Leader Emotional Intelligence, Behaviour and Job Performance Linkages among 3D printing Firms

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Abstract - The emerging and innovative 3D printing industry in South Africa necessitate leaders with managerial skills such as emotional intelligence to improve employee job performance. This study seeks to examine the direct and mediating relationships between leader emotional intelligence, leader emotional behaviour and employee job performance among 3D printing firms in South Africa. A total of 148 employees from 3D printing firms in South Africa were randomly selected to participate in this study through the use of questionnaires. Structural equation modelling was used to test the hypotheses. The results of the study showed that a significant positive relationship exists between leader emotional intelligence and employee job performance as well as leader emotional intelligence and leader emotional behaviour. Moreover, a significant positive relationship was found to exist between leader emotional behaviour and employee job performance. The result also indicated that leader emotional behaviour mediates the relationship between leader emotional intelligence and employee job performance. The implication of this study designates emotional intelligence as a critical managerial skill that can effectively enhance employee job performance in 3D printing firms.

Keyword - Innovation, Subordinates, Managerial, 3D Model, Work environment, Workforce

1   Introduction

Additive manufacturing, also known as 3D printing is a manufacturing process that creates three-dimensional objects by adding material layer by layer (Schonwetter & Van Wiele, 2018; Dzogbewu, 2020). In 3D printing, a digital 3D model of the object is created using computer-aided design (CAD) software (Schonwetter & Van Wiele, 2020). 3D printing is one of the world's most contemporary and emerging industries, and South Africa is at the forefront, especially in Africa (Windapo et al., 2023; Dzogbewu, Fianko, et al., 2022). The successful implementation of 3D printing technology requires employees with advanced skills and experience to operate and manage the 3D printing machines to achieve optimum company performance (Chong et al., 2018). Highly skilled workers are hard to come by, which makes it imperative that as 3D printing firms employ people, managers must possess and apply appropriate managerial practices to manage and create a conducive work environment that will ensure that employees perform their jobs according to expectations (Hossain et al., 2020; Schniederjans, 2017; Dzogbewu, Amoah, et al., 2022). Leaders emotional intelligence has emerged as a potent organizational practice that can influence the job performance of employees by creating an appropriate work environment to perform optimally (Goleman, 2021; Afrifa et al., 2021). Leaders emotional intelligence involves leaders leveraging emotions at the workplace for productive purposes hence organizational success (Cherniss & Roche, 2020; Fianko et al., 2020). Leaders' emotional intelligence and employee performance are therefore inextricably related and important to organizational success (Altındağ & Kösedağı, 2015; Miao et al., 2018; Sony & Mekoth, 2016). According to Mohamad and Jais (2016), leaders with high emotional intelligence can better understand and effectively manage their own emotions as well as that of their subordinates, thereby enhancing a productive workforce. Leader emotional behaviour, which is described as the ways in which leaders express and manage their emotions at the workplace has a crucial role to play in shaping the working environment and also having impact on employee outcomes (Neil, Wagstaff, Weller & Lewis, 2016). According to Wong and Law (2017), leaders who are able to express and manage their emotions positively tend to enhance the performance of their subordinates by showing them empathy and enhancing their problem solving abilities.

In the burgeoning 3D printing industry in South Africa, characterized by innovation and competition (Schonwetter & Van Wiele, 2018), it has become relevant for 3D printing firms to pay attention to managerial skills such as leader emotional intelligence and its association with leader emotional behaviour and employee job performance. Pascucci et al. (2018) argues that although 3D printing has gained much attention in research, the debates are more focused on its technical aspects and the economic implications at the institutional level. However, the managerial aspect of 3D printing research has been less explored (Pascucci et al., 2018). In an extensive literature review conducted on 3D printing research, four thematic areas were identified: technology adoption and use of additive manufacturing (Khorram Niaki & Nonino, 2017; Musso et al., 2022; Yeh & Chen, 2018); how additive manufacturing impacts supply chain structures and processes (Chaudhuri et al., 2017;

Ghadge et al., 2022; Oettmeier & Hofmann, 2016); additive manufacturing and business models (Bogers et al., 2016; Flammini et al., 2017; Holzmann et al., 2017); and additive manufacturing and sustainability (Despeisse et al., 2017; Ford & Despeisse, 2016).

