motivation and IWB (Gao, 2017). Moreover, individuals who take pleasure in their work and have a favourable attitude come up with a wide range of creative ideas (Shipton et al., 2006), leading to the IWB. As discussed above, creativity is positively associated with IWB. Hence, this study also hypothesizes that HP is positively impacting IWB and IRT (generating new ideas, putting them into action without fear of failure, and sharing their own opinions, even if they are not sure) may be able to strengthen the link between HP and IWB.

Hypothesis 1_d: HP is positively related to IRT.

Hypothesis 2_d: HP is positively related to IWB.

Hypothesis 3_d: IRT mediates the relationship between HP and IWB.

2.5. IDS, IRT and IWB

Information and Data Handling Skills (IDS) has no uniform definition, as IDS is a multidimensional concept (Yousef et al., 2021). Different terminologies are used for IDS in literature, such as data information literacy, data literacy, science data literacy, statistical literacy, and research data literacy, etc. (Carlson et al., 2011; Koltay, 2015; Prado & Marzal, 2013; Qin & D'Ignazio, 2010).

Moreover, IDS refers to competencies that better utilize the information to solve job tasks creatively (Prado & Marzal, 2013). 'These competencies generally include the ability to define precisely the informational need; the ability to locate information sources suited to that need; the ability to assess critically both the sources and the ideas expressed therein; the ability to manage the information selected; the ability to analyze and synthesize information to support arguments or generate new ideas; the ability to document the sources used; and the ability to record or communicate the results ethically' (Prado & Marzal, 2013). Resultantly, individuals enriched with IDS are involved in doing new things because they are encouraged to make an experiment and learn *via* trial and error. Similarly, this study proposes that IDS, in conjunction with IRT (creating new ideas, putting them into action without fear of failure, and presenting their viewpoints, even if unsure), will foster IWB.

Hypothesis 4_a: IDS has a positive relationship with IRT.

Hypothesis 5_a: IDS has a positive relationship with IWB.

Hypothesis 6_a: IRT mediates the relationship between IDS and IWB.

2.6. CCS, IRT and IWB

Knowing how to communicate effectively using various digital platforms in the modern age is important. Communication and collaboration skills (CCS) are the ability to use diverse digital technologies and recognise the right digital communication tools for a particular scenario (López-Meneses et al., 2020). CCS paves the way for digital tools and technologies for group work, resource production, and knowledge exchange (Carretero et al., 2017; Vuorikari et al., 2016). Therefore, professionals use CCS to learn about behavioral ethics, digital tools, and new ways of collaboration with society, which can enhance innovative capability.

With the changing nature of our society, a new approach is required to educate our future professionals. Individuals must replace the traditional paradigm of knowledge-seeking with new techniques to perform efficiently (Fernández et al., 2017). As we live in a technologically-enhanced age, professionals use synchronic conversation systems for CCS to express themselves creatively (López-Gil & Bernal-Bravo, 2019; Mosa et al., 2016; Sharkova, 2014). So, to compete and be relevant in the modern world, organizations pave the way to enhance the skills of professionals so that they can learn and find a new ways to perform job tasks despite the risk of failure.

Therefore, it is presumed that CCS enhances the individual capacity to learn and implement new techniques with the help of digital technology, which will ultimately help individuals share their new ideas with others and handle issues innovatively.

Additionally, the relationship between IRT and creativity (Beghetto, 2009; Perry & Karpova, 2017) fosters IWB. Therefore, this study proposes the following hypotheses.

Hypothesis 4_b: CCS is positively related to IRT.

Hypothesis 5_b: CCS is positively related to IWB.

Hypothesis 6_b: IRT mediates the relationship between CCS and IWB.

2.7. PSS, IRT, and IWB

Problem-Solving Skills (PSS) are used to discover and resolve technical issues with digital devices and settings (Vuorikari et al., 2016). Professionals with PSS can deal with problems effectively in various settings and identify the best solution (Yu et al., 2015). PSS motivates individuals to upgrade their professional and digital skills (Chang et al., 2017). Therefore, employees having PSS are more relevant and necessary in the Covid-19 era because they are more receptive to upgrading their abilities and digital skills to perform efficiently. As we know, an efficient problem solver can navigate his way through various situations (Lucenario et al., 2016) and is willing to learn and implement new approaches to perform efficiently (Khoiriyah et al., 2018); moreover, he is open to implementing new ideas and techniques without any fear.

Therefore, individuals must modernize their teaching approaches by proficiently using new digital tools (Taamneh et al., 2023), as good learners must be digitally equipped and have PSS. As Mohamed and Badrul Omar (2010) emphasized that a potential learner must possess PSS. Since PSS is chosen as a technique to identify, analyze and find appropriate solutions to the problem (Yu et al., 2015), educational institutions require teachers with rapid learning abilities as well as PS competence to overcome this pandemic condition. There is evidence in prior research that teachers with PSS are eager to learn new skills and improve their performance (Shanta & Wells, 2020). This curious behavior walkthrough teaches new digital techniques to complete job assignments efficiently and innovatively especially intense situations like the pandemic of Covid-19. A creative problem-solver must possess the intellectual fortitude to present and defend the points of view of others, which is always risky (Montmarquet, 1993). As already discussed, there is harmony in the literature and IRT is a potential predictor of creativity (Wan, Lee, et al., 2021). Moreover, creativity, i.e., developing unique and beneficial ideas, is a vital component of IWB (Amabile, 1988). Finally, this study suggests that PS has a significant effect on IRT and that this effect may strengthen the link between PSS and IWB.

Hypothesis 4_c: PSS is positively related to IRT.

Hypothesis 5_c: PSS is positively related to IWB.

Hypothesis 6_c: IRT mediates the relationship between PSS and IWB.

2.8. IRT and innovative work behavior

Intellectual risk-taking refers to an individual's desire to enact adaptive behaviors, share novel ideas, perform unique things, and learn to opt for new things; these behaviors put the individual at failure risk (Beghetto, 2009). IRT can be related to

creative behaviors and creative confidence beliefs with creative scenarios (Beghetto et al., 2021); according to Glover and Gray (1975), creative persons and intellectual risk-takers have behavioral propensities of being distinctive and non-conforming. A creative issue solver must possess the intellectual fortitude to present and defend other points of view, which is always risky (Montmarquet, 1993). The relationship between IRT and creativity has also been quantified (Beghetto, 2009; Dewett, 2006; Perry & Karpova, 2017). As a result, employees with IRT have an enhanced capacity for creativity. As we live in a creative era (Florida, 2019), creativity is a crucial component of innovative behavior (Saether, 2019), and this has improved both efficiency and enjoyment while performing tasks (Baer, 2012). Moreover, creativity, i.e., developing unique and beneficial ideas, is a vital component of IWB (Amabile, 1988). As we live in a creative era (Florida, 2019), creativity is a crucial component of innovative behavior (Saether, 2019). So, an individual with IRT will introduce and implement innovative ideas and find new approaches to perform routine tasks and solve organizational problems. Therefore, this study will have a positive relationship between IRT and IWB.

Hypothesis 3: IRT is positively related to IWB.

3. Method

3.1. Sampling and procedures

The data were collected from health and education to achieve the study's objectives because both have primary concerns during Covid-19. These sectors are selected because the success, growth, and survival during Covid-19 and high-tech global competition are based on innovation. Healthcare organizations face the problems of delivering quality services and cost minimization (Carlucci et al., 2020). Further, the education sector is in desperate need of innovations to keep the momentum of education at a pace even during the closer of education sector due to Covid-19 and gain a competitive edge over others (Hsiao et al., 2009).

The study's intended population consists of the following individuals: Teachers and administrative employees (who have completed at least 14 years of education) are taken from the education sector (Schools and Colleges), administrative employees work in the health sector (Govt. and Private hospital, and medical labs) of major cities of Pakistan through non-probability convenience sampling.

Three research instruments used in this study are named T1, T2, and multisource. The data collection unit was dyads in this study, a time-lagged cross-sectional study. So data were collected in two waves from both sectors. In the first-time lag period (T1), we will collect the data from the employees relating to independent variables such as psychological and technological factors. Further, in the second time lag period (T2), which incorporates a mediating variable, along with collecting multisource data of dependent variable, was collected from the immediate senior of the employees to minimize the common method biases after collecting the data. An interval of almost 30 days between the two waves of data collection (T1 and T2) minimized the influence of desirable and common method biases (Podskoff et al., 2013).

Researchers sent out 3700 surveys in the first time lag and got 2000 fully completed questionnaires; in the second time lag, they received 1700 completed questions and responses from the multisource supervisor. Only 1611 questionnaires were kept for analysis, while the rest were discarded due to incomplete questionnaires and unavailable supervisor replies.

3.2. Measurements

This study adopted measures of psychological empowerment, Grit, paradox mindset, Passion, IRT, creative self-efficacy, and IWB. Further, digital competence of five dimensions (e.g., Information and digital handling skills, communication and collaboration skills, problem-solving skills, digital content creation, and safety skills) (Vuorikari et al., 2016) is being adopted in this study three-dimension out of five is taken as technological skills such as (1) information and digital handling skills, (2) communication and collaboration skills and (3) problem-solving skills to investigate their effect on IWB through an IRT pathway which is being moderated by creative self-efficacy. Two dimensions, digital content creation and safety, are excluded from this study because safety skills and digital content creation are not supposed to support IRT.

Psychological empowerment was measured with Twelve (12) items adopted from (Spreitzer, 1995). The sample item is '*I am confident about my ability to do my job*' Cronbach's alpha ($\alpha = 0.871$) is more than the required $\alpha = 0.70$ (Taber, 2018).

Grit was measured with eight (8) items taken from the past study (Duckworth & Quinn, 2009). The sample item was '*Setbacks don't discourage me, and I am diligent.*' Cronbach's alpha ($\alpha = 0.784$) is more than the required $\alpha = 0.70$ (Taber, 2018).

Paradox Mindset is measured by employing Nine (9) items scale adopted from past research (Miron-Spektor et al., 2018). Sample item '*When I consider conflicting perspectives, I gain a better understanding of an issue*'. Cronbach's alpha ($\alpha = 0.840$) is more than the required $\alpha = 0.70$ (Taber, 2018).

Harmonious Passion was measured by using Seven (7) items scale adopted from previous research (Vallerand et al., 2003). Sample item '*The new things that I discover with this activity allow me to appreciate it even more*' Cronbach's alpha ($\alpha = 0.830$) is more than the required $\alpha = 0.70$ (Taber, 2018).

Information and digital literacy scale consist of Five (5) items taken from (Vuorikari et al., 2016). A sample item is '*I could adapt my searches based on knowledge about how search engines produce results*' Cronbach's alpha ($\alpha = 0.800$) is more than the required $\alpha = 0.70$ (Taber, 2018).

Communication and collaboration was measured with Six (6) items scale adopted from the previous study (Vuorikari et al., 2016). A sample item is '*I could communicate with someone online without exposing my identity*'. Cronbach's alpha ($\alpha = 0.809$) is more than the required $\alpha = 0.70$ (Taber, 2018).

Problem-Solving was measured with five (5) items adopted from past studies (Vuorikari et al., 2016). The sample item is '*I could find solutions to technical problems by searching online*'. Cronbach's alpha ($\alpha = 0.811$) is more than the required $\alpha = 0.70$ (Taber, 2018).

Intellectual Risk-Taking was measured with Six (6) items adopted from (Beghetto, 2009). Sample items were '*During work, I like doing new things even if I am not very good at them*'. Cronbach's alpha ($\alpha = 0.873$) is more than the required $\alpha = 0.70$ (Taber, 2018).

Innovative work behavior was measured with Ten (10) items adopted from (de Jong & den Hartog, 2010). Sample item is '*He often generates original solutions for problems*'. Cronbach's alpha ($\alpha = 0.838$) is more than the required $\alpha = 0.70$ (Taber, 2018).

The Table 1 shows the demographics (age, gender, qualification, marital status, and tenure in this organization) of those who work in the health and education sector. 528 (73.13%) health sector employees were up to the age of 30 years. Furthermore, the average age of the 183 (25.35%) workers was between 31 and 40 years, with just 11(1.52%) employees older than 40 years old. 648 (72.89%) of education sector workers were between 20 and 30 years. The age of the 203 employees (22.84%) ranged between 31 and 40 years, with just 38 (4.27%) employees older than 40 years of age in the group.

The majority of workers in the health sector are male, as demographics of employees reveal that 576 (79.78%) are male and 146 (20.22%) are female. Education sector also show that 501 (56.36%) are male and 388 (43.64%) are female, indicating that men are more than women.

In health sector, the majority of respondents (424 employees, which are 58.73% of the total) finish their 16 years of education. A significant number (230 employees, 31.86% of the total) complete their 14 years of education. In contrast, only 56 (7.76%) and 12 (1.65%) of employees complete their education of 18 and 21 years, respectively. In education sector, the majority of respondents (741 employees, or 83.35% of the total) complete their 16 years of education. Further, only (38 employees or 4.27% % of the total) complete their 14 years of study. However, a considerable number 102 (11.47%) and 8 (0.91%) of employees have completed their education of 18 years and 21 years respectively.

Table 1. Respondent profile of the health and education sector.

		Health Sector		Education Sector	
Demographics	Categories	Frequency	Percentage of responses	Frequency	Percentage of responses
Age	Up to 30	528	73.13	648	72.89
	31–40	183	25.35	203	22.84
	Above 40	11	1.52	38	4.27
	Total	722	100	889	100
Gender	Male	576	79.78	501	56.36
	Female	146	20.22	388	43.64
	Total	722	100	889	100
Qualification	14 Years	230	31.86	38	4.27
	16 Years	424	58.73	741	83.35
	18 Years	56	7.76	102	11.47
	21 Years	12	1.65	8	0.91
	Total	722	100	889	100
Tenure in this organization	Less than 4 Years	555	76.87	629	70.75
	4–6 (Years)	147	20.36	194	21.83
	7–9 (Years)	16	2.22	45	5.06
	Above 9 Years	4	0.55	21	2.36
	Total	722	100	889	100

Source: Author-created through PLS software.

Finally, health sector shows the time spent by their workers in this organization. Most of them (555 employees that are 76.87% of total) spent less than four years in this organization, 147 (20.36%) employees were spent between 4 to 6 years, rest of them spent above seven years in this organization. In education sector majority of majority of employees (629 employees, or 70.75% of the total) spending less than four years in this organization, 194 employees (21.83%) spending between four and six years, and the remainder spending more than seven years in this organization. Overall it's a good demographic stats to conclude the results.

3.3. Data analysis and findings

3.3.1. ANOVA test

As data were obtained from two distinct sectors, i.e., health and education. It was expected that there would be divergences in the core variable. As a result, we used the 'Analysis of Variance (ANOVA)' test to look for patterns in the data (Agarwal, 2014a). Results in Table 2 show that the F value for the core variable (IWB dependent variable) was not statistically significant. So, both sectors are the same, and there is no need to handle them differently.

Above Table 3 shows the variables' mean and standard deviation and correlations. All relationships are positively significant, and there is no issue of multicollinearity.

3.4. Validity and reliability of the measures

Before analyzing the path coefficients, the construct's discriminant and convergent validity (Wong, 2013). As 'measurement model approach is used to assess the reliability, composite reliability (CR) and average variance extracted (AVE) of the constructs' (Iqbal et al., 2021). Thus, Cronbach Alpha (CA) and CR were utilized in this study to assess the construct's reliability. To be considered acceptable, CA and CR values can be more than 0.70 (Hair et al., 2011).

Table 2. ANOVA results.

Average IWB	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.455	1	0.455	2.58	0.11
Within Groups	198.951	1610	0.176		
Total	199.405	1611			

Source: Author-created through PLS software.

Table 3. Descriptive statistics and bivariate correlations.

Variables	Means	SD	1	2	3	4	5	6	7	8	9
1. PE	4.532	0.628	1								
1Grit	4.156	0.437	0.614**	1							
1PMS	4.15	0.469	0.778**	0.638**	1						
1. HP	4.329	0.556	0.804**	0.658**	0.789**	1					
1.IDS	4.23	0.58	0.665**	0.640**	0.722**	0.733**	1				
1CCS	4.053	0.49	0.516**	0.579**	0.564**	0.565**	0.655**	1			
1PSS	4.357	0.571	0.744**	0.603**	0.706**	0.773**	0.716**	0.571**	1		
1.IRT	4.517	0.552	0.568**	0.389**	0.469**	0.554**	0.423**	0.357**	0.576**	1	
1IWB	4.529	0.426	0.612**	0.454**	0.549**	0.562**	0.533**	0.319**	0.578**	0.487**	1

Note: $N = 1611$. $^{**}p < 0.01$.
Source: Author-created through PLS software.

Below Table 4 indicated that the values were within acceptable limits. The convergent validity is present. All of the results were over the 0.50 criterion for AVE (for PE, Grit, PMS, HP, IDL, CC, PS, IRT, and IWB, the AVE values were 0.526, 0.607, 0.510, 0.541, 0.624, 0.637, 0.569, 0.613, and 0.508 respectively), as recommended by Henseler et al., (2016). Furthermore, some line items of various constructs delete due to low factor loading.

3.5. Discriminant validity

This study incorporates the HTMT ratio approach to determine the discriminant validity. Table 5 displays the outcomes of HTMT ratios that all are less than 0.90 compared to the criteria (Henseler et al., 2015).

3.6. Model fitness

This research found a substantial GoF since the SRMR value in this study is (0.069). Further, Chin (1998) claims that the value of R square must be greater than 0.1. As the value of the R square of IWB is 0.58, in this study, 58% variance appeared in IWB, explained by all independent factors (PE, grit, PMS, HP, IDS CCS, and PSS) and mediated factor (IRT). Futher, in this study 39% variance occurred in IRT by all independent factors (PE, grit, PMS, HP, IDS, CCS, and PSS) (see below Table 6).