The limited studies on managerial research in a growing industry such as 3D printing sector in South Africa, necessitated the need for our study to examine the direct and indirect (mediating) relationships between leader emotional intelligence, leader emotional behaviour and employee job performance among 3D printing firms in South Africa. Our study therefore seeks to contribute to managerial research in South Africa's 3D printing industry and make managerial recommendations to enhance positive organizational environment that can transcend into employee job performance among 3D printing firms in South Africa.

2   Literature Review

2.1   Leader emotional intelligence

Leader emotional intelligence is defined as the ability of a leaders to be aware of their emotions, manage their emotions, and also understand and manage the emotions of their subordinates in the organization (Goleman, 2014). Leader emotional intelligence has four dimensions according to Goleman and these are self-awareness, self-management, social awareness and relationship management (Goleman, 2015). Self-awareness refers to awareness of one's emotions at work and enables leaders to monitor their own emotions and their effects on the people around them (Goleman, Kaplan, David & Eurich, 2018). Self-management entails having the capacity to properly manage one's emotions and actions in the workplace (Goleman & Nevarez, 2018). Social awareness pertains to an individual's ability to identify and comprehend the emotions of others and is characterized by empathy towards subordinate's feelings (Goleman, 2015). Relationship management refers to the proficient management of relationships with others, which encompasses the skills of influencing, collaborating and fostering strong bonds with followers (Goleman, 2015). In the context of this study, leader emotional intelligence comprises of the ability of leaders of 3D printing firms to identify and manage their personal emotions as well as the emotions of subordinates among 3D printing firms in South Africa.

2.2   Employee Job Performance

Job performance is also defined as the actions, behaviours and results of workers at work that are connected to and contribute to the organisation's objectives (Rahiman & Kodikal, 2017). Task performance is defined as the work-related actions of workers, which often vary from one employee to another according to their job descriptions (Singh, 2019). Based on the definitions, our study defines employee task performance as the ability of employees to carry

out the responsibilities that have been given to them and to meet the standards of performance that have been set in the organisation. Therefore, in the field of 3D printing in South Africa, task performance consists of employees' abilities to operate 3D printing machinery effectively, participate in the production of 3D-printed products of high quality, meet the production targets set by the organisation, and also contribute to organisational productivity through the completion of job duties in real-time.

Contextual performance also refers to activities that go beyond one's assigned responsibilities and contribute to the efficiency and productivity of the company as a whole (Sackett et al., 2017). In our study, contextual performance was defined as the voluntary and discretionary behaviours demonstrated by workers with the ultimate objective of supporting the success of the organisation above and beyond the official job requirements of their positions. Within the framework of the 3D printing industry, the concept of contextual performance may refer to employee behaviours such as actively participating in organisational initiatives, actively engaging in collaboration and teamwork to achieve corporate success, and providing support in accomplishing the organisation's values and mission. Hence, contextual performance in the work environment of 3D printing is vital for fostering a pleasant work environment, which can boost organisational productivity.

2.3   Leader emotional behaviour

According to Heath and Heath (2017), emotional behaviour pertains to observable and measurable displays of emotions that are evident to others. Forgas, Haslam and Laham (2016) argue that emotional behaviour refers to an individual's conduct and social interactions influenced by their present emotional state. Mayer, Salovey and Caruso (2016) state that emotional behaviour refers to the outward expression of emotional states through observable actions, such as facial expressions, body language and tone of voice.

The definitions mentioned above are characterised by focus on the outward manifestation of emotions through an individual's behaviour, encompassing non-verbal cues such as facial expressions, gestures and vocal intonation. An individual's emotional state can significantly influence their behavioural patterns, which can be assessed and evaluated through various observable indicators.

Based on these definitions, this study defines emotional behaviour as the outward expression of an individual's emotional state through observable behaviours such as facial expressions, body language and tone of voice, which are influenced by their emotional state and can be quantified and measured through these observable indicators.

2.4   Hypotheses Development

This section presents literature for hypotheses development on direct and mediating relationships between leaders' emotional intelligence and employee job performance, leaders' emotional intelligence and leaders' emotional behaviour, leaders' emotional behaviour and employee job performance

as well as mediating role of leader emotional behaviour on relationship between leader emotional intelligence and employee job performance.