3.7. Hypothesis testing

The hypotheses for the research were tested in two stages. The first phase determined the direct relationship between research variables, such as psychological factors (PE,

Table 4. Factors loading and convergent validity.

Construct	CR	AVE	Cronbach's Alpha
Psychological Empowerment	0.9	0.53	0.87
Grit	0.86	0.61	0.784
Paradox Mindset	0.88	0.51	0.84
Harmonious Passion	0.88	0.54	0.83
Information and Data Literacy	0.87	0.62	0.8
Communication and Collaboration	0.88	0.64	0.809
Problem-Solving	0.87	0.57	0.811
Intellectual Risk-Taking	0.91	0.61	0.873
Innovative Work Behavior	0.88	0.51	0.838

Note: All items loading were above 0.45.
Source: Author-created through PLS software.

Table 5. Heterotrait-Monotrait (HTMT).

Constructs	CCS	GRT	IDS	IRT	IWB	PE	PMS	HP (PSN)
CCS								
GRT	0.826							
IDS	0.813	0.879						
IRT	0.557	0.599	0.528					
IWB	0.616	0.786	0.734	0.592				
PE	0.728	0.895	0.775	0.642	0.793			
PMS	0.852	0.89	0.892	0.583	0.77	0.88		
HP (PSN)	0.82	0.896	0.895	0.644	0.755	0.889	0.895	
PSS	0.85	0.877	0.896	0.686	0.752	0.865	0.89	0.895

Source: Author-created through PLS software.

Table 6. Structure model results.

Construct	R Square	Adjusted R Square	SRMR
Innovative work behavior	0.58	0.574	0.069
Intellectual Risk-Taking	0.39	0.385	

Source: Author-created through PLS software.

Table 7. Psycho-tech variables correlations with IRT.

Hypotheses	Relationship	Beta	Mean	Standard Deviation	*t*-value	*p*-value	Decision
$H1_a$	PE → IRT	0.25	0.249	0.046	5.447	0.000	Accepted
$H1_b$	Girt → IRT	0.056	0.054	0.044	1.265	0.206	Rejected
$H1_c$	PMS → IRT	−0.055	−0.051	0.048	1.141	0.254	Rejected
$H1_d$	HP → IRT	0.162	0.164	0.059	2.765	0.006	Accepted
$H4_a$	IDS → IRT	−0.088	−0.091	0.041	2.125	0.034	Accepted
$H4_b$	CCS → IRT	0.024	0.023	0.043	0.545	0.586	Rejected
$H4_c$	PSS → IRT	0.321	0.322	0.053	6.027	0.000	Accepted

Source: Author-created through PLS software.

Table 8. Stepwise regression analysis of Grit and PMS with IRT.

Steps	Beta	*t*-Value	*p* Value	Steps	Beta	*t*-Value	*p*-Value
Step 1: Girt→IRT	0.49	22.456	0.000	Step 1: PMS→IRT	0.502	24.05	0.000
Step 2: Grit→IRT	0.179	4.622	0.000				
PE→IRT	0.432	11.866	0.000	Step 2: PMS→IRT	0.297	7.547	0.000
Step 3: Grit→IRT	0.078	1.817	0.070	Grit→IRT	0.278	6.726	0.000
PE→IRT	0.276	7.128	0.000				
HP→IRT	0.299	7.709	0.000	Step 3: PMS→IRT	0.094	2.124	0.034
Step 4: Grit→IRT	0.084	1.882	0.060	Grit→IRT	0.147	3.352	0.001
PE→IRT	0.289	6.551	0.000	PE→IRT	0.381	8.929	0.000
HP→IRT	0.311	7.194	0.000				
PMS→IRT	−0.03	0.676	0.499	Step 4: PMS→IRT	−0.03	0.692	0.489
Step 5: Grit→IRT	0.065	1.411	0.158	Grit→IRT	0.084	1.878	0.061
PE→IRT	0.322	7.538	0.000	PE→IRT	0.311	7.067	0.000
HP→IRT	0.241	4.661	0.000	HP→IRT	0.289	6.465	0
PMS→IRT	−0.06	1.248	0.212				
IDS→IRT	0.101	2.692	0.007				

Source: Author-created through PLS software.

grit, PMS, and HP) and technological factors (IDS, CCS, and PSS) that have a relationship with IRT and IWB. And the second phase was measuring and analyzing the mediation paths that existed between the variables.

3.8. Correlations with IRT

Table 7 shown that ($H1_a$) PE has a positive and substantial impact on IRT ($\beta = 0.277$, $t = 5.447$, $p = 0.000$). Thus, $H1_a$ is accepted, as this explains that PE positively impacts IRT. Grit has no impact on IRT as its *p*value is insignificant ($p = 0.206$); therefore, $H1_b$ was rejected. But when this path is check from stepwise regression analysis (SRA) it is significant ($\beta = 0.490$, $t = 22.456$, $p = 0.000$). (see Table 8). Further ($H1_c$) does not affect IRT due to its insignificant *p*value as well ($p = 0.206$) in PLS-SEM, hence rejected. Whereas in SRAthis path is also significant ($\beta = 0.500$, $t = 24.047$, $p = 0.000$). (see Table 8). Furthermore, ($H1_d$) has a positive significant effect on IRT ($\beta = 0.162$, $t = 2.765$, $p = 0.006$). Thus, $H1_d$ is accepted, demonstrating that HP has a positive effect on IRT. Additionally, the results of PLS-SEM reveals that ($H4_a$) IDS has a negative impact on IRT ($\beta = -0.088$, $t = 2.125$, $p = 0.034$). Hence accepted $H4_a$. Further, $H4_b$ has no impact on IRT as its *p*value is insignificant ($p = 0.586$),

therefore rejected. However, SRA confirms the significance of this path. (see Table 9). Finally, results show that ($H4_c$) PSS has a strong positive impact on IRT ($\beta = 0.321$, $t = 6.027$, $p = 0.000$), therefore $H4_c$ accepted.

Table 8 shown that Grit has a considerable influence on IRT up to step 4. However, by integrating IDS (the technology aspect) in step 5, Grit becomes unimportant. As a result, grit has a considerable influence on the IRT in terms of psychological factors.

Table 9 shown that CCS has a considerable influence on IRT up to step 3. However, by integrating PMS (the technology aspect) in step 4, CCS becomes unimportant. As a result, CCS has a considerable influence on the IRT in terms of technological factors.

3.9. Direct correlations with IWB

Below Table 10 shows the results of the direct path of all independent variables with IWB. Results of PLS-SEM show that ($H2_a$) has a significant impact on IWB ($\beta = 0.268$, $t = 6.843$, $p = 0.000$). Thus, H2(a) is accepted, as this explains that PE has a positive impact on IWB. $H2_b$ results demonstrate that Grit has a significant positive effect on IWB ($\beta = 0.157$, $t = 4.351$, $p = 0.000$). Therefore, $H2_b$ accepted. Further PMS ($H2_c$) has a positive and substantial impact on IWB ($\beta = 0.108$, $t = 2.727$, $p = 0.007$). Thus, $H2_c$ is also accepted. Furthermore, $H2_d$ is accepted there is significant relationship between HP and IWB ($\beta = 0.075$, $t = 1.878$, $p = 0.061$). Study results also reveal that IDS ($H5_a$) has a substantial positive effect on IWB ($\beta = 0.0.200$, $t = 5.464$, $p = 0.000$). Therefore $H5_a$ is accepted. Additionally, the results of PLS-SEM reveals that ($H5_b$) CCS has a Strong positive impact on IRT ($\beta = 0.181$, $t = 5.816$, $p = 0.000$). Hence accepted $H5_b$. In the end table, 10 show that $H5_c$ is accepted as well, because

Table 9. Stepwise regression analysis of CCS with IRT.

Steps	Beta	*t*-Value	*p*-Value
Step 1: CCS→IRT	0.48	23.05	0.000
Step 2: CCS→IRT	0.33	9.261	0.000
IDS→IRT	−0.2	5.152	0.000
Step 3: CCS→IRT	0.1	2.295	0.022
IDS→IRT	−0.01	0.162	0.471
PSS→IRT	0.51	11.05	0.000
Step 4: CCS→IRT	0.08	1.882	0.450
IDS→IRT	0	0.611	0.652
PSS→IRT	0.31	18.19	0.000
PMS→IRT	−0.03	0.676	0.499

Source: Author-created through PLS software.

Table 10. Psycho-tech variables correlations with IWB.

Effects	Relationship	Beta	Mean	S.D	*t*-Value	*p*-Value	Decision
$H2_a$	PE → IWB	0.27	0.271	0.04	6.843	0.000	Accepted
$H2_b$	Grit → IWB	0.16	0.157	0.04	4.351	0.000	Accepted
$H2_c$	PMS → IWB	0.11	0.107	0.04	2.727	0.007	Accepted
$H2_d$	HP → IWB	0.08	0.073	0.04	1.878	0.061	Accepted
$H5_a$	IDS → IWB	0.2	0.2	0.04	5.464	0.000	Accepted
$H5_b$	CCS → IWB	0.18	0.18	0.03	5.816	0.000	Accepted
$H5_c$	PSS → IWB	0.12	0.121	0.04	3.043	0.002	Accepted

Source: Author-created through PLS software.

($\beta = 0.121$, $t = 3.043$, $p = 0.002$) this means PSS has a positive significant effect on IWB

3.10. Correlations with IWB through IRT

Below Table 11 shows mediations or indirect paths. As the results reveal that ($H3_a$) IRT has a positive significant indirect effect between PE and IWB ($\beta = 0.029$, $t = 3.415$, $p < 0.01$). Hence $H3_a$ is accepted. Further the direct effect of PE on IRT ($\beta = 0.277$, $t = 5.447$, $p < 0.01$) and PE on IWB IWB ($\beta = 0.268$, $t = 6.843$, $p < 0.01$), both are positive and significant, along with indirect significant path, this demonstrates the partial mediation in this path. $H3_b$ and $H3_c$ are rejected due to insignificant *p*value ($p = 0.228$) and ($p = 0.267$), respectively. But both path is significant in SRA. Furthermore, $H3_d$ is accepted ($\beta = 0.019$, $t = 2.352$, $p < 0.05$); this means IRT positively and significantly mediates between HP and IWB. In addition HP have positive and significant direct relation with IRT ($\beta = 0.162$, $t = 2.765$, $p < 0.01$), which means Partial mediation in this indirect path. IDS have negative and significant direct relation with IRT ($\beta = -0.010$, $t = 1.941$, $p = 0.036$), which means Partial mediation in this indirect path. Additionally, $H6_b$ are rejected due to an insignificant *p*value ($p = 0.589$). Finally, $H6_c$ is accepted because this path has th e significant positive *p*value ($\beta = 0.037$, $t = 3.588$, $p < 0.01$), which means IRT has indirect positive effect between PSS and IWB, and PSS has significant positive relation with IRT ($\beta = 0.321$, $t = 6.027$, $p < 0.01$) and IWB ($\beta = 0.121$, $t = 3.043$, $p < 0.01$) as well. Therefore, there is partial mediation in this path (Tables 12 and 13).

Table 11. Mediations results.

Effects	Relationship	Beta	Mean	S.D	*t*-Value	*p*-Value	Decision
$H3_a$	PE → IRT → IWB	0.029	0.029	0.009	3.415	0.001	Accepted
$H3_b$	Grit → IRT → IWB	0.007	0.006	0.005	1.206	0.228	Rejected
$H3_c$	PMS → IRT → IWB	−0.006	−0.006	0.006	1.111	0.267	Rejected
$H3_d$	HP → IRT → IWB	0.019	0.019	0.008	2.352	0.019	Accepted
$H6_a$	IDS → IRT → IWB	−0.01	−0.01	0.005	1.941	0.036	Accepted
$H6_b$	CSS → IRT → IWB	0.003	0.003	0.005	0.541	0.589	Rejected
$H6_c$	PSS → IRT → IWB	0.037	0.037	0.01	3.588	0.000	Accepted

Source: Author-created through PLS software.

Table 12. Stepwise regression analysis of Grit and PMS with IWB through IRT.

Steps	Beta	t-value	p-value	Steps	Beta	*t*-value	*p*-value
Step1: Grit→IRT→IWB	0.26	14.27	0.000	Step1: PMS→IRT→IWB	0.264	14.729	0.000
Step2: Grit→IRT→IWB	0.1	4.561	0.000				
PE→IRT→IWB	0.23	9.647	0.000				
Step3: Grit→IRT→IWB	0.04	1.967	0.049	Step2: PMS→IRT→IWB	0.081	3.869	0.000
PE→IRT→IWB	0.16	6.724	0.000	Grit→IRT→IWB	0.232	10.012	0.000
HP→IRT→IWB	0.14	6.401	0.000				
Step4: Grit→IRT→IWB	0.09	2.047	0.041	Step3: PMS→IRT→IWB	0.049	2.121	0.034
PE→IRT→IWB	0.31	7.325	0.000	Grit→IRT→IWB	0.078	3.513	0.001
HP→IRT→IWB	0.28	6.546	0.000	PE→IRT→IWB	0.199	8.217	0.000
PMS→IRT→IWB	−0.03	0.627	0.531				
Step5: Grit→IRT→IWB	0.07	1.579	0.115	Step4: PMS→IRT→IWB	−0.02	0.621	0.534
PE→IRT→IWB	0.32	7.324	0.000	Grit→IRT→IWB	0.047	2.02	0.044
HP→IRT→IWB	0.24	4.585	0.000	PE→IRT→IWB	0.162	6.89	0.000
PMS→IRT→IWB	−0.06	1.19	0.234	HP→IRT→IWB	0.148	6.226	0.000
CCS→IRT→IWB	0.1	2.629	0.009				

Source: Author-created through PLS software.

Table 13. Stepwise regression analysis of CCS with IWB through IRT.

Steps	Beta	*t*-value	*p*-value
Step1: CCS→IRT→IWB	0.243	13.574	0.000
Step2: CCS→IRT→IWB	0.115	5.431	0.000
IDS→IRT→IWB	−0.160	4.152	0.000
Step3: CCS→IRT→IWB	0.043	1.967	0.029
IDS→IRT→IWB	−0.160	6.724	0.682
PSS→IRT→IWB	0.325	11.048	0.000
Step4: CCS→IRT→IWB	0.029	2.047	0.121
IDS→IRT→IWB	−0.010	1.251	0.321
PSS→IRT→IWB	0.283	6.546	0.000
PMS→IRT→IWB	−0.030	0.627	0.531

Source: Author-created through PLS software.

Table 14. Direct correlation between IRT and IWB.

Effects	Relationship	Beta	Mean	S.D	*t*-Value	*P*-Value	Decision
H7	IRT → IWB	0.117	0.116	0.027	4.398	0.000	Accepted

Source: Author-created through PLS software.

Table 14 shows the results of the direct path IRT with IWB. Results of PLS-SEM show that (H7) has a significant impact on IWB ($\beta = 0.117$, $t = 4.398$, $p < 0.01$). Thus, H7 is accepted, as this explains that IRT positively impacts IWB.

4. Discussion

'Innovative work behavior (IWB) is the ability of employees to generate and implement new ideas and solutions to improve work processes, products, or services' (de Jong & den Hartog, 2010). The results show that psychological factors such as psychological empowerment, paradox mindset, grit and harmonious workforce passion in the education and health sector enhance intellectual risk-taking ability. As innovation is risky and outcomes are usually uncertain (Elsayed et al., 2023), IRT augments the IWB of psychologically empowered employees. This study's findings were consistent with those of other earlier investigations (e.g., Masood & Afsar, 2017; Saeed et al., 2019; Singh & Sarkar, 2012). Similarly, employees with a paradox mindset are not feared for their failure; in return, they get more motivated to try other ways of doing things (Liu & Zhang, 2022) and take an intellectual risk, which fosters their IWB. This study's result is aligned with previous studies' results (Liu et al., 2020; Miron-Spektor et al., 2018).

Grit, on the other hand, refers to an individual's passion and perseverance toward long-term goals despite facing challenges and obstacles. Results have shown that grit is positively associated with IWB. This research's results align with previous studies (Rasidi, 2021; Suendarti et al., 2020; Widodo & Chandrawat, 2021). Employees with high levels of grit are more likely to engage in IWB and overcome the hurdles that come with it. They are more persistent in pursuing innovative ideas and less likely to give up when faced with setbacks or failure. Furthermore, individuals with high levels of grit tend to be more resilient, which is an essential quality for innovation. They can bounce back quickly from setbacks and failures, learn from their experiences, and use that knowledge to generate better ideas and solutions.

Harmonious Passion (HP) refers to an individual's intense enjoyment and internal motivation for a particular activity that aligns with their identity and

values, bringing a sense of fulfilment and positive emotions. When it comes to (IWB), individuals with a higher level of HP are more likely to engage in IWB and generate new and valuable ideas for their organizations, as they feel a sense of purpose and enjoyment in their work. Moreover, results have suggested that harmonious passion can also facilitate IWB through intellectual risk-taking (IRT), which involves the willingness to take calculated risks and challenge the status quo to generate novel and useful ideas. This research results align with previous studies (Rasidi, 2021; Suendarti et al., 2020; Widodo & Chandrawat, 2021). Individuals with harmonious passion may be more likely to engage in IRT, as they perceive their work as meaningful and enjoy generating new ideas, even if it involves some level of risk or uncertainty. Therefore, organizations can benefit from fostering harmonious passion among their employees, as it may lead to increased IWB and innovation, which can drive growth and competitiveness in the long term. Additionally, providing a supportive work environment and encouraging risk-taking can help individuals with harmonious passion feel more comfortable and confident in engaging in IRT and generating novel and valuable ideas.