2.5 Relationship between leaders' emotional intelligence and employee job performance

The study conducted by Lakshmi and Rao (2018) examined the correlation between the emotional intelligence of leaders and the work performance of teachers in public schools in India. The research findings suggest a significant positive correlation between teachers' emotional intelligence and job performance. Jordan et al. (2016) conducted a study investigating the impact of a leader's emotional intelligence on job performance, with job satisfaction as a moderating variable. It was found that there is a significant positive relationship between leader's emotional intelligence and employee job performance. Pant and Yadav (2016) investigated the connection between a leader's emotional intelligence and their employees' job performance in five software businesses in Moradabad, India. The study's findings suggest that a leader's emotional intelligence significantly enhances employees' job performance by enabling effective stress management. Suhairy et al. (2022) investigated the impact of emotional intelligence on the job performance of telecommunication firms in Malaysia. The research findings showed a significant positive relationship between the emotional intelligence of telecommunication workers and their job performance. Based on the literature, therefore, we hypothesized that: H1: There is a significant positive relationship between leaders' emotional intelligence and employee job performance in 3D printing firms.

2.6 Relationship between leaders' emotional intelligence and leaders' emotional behaviour

According to studies, leaders' level of emotional intelligence is shown to have a direct correlation with their emotional behaviours (Walter, Humphrey & Cole, 2012; Walter & Bruch, 2009). Dabke (2016) researched how subordinates perceived the emotional behaviours of leaders with emotional intelligence who also employed the transformational leadership style. In this study, Dabke focused on leaders who used transformational leadership styles. As leaders with emotional intelligence were more successful in their roles, their subordinates had a positive impression of these leaders' emotional behaviours. In addition, the data showed that emotional behaviours demonstrated by leaders were connected to their exhibition of transformational leadership, which subordinates rated as successful leadership. It has also been stated that emotional intelligence in leaders gives them the ability to exhibit good emotional behaviours while maintaining control over negative emotional behaviours such as rage, confusion, despair and worry, amongst others, while showing positive emotional behaviours such as empathy, positive reinforcement, gratitude, active listening and optimism (Siegling, Nielsen & Petrides, 2014b). Based on the literature, therefore, it is hypothesized in this study as follows: H2: There is a significant positive relationship between leaders' emotional intelligence and leaders' emotional behaviour in 3D printing firms.

2.7 Relationship between leaders' emotional behaviour and employee job performance

Employees' positive opinions regarding their leaders' emotional behaviours contribute to favourable work outcomes such as employee job performance, and vice versa (Dulebohn et al., 2012). Positive leaders treat their subordinates with respect, approbation and love, inspiring them to do well in the assigned tasks (Moss Ritossa & Ngu, 2006). Positive emotional actions on the part of leaders, according to Moss et al. (2006) and Dulebohn et al. (2012), improve subordinate job performance. Choudhary, Naqshbandi, Philip and Kumar (2017) studied faculty members at Indian universities to examine the role of leaders' emotional management skills and their impact on employee work performance, with job characteristics functioning as a moderating variable. According to the study, leaders' emotional management abilities at universities had a strong positive association with workers' job performance. In another study, Bambale, Kassim and Musa (2016) investigated the influence of emotional leadership style on employee performance among tertiary institution workers in Gombe, Northern India. Among the emotional leadership characteristics investigated were assertiveness, empathy, relationship management and flexibility. According to the results, the emotional behaviours of leaders, such as assertiveness and relationship management, have a significant favourable impact on employee job performance. Based on the empirical results, therefore, the researcher hypothesises as follows: H3: There is a significant positive relationship between leaders' emotional behaviour and employee job performance among 3D printing firms.

2.8 Leader emotional behaviour mediates the relationship between leader emotional intelligence and employee job performance

According to research, leaders' emotional behavior, which includes emotional expression and control, has a substantial impact on how workers perceive and respond to their work environment (Goswami, Nair, Beehr, & Grossenbacher, 2016). In a study that was conducted by Ashkanasy and Dorris (2017), it was found that leaders who exhibit appropriate emotional conduct may successfully encourage their colleagues, reduce stress, and raise job satisfaction, resulting in improved performance results. Similarly, Jiang and Luo (2018) discovered that leaders who regulate their emotions well foster a supportive and trusting work environment, which increases staff engagement and productivity. The mediating function of leader emotional behavior is highlighted in the work of Wong and Law (2017) who proved that leader emotional intelligence (EI) improves employee performance through the influence of leader emotional behavior. According to their research, leaders who demonstrate emotionally intelligent behaviors like empathy and emotional control are more likely to favorably impact their workers' attitudes and actions (Wong & Law, 2017). Based on the literature, we hypothesize that: H4: Leader emotional behaviour mediates the relationship between leader emotional intelligence and employee job performance.