The COVID-19 pandemic has brought about significant changes in the education and health sectors, where the use of technology has become even more critical for these sectors' continuity. In this context, technological skills such as information and digital handling skills, communication and collaboration skills, and problem-solving skills have become essential for individuals to perform their roles effectively. Information and data handling skills are the ability to comprehend and effectively use data to influence decision-making (Mandinach & Gummer, 2013).

This study's results show that IDS negatively influences IRT. There are various reasons for the negative association between IDS and IRT. Firstly, IRT indicates that workers like trying new things, even if they are not very good at them, which means a risk of failure. At the same time, IDS is a particular set of knowledge and skills that enable the individual to analyze and convert data into operational data (Koltay, 2015). Therefore, when employees possess the necessary abilities for successful information and data management, the risk of failure is reduced. Hence, there is a negative relationship between IDS and IRT. Additionally, results indicate a strong positive association between IDS and IWB. IDS refers to a set of competencies that can effectively utilize the information to solve job tasks (Prado & Marzal, 2013); as information and data become more digitalized, employees with IDS successfully do work activities using digital data and information (Koltay, 2015).

Further, this study tests the second technological factor (CCS) with IRT. Hypothesis rejected due to insignificant value ($p = 0.586$). Results showed that CCS has a strong positive relationship with IWB. Therefore, this skill is beneficial in a tense situation like Covid-19. Since such situations possess enormous challenges, professionals must have CCS to perform effectively. Furthermore, statistical results confirmed the strong positive relationship between PSS, IRT, and IWB. As we know, the Covid-19 outbreak caused disorder in the world's educational institutions (Ahmed et al., 2021); therefore, educational institutions need instructors and administrators to have PSS because educational institutions need efficient and effective procedures to survive during epidemics.

In the education sector, teachers have had to adapt to remote teaching methods, which requires them to have a strong grasp of various digital tools and platforms to deliver quality education. Teachers who possess better digital skills are more likely to incorporate new technologies into their teaching practices, leading to more innovative work behavior. In the health sector, the pandemic has accelerated the adoption of telemedicine and remote healthcare services, requiring healthcare professionals to have robust Information and digital handling skills to provide quality patient care. Additionally, healthcare professionals with good communication and collaboration skills can work more effectively in multidisciplinary teams to develop innovative solutions to complex healthcare problems.

Individuals with better technological skills are more likely to engage in innovative work behavior through intellectual risk-taking, particularly in the education and health sector during COVID-19.

4.1. Implications

Theoretically, this study contributes to the theory of planned behavior and self-determination theory by presenting a new IRT pathway to improve the IWB, as well as exploring psychological factors (such as PE, Grit, PMS, and HP) and technological skills (such as IDS, CCS, and PSS) that nurture the IRT and, in turn, boost the IWB. This study contributes to the existing literature in many folds. Firstly, it explores the role of psychological and technological factors in enhancing the individual's IWB. Secondly, IRT behavior among employees plays a significant role in the IWB of employees of the education and health sector, and this study has examined the mediating role of IRT between psychological factors and IWB. Similarly, the mediating role of IRT between Technological factors and IWB is also tested, which was missing in the existing body of knowledge. This study has explored new psychological determinants such as psychological empowerment, paradox mindset, Grit and harmonious passion that enhance the individuals' IWB at the workplace. Fourthly, this study provides a comprehensive framework to reduce or combat the effects of a pandemic like Covid-19.

The practical implications of this paper suggest that organizations can benefit from fostering psychological empowerment, paradox mindset, Grit, and harmonious passion among their employees to enhance their ability to generate and implement new ideas and solutions to improve work processes, products, or services. These factors can help individuals to take intellectual risks and overcome the hurdles that come with innovation. Therefore, organizations must provide a supportive work environment and encourage risk-taking to help employees feel more comfortable and confident in engaging in innovative work behavior.

Moreover, the COVID-19 pandemic has brought about significant changes in the education and health sectors, where technology has become even more critical for these sectors' continuity. Therefore, individuals must possess technological skills such as Information and digital handling skills, communication and collaboration skills, and problem-solving skills to perform their roles effectively in these sectors. Individuals with better technological skills are more likely to engage in

innovative work behavior by taking intellectual risks in their learning and applying their skills to solve complex problems in the education and health sector during COVID-19.

In summary, organizations can benefit from fostering psychological empowerment, paradox mindset, Grit, and harmonious passion among their employees, along with providing a supportive work environment and encouraging risk-taking. Additionally, individuals with better technological skills are more likely to engage in innovative work behavior through intellectual risk-taking, particularly in the education and health sector during COVID-19. In addition, this research provides policymakers and practitioners with a new 'psycho-tech innovative work behavior model through IRT pathway' to reduce the consequences of pandemics such as Covid-19 and Omicron in the health and education sectors and meet the high-tech global challenges.

4.2. Limitations and future research directions

While this study used a large data set and established research criteria to validate the effectiveness of a novel psycho-tech innovative work behavior model through the IRT pathway, it is limited by a few shortcomings. This study's results cannot be generalized as a sample was drawn only from the education and health sector. Future research may resolve this issue by including data from other sectors. Further, this study incorporated supervisory assessments, generally accepted as reliable indicators of IWB, but there is always the possibility of biases in perception. Future studies may solve this problem by including both supervisor and peer evaluations in their research. Furthermore, since this research is cross-sectional, it may be limited in establishing a causal link between the factors. So, Future research can conduct longitudinal studies such as implementing the Psycho-Tech model in organizations and, after some time, testing again to check the model's effectiveness.

5. Conclusion

Globalization opens the door for everyone, and every organization, owing to globalization, needs a vibrant environment. After the 4th industrial revolution, innovation becomes paramount for the organization to remain competitive. Additionally, since the onset of the Covid-19 pandemic, traditional approaches have become obsolete to compete in the market. Current research explores the psychological factors (e.g., psychological empowerment, Grit, paradox mindset, and harmonious Passion) and technological factors (for instance, Information and digital handling skills, Communication and collaboration skills and problem-solving skills) to augment the individual's IWB, and results revealed that both factors boost IWB well. Further, a novel mediation path of IRT is the most significant contribution of the research. Consequently, findings confirmed the newly introduced 'psycho-tech innovative work behavior model through IRT pathway,' which is beneficial in combating high-tech global issues and reducing the effects of pandemics such as Covid-19 in both the health and education sectors.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Umar Safdar http://orcid.org/0000-0002-7357-8319

References

Abbas, G., Iqbal, J., Waheed, A., & Naveed Riaz, M. (2017). Relationship between transformational leadership style and innovative work behavior in educational institutions. *Journal of Behavioral Sciences*, *22*(3), 112–122.

Afridi, S. A., Afsar, B., Shahjehan, A., & Rehman, Z. U. (2020). Retracted: Perceived corporate social responsibility and innovative work behavior: The role of employee volunteerism and authenticity. *Corporate Social Responsibility and Environmental Management*, *27*(4), 1865–1877.

Agarwal, U. A. (2014a). Examining the impact of social exchange relationships on innovative work behavior: Role of work engagement. *Team Performance Management*, *20*(3/4), 102–120. https://doi.org/10.1108/TPM-01-2013-0004

Agarwal, U. A. (2014b). Linking justice, trust and innovative work behavior to work engagement. *Personnel Review*, *43*(1), 41–73. https://doi.org/10.1108/PR-02-2012-0019

Ahmed, S., Taqi, H. M. M., Farabi, Y. I., Sarker, M., Ali, S. M., & Sankaranarayanan, B. (2021). Evaluation of flexible strategies to manage the COVID-19 pandemic in the education sector. *Global Journal of Flexible Systems Management*, *22*(2), 81–105.

Akpan, I. J., Soopramanien, D., & Kwak, D. H. (2021). Cutting-edge technologies for small business and innovation in the era of COVID-19 global health pandemic. *Journal of Small Business & Entrepreneurship*, *33*(6), 607–617. https://doi.org/10.1080/08276331.2020.1799294

Ala-Mutka, K. (2011). Mapping digital competence: Author: Kirsti Ala-Mutka (Issue April https://doi.org/10.13140/RG.2.2.18046.00322

Amabile, T. M. (1988). A model of creativity and innovation in organizations. *Research in Organizational Behavior*, *10*(1), 123–167.

Amabile, T. M. (1996). *Creativity in context*. Westview Press.

Baer, J. (2012). Domain specificity and the limits of creativity theory. *The Journal of Creative Behavior*, *46*(1), 16–29. https://doi.org/10.1002/jocb.002

Bailey, K., & Breslin, D. (2021). The COVID-19 pandemic: What can we learn from past research in organizations and management? *International Journal of Management Reviews*, *23*(1), 3–6. https://doi.org/10.1111/ijmr.12237

Bain, P. G., Mann, L., & Pirola-Merlo, A. (2001). The innovation imperative: The relationships between team climate, innovation, and performance in research and development teams. *Small Group Research*, *32*(1), 55–73. https://doi.org/10.1177/104649640103200103

Bayani, D. B. S., & Tan, S. G. (2021). Health systems impact of COVID-19 in the Philippines Working Paper 569 March 2021. Center for Global Develpment, *March 2021*. https://www.cgdev.org/publication/health-systems-impact-covid-19-philippines.%0AThe.

Beghetto, R. A. (2009). Correlates of intellectual risk taking in elementary school science. *Journal of Research in Science Teaching*, *46*(2), 210–223. https://doi.org/10.1002/tea.20270

Beghetto, R. A., Karwowski, M., & Reiter-Palmon, R. (2021). Intellectual risk taking: A moderating link between creative confidence and creative behavior? *Psychology of Aesthetics, Creativity, and the Arts*, *15*(4), 637–644. https://doi.org/10.1037/aca0000323

Bernardy, V., & Antoni, C. H. (2021). With grit to innovative teams? *Gruppe. Interaktion. Organisation. Zeitschrift Für Angewandte Organisationspsychologie (GIO)*, *52*(1), 65–78. https://doi.org/10.1007/s11612-021-00555-z

Bogers, M. L. A. M., Garud, R., Thomas, L. D. W., Tuertscher, P., & Yoo, Y. (2022). Digital innovation: Transforming research and practice. *Innovation*, *24*(1), 4–12. https://doi.org/10.1080/14479338.2021.2005465

Bos-Nehles, A., Renkema, M., & Janssen, M. (2017). HRM and innovative work behavior: A systematic literature review. *Personnel Review*, *46*(7), 1228–1253. https://doi.org/10.1108/PR-09-2016-0257

Cangialosi, N., Odoardi, C., & Battistelli, A. (2020). Learning climate and innovative work behavior, the mediating role of the learning potential of the workplace. *Vocations and Learning*, *13*(2), 263–280. https://doi.org/10.1007/s12186-019-09235-y

Carlson, J., Fosmire, M., Miller, C. C., & Nelson, M. S. (2011). Determining data information literacy needs: A study of students and research faculty. *Portal*, *11*(2), 629–657. https://doi.org/10.1353/pla.2011.0022

Carlucci, D., Mura, M., & Schiuma, G. (2020). Fostering employees' innovative work behavior in healthcare organisations. *International Journal of Innovation Management*, *24*(02), 2050014. https://doi.org/10.1142/S1363919620500140

Carretero, S., Vuorikari, R., & Punie, Y. (2017). *DigComp 2.1. Publications Office of the European Union*. Joint Research Centre (JRC) Science Hub.

Chang, H. C., Wang, N. Y., Ko, W. R., Yu, Y. T., Lin, L. Y., & Tsai, H. F. (2017). The effectiveness of clinical problem-based learning model of medico-jurisprudence education on general law knowledge for Obstetrics/Gynecological interns. *Taiwanese Journal of Obstetrics & Gynecology*, *56*(3), 325–330. https://doi.org/10.1016/j.tjog.2017.04.011

Chin, W. (1998). The partial least squares approach to structural equation modeling. *Mod. Methods Bus. Res*, *29*(5), 295–336.

Colombo, M. G., Foss, N. J., Lyngsie, J., & Rossi, C. (2021). What drives the delegation of innovation decisions ? The roles of firm innovation strategy and the nature of external knowledge. *Research Policy*, *50*(1), 104134. https://doi.org/10.1016/j.respol.2020.104134

Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic synthesis of the grit literature. *Journal of Personality and Social Psychology*, *113*(3), 492–511. https://doi.org/10.1037/pspp0000102

Dachner, A. M., Miguel, R. F., & Patena, R. A. (2017). Risky business: Understanding student intellectual risk taking in management education. *Journal of Management Education*, *41*(3), 415–443. https://doi.org/10.1177/1052562917695775

Damanpour, F., & Wischnevsky, J. D. (2006). Research on innovation in organizations: Distinguishing innovation-generating from innovation-adopting organizations. *Journal of Engineering and Technology Management*,*23*, 269–291. https://doi.org/10.1016/j.jengtecman.2006.08.002

de Jong, J., & den Hartog, D. (2010). Measuring innovative work behavior. *Creativity and Innovation Management*, *19*(1), 23–36. https://doi.org/10.1111/j.1467-8691.2010.00547.x

de Souza Fleith, D. (2000). Teacher and student perceptions of creativity in the classroom environment. *Roeper Review*, *22*(3), 148–153. https://doi.org/10.1080/02783190009554022

Dewett, T. (2006). Exploring the role of risk in employee creativity. *The Journal of Creative Behavior*, *40*(1), 27–45. https://doi.org/10.1002/j.2162-6057.2006.tb01265.x

Donely, R., Patrinos, H. A., & James, G. (2020). *The Impact of COVID-19 on Education – Recommendations and Opportunities for Ukraine*. Opinion. https://www.worldbank.org/en/news/opinion/2021/04/02/the-impact-of-covid-19-on-education-recommendations-and-opportunities-for-ukraine

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the short grit scale (Grit – S). *Journal of Personality Assessment*, *91*(2), 166–174. https://doi.org/10.1080/00223890802634290

Duckworth, A. L., Peterson, C., Matthews, M. D., … Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, *92*(6), 1087–1101. https://doi.org/10.1037/0022-3514.92.6.1087

Duckworth, A. L. (2016). *Grit: The power of passion and perseverance*. Scribner.

Duran, P., Kammerlander, N., Van Essen, M., & Zellweger, T. (2016). Doing more with less: Innovation input and output in family firms. *Academy of Management Journal*, *59*(4), 1224–1264. https://doi.org/10.5465/amj.2014.0424

Eisenman, R. (1987). Creativity, birth order, and risk taking. *Bulletin of the Psychonomic Society*, *25*(2), 87–88. https://doi.org/10.3758/BF03330292

Elsayed, A. M., Zhao, B., Goda, A. E., & Elsetouhi, A. M. (2023). The role of error risk taking and perceived organizational innovation climate in the relationship between perceived psychological safety and innovative work behavior: A moderated mediation model. *Frontiers in Psychology*, *14*(January), 1042911. https://doi.org/10.3389/fpsyg.2023.1042911

European Commission. (2016). *DigCompOrg. Digitally Competent Educational Organisations*. European Commission.

Fernández, E., Leiva, J. J., & López-Meneses, E. (2017). Training in e-skills at university. Perceptions of the students. *Training in E-Skills at University*, *6*(2), 79–89.

Fikri, M. A., Asbari, M., Purwanto, A., Nugroho, Y., Waruwu, H., Fauji, A., Shobihi, A. W., Singgih, E., Sudiyono, R., Agistiawati, E., & Dewi, W. (2020). a Mediation Role of Organizational Learning on Relationship of Hard Skills, Soft Skills, Innovation and Performance: Evidence At Islamic School. *EduPsyCouns: Journal of Education, Psychology and Counseling*, *2*(1), 365–383.

Florida, R. (2019). *The rise of the creative class*. UK: Hachette.

Forest, J., Mageau, G. A., Crevier-Braud, L., Bergeron, É., Dubreuil, P., & Lavigne, G. L. (2012). Harmonious passion as an explanation of the relation between signature strengths ' use and well-being at work: Test of an intervention program. *Human Relations*, *65*(9), 1233–1252. https://doi.org/10.1177/0018726711433134

Frank, B., Enkawa, T., Schvaneveldt, S. J., & Herbas, B. (2015). Technological Forecasting & Social Change Antecedents and consequences of innate willingness to pay for innovations: Understanding motivations and consumer preferences of prospective early adopters. *Technological Forecasting and Social Change*, *99*, 252–266. https://doi.org/10.1016/j.techfore.2015.06.029

Galindo-Martín, M., Mendez-Picazo, M., & Castaño-Martínez, M. (2019). *Analyzing the relationship between innovation, value creation, and entrepreneurship*. Business Science Reference.

Gao, M. (2017). *A self-determination approach to understanding employees' innovative work behavior* [Doctoral dissertation]. Concordia University.

George, J. M., & Zhou, J. (2001). When job dissatisfaction leads to creativity: encouraging the expression of voice. *Academy of Management Journal*, *44*(4), 682–696. https://doi.org/10.5465/3069410

Glover, J. A., & Gray, A. L. (1975). *Behavior modification: Enhancing creativity and other good behaviors*. Boxwood Press.