2.9 Conceptual Framework

The Job demand-resources theory (JDRT), as proposed by (Demerouti et al., 2001) was formulated to enhance understanding of the variables that influence employee burnout. The job-demand resources theory is a theoretical framework that endeavours to explain the mechanisms accountable for employee job performance and well-being outcomes (Bakker & Demerouti, 2017). The JDRT has an impact on their level of motivation and engagement, which consequently influences their overall job performance (Demerouti et al., 2001). According to the JDRT, job demands refer to the specific aspects of a job that require consistent physical or mental exertion and are consequently linked to distinct physiological and psychological consequences (Demerouti et al., 2001). From the JDRT, an individual's performance capability may deteriorate due to exhaustion when the demands of their job are excessively high. The job requirements may have an adverse impact on an individual's physical and mental well-being, leading to exhaustion (Bakker & Demerouti, 2014). On the other hand, job resources are those elements of a job that can effectively attain work-related objectives, reduce the level of work stress, or have physiological and psychological effects associated with them (Bakker et al., 2023).

Receiving feedback, having control over one's employment and having access to social support are examples of job resources available to employees (Bakker & De Vries, 2021). The primary reasons why employees view job resources as motivating are the provision of a sense of purpose, the satisfaction of their fundamental needs, and the positive contribution to worker engagement and performance (Van Woerkom et al., 2016). According to studies, high job demands and a lack of resources are the leading causes of burnout (Huang et al., 2016; Schaufeli, 2017). Lack of resources has been linked to disengagement, even though work demands are associated with fatigue (Bakker et al., 2023; Van Woerkom et al., 2016). It has been argued that the JDRT predicts that the positive effect of job resources on employee performance could compensate for the adverse influence of work demands on employee performance (Schaufeli, 2017). Schaufeli and Bakker (2004) introduced a new JDRT that described the positive impact of such interactions on employee engagement in their work. The decision was made based on the premise that the initial JDRT prioritized the understanding of burnout by examining the interplay between job demands and work resources (Schaufeli & Bakker, 2004).

The new JDRT encompasses a constructive psychological dimension of employee job engagement (Schaufeli & Bakker, 2004). Employee engagement can be described as a positive mental state linked to their work and distinguished by enthusiasm, commitment and complete involvement in the given responsibilities (Knight et al., 2017). According to Schaufeli and Bakker (2004), the terms vigour, dedication, and absorption are defined as possessing a notable degree of physical and mental resilience, demonstrating a distinct motivation and passion for work, and being fully immersed in the current job. The allocation of job resources can serve as an extrinsic motivator, prompting personnel to exert additional effort to compensate for the benefits provided (Schaufeli, 2017).

When the resources provided in the workplace align with an employee's expectations regarding their level of skill and independence, it motivates them

to engage in their work actively (Barrick et al., 2015). As a result, there has been an increase in employee engagement and productivity (Barrick et al., 2015). Ozyilmaz (2020) found that job resources have the potential to foster a positive and satisfying psychological state that is associated with job engagement. Attainment of this objective can be realised by accomplishing job-specific goals or fulfilling fundamental prerequisites (Bakker & Demerouti, 2017). Although the JDRT has numerous advantages, it has also been criticized. A significant criticism of the JDRT is the absence of clarity regarding the mechanisms underlying the relationship between work demands, job resources, employee engagement, and job performance (Taris & Schaufeli, 2015). The JDRT does not provide convincing explanations for why certain work demands and resources affect the well-being and performance of employees while they are at work (Reijseger et al., 2017). Due to a dearth of specificity, organizations may struggle to identify and manage specific job requirements and resources pertinent to their particular circumstances. This is because the specifics of these needs and resources could vary substantially between organizations (Taris & Schaufeli, 2015).