Grohman, M. G., Ivcevic, Z., Silvia, P., & Kaufman, S. B. (2017). The role of passion and persistence in creativity. *Psychology of Aesthetics, Creativity, and the Arts*, *11*(4), 376–385. https://doi.org/10.1037/aca0000121

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet …. *Journal of Marketing Theory and Practice*, *19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Henseler, J., Hubona, G., & Ray, P. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management & Data Systems*, *116*(1), 2–20. https://doi.org/10.1108/IMDS-09-2015-0382

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Ho, T. T., Vo, T. N., & Sipko, J. (2019). Predicting overall staffs' creativity and innovative work behavior in banking. *Management & Marketing. Challenges for the Knowledge Society*, *14*(2), 188–202. https://doi.org/10.2478/mmcks-2019-0013

Ho, V. T., Tony, D., Lee, C., Dubreuil, P., & Forest, J. (2018). Promoting harmonious work passion among unmotivated employees: A two-nation investigation of the compensatory

function of cooperative psychological climate. *Journal of Vocational Behavior*, *106*, 112–125. https://doi.org/10.1016/j.jvb.2018.01.005

Hong, Y., Liao, H., Raub, S., & Han, J. (2016). What it takes to get proactive: An integrative multilevel model of the antecedents of personal initiative. *The Journal of Applied Psychology*, *101*(5), 687–701. https://doi.org/10.1037/apl0000064

Hsiao, H., Ch, Chen, S., Chang, J., Chou, Ch., & Shen, C. (2009). Factors that influence school organizational innovation in technical institutes and universities. *World Transactions on Engineering and Technology Education*, *7*(1), 71–76.

Huang, J. (2012). Be proactive as empowered? The role of trust in one's supervisor in psychological empowerment, feedback seeking, and job performance. *Journal of Applied Social Psychology*, *42*, E103–E127. https://doi.org/10.1111/j.1559-1816.2012.01019.x

Iqbal, S., Moleiro Martins, J., Nuno Mata, M., Naz, S., Akhtar, S., & Abreu, A. (2021). Linking entrepreneurial orientation with innovation performance in SMEs; the role of organizational commitment and transformational leadership using smart PLS-SEM. *Sustainability*, *13*(8), 4361. https://doi.org/10.3390/su13084361

Judge, T. A., & Zapata, C. P. (2015). The person-situation debate revisited: effect of situation strength and trait activation on the validity of the big five personality traits in predicting job performance. *Academy of Management Journal*, *58*(4), 1149–1179. https://doi.org/10.5465/amj.2010.0837

Khoiriyah, A. J., Java, E., & Java, E. (2018). *Problem-based learning: Creative thinking skills. JPBI (Jurnal Pendidikan Biologi Indonesia)*, *4*(2), 151–160. https://doi.org/10.22219/jpbi.v4i2.5804

Kijek, A., & Kijek, T. (2010). The analysis of innovation input-output relationships in eu member states. *Comparative Economic Research. Central and Eastern Europe*, *13*(3), 93–106. https://doi.org/10.2478/v10103-009-0040-5

Koltay, T. (2015). Data literacy: In search of a name and identity. *Journal of Documentation*, *71*(2), 401–415. https://doi.org/10.1108/JD-02-2014-0026

Li, X., & Zheng, Y. (2014). The influential factors of employees' innovative behavior and the management advices. *Journal of Service Science and Management*, *07*(06), 446–450. https://doi.org/10.4236/jssm.2014.76042

Liu, Y., Xu, S., & Zhang, B. (2020). Thriving at work: How a paradox mindset influences innovative work behavior. *The Journal of Applied Behavioral Science*, *56*(3), 347–366. https://doi.org/10.1177/0021886319888267

Liu, Y., & Zhang, H. (2022). Making things happen: How employees' paradox mindset influences innovative performance. *Frontiers in Psychology*, *13*(December), 1009209. https://doi.org/10.3389/fpsyg.2022.1009209

López-Gil, M., & Bernal-Bravo, C. (2019). Teaching in the network society: Analysis of the digital competences of students in education at the University of Cádiz. *International Journal of Educational Research and Innovation*, *11*, 83–100.

López-Meneses, E., Sirignano, F. M., Vázquez-Cano, E., & Ramírez-Hurtado, J. M. (2020). University students' digital competence in three areas of the DigCom 2.1 model: A comparative study at three European universities. *Australasian Journal of Educational Technology*, *36*(3), 69–88. https://doi.org/10.14742/ajet.5583

Lucenario, J. L. S., Yangco, R. T., Punzalan, A. E., & Espinosa, A. A. (2016). Pedagogical content knowledge-guided lesson study: Effects on teacher competence and students. *Education Research International*, *2016*, 1–9. https://doi.org/10.1155/2016/6068930

Luthans, F., & Youssef, C. M. (2007). Emerging positive organizational behavior. *Journal of Management*, *33*(3), 321–349. https://doi.org/10.1177/0149206307300814

Luu, T. T. (2021). Can human resource flexibility disentangle innovative work behavior among hospitality employees? The roles of harmonious passion and regulatory foci. *International Journal of Contemporary Hospitality Management*, *33*(12), 4258–4285. https://doi.org/10.1108/IJCHM-02-2021-0276

Mandinach, E. B., & Gummer, E. S. (2013). A systemic view of implementing data literacy in educator preparation. *Educational Researcher*, *42*(1), 30–37. https://doi.org/10.3102/0013189X12459803

Masood, M., & Afsar, B. (2017). Transformational leadership and innovative work behavior among nursing staff. *Nursing Inquiry*, *24*(4), e12188. https://doi.org/10.1111/nin.12188

Miron-Spektor, E., Ingram, A., Keller, J., Smith, W. K., & Lewis, M. W. (2018). Microfoundations of organizational paradox: The problem is how we think about the problem. *Academy of Management Journal*, *61*(1), 26–45. https://doi.org/10.5465/amj.2016.0594

Mohamed, W. A., & Badrul Omar, W. (2010). Through work-based learning among community college. *Journal of Technical Education and Training (JTET)*, *2*(1), 1–8.

Montmarquet, J. A. (1993). *Epistemic virtue and doxastic responsibility*. Rowman & Littlefield.

Mooradian, T., Matzler, K., Uzelac, B., & Bauer, F. (2016). Perspiration and inspiration. Grit and innovativeness as antecedents of entrepreneurial success. *Journal of Economic Psychology*, *56*, 232–243. https://doi.org/10.1016/j.joep.2016.08.001

Mosa, A. A., Naz'ri bin Mahrin, M., & Ibrrahim, R. (2016). Technological aspects of e-learning readiness in higher education: A review of the literature. *Computer and Information Science*, *9*(1), 113–127. https://doi.org/10.5539/cis.v9n1p113

Odoardi, C., Montani, F., Boudrias, J. S., & Battistelli, A. (2015). Linking managerial practices and leadership style to innovative work behavior: The role of group and psychological processes. *Leadership & Organization Development Journal*, *36*(5), 545–569. https://doi.org/10.1108/LODJ-10-2013-0131

Paille, P., Boiral, O., & C, Y. (2013). Linking environmental management practices and organizational citizenship behavior for the environment: A social exchange perspective. *The International Journal of Human Resource Management*, *24*(18), 3552–3575. https://doi.org/10.1080/09585192.2013.777934

Parthasarthy, R., & Hammond, J. (2002). *Product innovation input and outcome: Moderating effects of the innovation process*. *Journal of Engineering and Technology Management*, *19*(1), 75–91. https://doi.org/10.1016/S0923-4748(01)00047-9

Perry, A., & Karpova, E. (2017). Relationships between creativity and its antecedents before and after training: The role of risk taking and past creative experience. *Creativity. Theories – Research – Applications*, *4*(1), 80–98. https://doi.org/10.1515/ctra-2017-0004

Poole, M. S., & Van de Ven, A. H. (1989). Using paradox to build management and organization theories. *The Academy of Management Review*, *14*(4), 562–578. https://doi.org/10.2307/258559

Prado, J. C., & Marzal, M. Á. (2013). Incorporating data literacy into information literacy programs: Core competencies and contents. *Libri*, *63*(2), 123–134. https://doi.org/10.1515/libri-2013-0010

Qin, J., & D'Ignazio, J. (2010). Lessons learned from a two-year experience in science data literacy education. *Proceedings of the 31st Annual IATUL Conference*, 20–24.

Rasidi, S. H. (2021). The role of grit in determining work engagement and innovative behavior outcome for lifelong learning in digital economy. In *The International Islamic Economic System Conference – the 9th I-IECONS*, 2021, 440–456.

Rothenberg, A. (1979). *The emerging goddess*. University of Chicago press.

Rousseau, V., Aubé, C., & Tremblay, S. (2013). Team coaching and innovation in work teams. *Leadership & Organization Development Journal*, *34*(4), 344–364. https://doi.org/10.1108/LODJ-08-2011-0073

Saeed, B., Bin, Afsar, B., Shahjehan, A., & Shah, S. I. (2019). Does transformational leadership foster innovative work behavior ? The roles of psychological empowerment, intrinsic motivation, and creative process engagement. *Economic Research-Ekonomska Istraživanja*, *32*(1), 254–281. https://doi.org/10.1080/1331677X.2018.1556108

Saether, E. A. (2019). Motivational antecedents to high-tech R&D employees' innovative work behavior: Self-determined motivation, person-organization fit, organization support of creativity, and pay justice. *The Journal of High Technology Management Research*, *30*(2), 100350. https://doi.org/10.1016/j.hitech.2019.100350

Safdar, U., Badir, Y. F., & Afsar, B. (2017). Who can I ask? How psychological safety affects knowledge sourcing among new product development team members. *The Journal of High Technology Management Research*, *28*(1), 79–92. https://doi.org/10.1016/j.hitech.2017.04.006

Salas-Vallina, A., Pozo, M., … Fernandez-Guerrero, R. (2020). New times for HRM? Well-being oriented management (WOM), harmonious work passion and innovative work

behavior. *Employee Relations: The International Journal*, *42*(3), 561–581. https://doi.org/10.1108/ER-04-2019-0185

Schuh, S. C., Zhang, X-a., Morgeson, F. P., Tian, P., & van Dick, R. (2018). Are you really doing good things in your boss' eyes ? *Human Resource Management*, *57*(1), 397–409. https://doi.org/10.1002/hrm.21851

Schumpeter, J. A. (1942). *Capitalism, Socialism, and Democracy (2003 edit)*. London.

Shanker, R., Bhanugopan, R., Van der Heijden, B. I., & Farrell, M. (2017). Organizational climate for innovation and organizational performance: The mediating effect of innovative work behavior. *Journal of Vocational Behavior*, *100*, 67–77. https://doi.org/10.1016/j.jvb.2017.02.004

Shanta, S., & Wells, J. G. (2022). T/E design based learning: Assessing student critical thinking and problem solving abilities. *International Journal of Technology and Design Education*, *32*(1), 267–285. https://doi.org/10.1007/s10798-020-09608-8

Sharkova, N. (2014). Learning supported by technology in higher education: From experience to practice. *Education Inquiry*, *5*(3), 24610. https://doi.org/10.3402/edui.v5.24610

Shipton, H. J., West, M. A., Parkes, C. L., Dawson, J. F., & Patterson, M. G. (2006). When promoting positive feelings pays: Aggregate job satisfaction, work design features, and innovation in manufacturing organizations. *European Journal of Work and Organizational Psychology*, *15*(4), 404–430.

Singh, M., & Sarkar, A. (2012). The relationship between psychological empowerment and innovative behavior. *Journal of Personnel Psychology*, *11*(3), 127–137. https://doi.org/10.1027/1866-5888/a000065

Sirmon, D. G., Hitt, M. A., Ireland, R. D., & Gilbert, B. A. (2011). Resource orchestration to create competitive advantage: Breadth, depth, and life cycle effects. *Journal of Management*, *37*(5), 1390–1412. https://doi.org/10.1177/0149206310385695

Sleesman, D. J. (2019). Pushing through the tension while stuck in the mud: Paradox mindset and escalation of commitment. *Organizational Behavior and Human Decision Processes*, *155*, 83–96. https://doi.org/10.1016/j.obhdp.2019.03.008

Smith, K., & Berg, D. (1986). *Paradoxes of group life: Understanding conflict, paralysis, and movement in group dynamics*. Josey-Bass.

Smith, W. K., & Lewis, M. W. (2011). Toward a theory of paradox: A dynamic equilibrium model of organizing. *Academy of Management Review*, *36*(2), 381–403. https://doi.org/10.5465/AMR.2011.59330958

Smith, W. K., & Tushman, M. L. (2005). Managing strategic contradictions: A top management model for managing innovation streams. *Organization Science*, *16*(5), 522–536. https://doi.org/10.1287/orsc.1050.0134

Spreitzer, G. M., De Janasz, S. C., & Quinn, R. (1999). Empowered to lead: The role of psychological empowerment in leadership. *Journal of Organizational Behavior*, *20*(4), 511–526. https://doi.org/10.1002/(SICI)1099-1379(199907)20:4<511::AID-JOB900>3.0.CO;2-L

Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions, measurement, and validation. *Academy of Management Journal*, *38*(5), 1442–1465. https://doi.org/10.2307/256865

Suendarti, M., Widodo, W., & Hasbullah, H. (2020). Demonstrating the effect of grit and creativity on innovative behavior of teacher's natural science: Mediating by self -efficacy. *Journal of Xi'an University of Architecture & Technology*, *XII*(Vi), 470–478.

Supriyadi, D., Syafitri, L. N. H., Widodo, S. F. A., Wahidi, R., Arinta, Y. N., Nabhan, F., Mufid, A., Purwanto, A., Fahlevi, M., Sunarsi, D., & Cahyono, Y. (2020). Innovation and authentic leadership of islamic university lectures in faculty pharmacy faculty: What is the role of psychological capital? *Systematic Reviews in Pharmacy*, *11*(8), 383–393. https://doi.org/10.31838/srp.2020.8.56

Taamneh, A., Alsaad, A., Elrehail, H., Al-Okaily, M., Lutfi, A., & Sergio, R. P. (2023). University lecturers acceptance of moodle platform in the context of the COVID-19 pandemic. *Global Knowledge, Memory and Communication*, *72*(6/7), 666–684. https://doi.org/10.1108/GKMC-05-2021-0087

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, *48*(6), 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Teece, D. J., Pisano, G., & Shuen, A. (2009). Dynamic capabilities and strategic management. *Knowledge and Strategy*, *18*(March), 77–116. https://doi.org/10.1093/0199248540.003.0013

To, M. L., Fisher, C. D., & Ashkanasy, N. M. (2015). Unleashing angst: Negative mood, learning goal orientation, psychological empowerment and creative behavior. *Human Relations*, *68*(10), 1601–1622. https://doi.org/10.1177/0018726714562235

Vallerand, R. J., Blanchard, C., Mageau, G. A., Koestner, R., Ratelle, C., Léonard, M., Gagné, M., & Marsolais, J. (2003). Les passions de l'âme: On obsessive and harmonious passion. *Journal of Personality and Social Psychology*, *85*(4), 756–767. https://doi.org/10.1037/0022-3514.85.4.756

Vallerand, R. J. (2010). On passion for life activities: The Dualistic Model of Passion. In M. P. Zanna (Ed.), *Advances in experimental social psychology*. Academic Press.

Von Culin, K. R., Tsukayama, E., & Duckworth, A. L. (2014). Unpacking grit: Motivational correlates of perseverance and passion for long-term goals. *The Journal of Positive Psychology*, *9*(4), 306–312. https://doi.org/10.1080/17439760.2014.898320

Vuorikari, R., Punie, Y., Carretero Gomez, S., & Van den Brande, G. (2016). *DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1*. The Conceptual Reference Model. https://doi.org/10.2791/11517

Wan, Z. H., Lee, J. C.-K., & Hu, W. (2021). How should undergraduate students perceive knowledge as a product of human creation ? Insights from a study on epistemic beliefs, intellectual risk-taking, and creativity. *Thinking Skills and Creativity*, *39*(September 2020), 100786. https://doi.org/10.1016/j.tsc.2021.100786

Wan, Z. H., So, W. M. W., & Hu, W. (2021). Necessary or sufficient? The impacts of epistemic beliefs on STEM creativity and the mediation of intellectual risk-taking. *International Journal of Science Education*, *43*(5), 672–692. https://doi.org/10.1080/09500693.2021.1877368

Waruwu, H., Asbari, M., Purwanto, A., Nugroho, Y. A., Fikri, M. A. A., Fauji, A., Shobihi, A. W. I., Hulu, P., Sudiyono, R. N., Agistiawati, E., & Dewi, W. R. (2020). The role of transformational leadership, organizational learning and structure on innovation capacity: Evidence from Indonesian Private Schools. *EduPsyCouns*, *2*(1), 378–397. https://ummaspul.e-journal.id/Edupsycouns/article/view/499

Weinek, L., Saeed, S., & Enke, S. (2020). *The effect of corporate support programs on employees. Innovative Behavior: A cross-cultural study: Corporate support programs and innovative behavior*, 2020, 12386. https://doi.org/10.1111/jpim.12386

Widodo, W., & Chandrawat, C. (2021). Developing lecturers ' innovative work behavior based on grit and East African Scholars Journal of Education. *Humanities and Literature*, *4*(8), 319–326. https://doi.org/10.36349/easjehl.2021.v04i08.003

Wong, K. K. (2013). Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketing Bulletin*, *24*(1), 1–32.

Yidong, T., & Xinxin, L. (2016). How ethical leadership influence employees ' innovative work behavior: A perspective of intrinsic motivation how ethical leadership influence employees. *Innovative Work Behavior*. https://doi.org/10.1007/s10551-012-1455-7

Yousef, A. M. F., Catherine Walker, J., & Leon-Urrutia, M. (2021). Defining data literacy communities by their objectives: A text mining analysis. In *13th ACM Web Science Conference 2021*, 26–33. https://doi.org/10.1145/3462741.3466663

Yu, K. C., Fan, S. C., & Lin, K. Y. (2015). Enhancing students' problem-solving skills through context-based learning. *International Journal of Science and Mathematics Education*, *13*(6), 1377–1401. https://doi.org/10.1007/s10763-014-9567-4

Zhang, X., & Bartol, K. M. (2010). Linking empowering leadership and employee creativity: The influence of psychological empowerment, intrinsic motivation, and creative process engagement. *Academy of Management Journal*, *53*(1), 107–128. https://doi.org/10.5465/amj.2010.48037118