Linking the JDRT to this study, it is argued that exposure of employees in the 3D printing industry to job demands such as workload, time, pressure, and more complex tasks could negatively affect the job performance of employees. However, with appropriate job resources, such as providing the right infrastructure and tools for employees and employee support, employees could become more engaged in their work and exhibit vigor, dedication, and absorption, enhancing their job performance positively. Thus, the exposure of employees to various forms of job demands could positively or negatively affect the job performance of employees in the 3D printing industry based on the availability and accessibility of appropriate job resources. In this regard, firms in the 3D printing industry may improve employee well-being and work performance if they properly manage the job demands and resources.
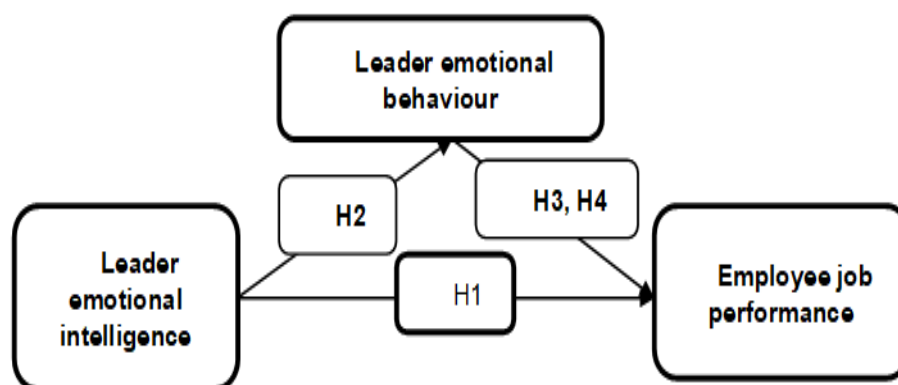
Figure 1: Conceptual framework on direct and mediating relationships
Source: Author's construct, 2024

The conceptual framework justifies job demands-resources theory for the direct and mediating relationships among leaders' emotional intelligence, leader's emotional behaviour, and employee job performance among 3D printing companies in South Africa. Job-demands resources theory is justified for this study on the premise that it helps to explain the effect of job characteristics (demands/resources) and its associations with organizational emotional climate and employee task performance. Thus, within the 3D printing industry, the exposure of employees to high job demands such as work overloads could negatively affect the organizational emotional climate and employee job performance. However, the provision of job resources such as organizational support systems could enhance a positive organizational climate and employee job task performance.

3   Methodology

3.1   Population, Sampling Technique and Sample

The population of the study comprised employees of 3D printing firms that participated in the 23rd Annual RAPDASA (Rapid Product Development Association of South Africa) Conference in South Africa. The Macorr sample size calculator was used to deduce the appropriate sample size based on a population of 275. Using the Rao Soft Sample Size calculator, at the 95% confidence level, the appropriate sample size for a population of 275 is 161. A simple random sampling technique was used to select the respondents. Since Google Forms was used for the online data collection procedure, simple random gave each participant an equal opportunity to be selected to participate

in the study. First, to implement the simple random sampling technique, numbers were assigned to the emails of the 275 employees of 3D printing firms and institutions that participated in the conference. The Statistical Package for Social Sciences (SPSS) version 26 random number generator function was used to generate random numbers for 161 participant emails out of the population of 275.

3.2 Data Collection

Data collection was done online using Google Forms. An approved questionnaire was converted to an online version using Google Forms. The questionnaire was emailed to participants randomly selected by the researcher using the SPSS random generator. Three months were taken to gather data online from respondents This is because most of the respondents delayed filling out the online questionnaires, and as a result, email reminders were sent from time to time until an acceptable response rate was reached for data analysis.

3.3 Measures

This section presents the instruments that were used in measuring the constructs of the study namely leader emotional intelligence, leader emotional behaviour and employee job performance.

Leader emotional intelligence was measured using the Emotional Competence Inventory (ECI). Boyatzis et al. (2010) developed the Emotional Competence Inventory (ECI) as a self-report questionnaire to assess emotional and social competencies, using Goleman's emotional intelligence model. The ECI assesses 12 competencies classified into four groups: self-awareness, self-management, social awareness and relationship management.

Various studies have verified the credibility of the ECI, exhibiting strong psychometric characteristics such as reliability and validity. Various studies have verified the credibility of the ECI, exhibiting strong psychometric characteristics such as reliability and validity. Boyatzis et al. (2010) discovered that the ECI revealed strong internal consistency and test-retest reliability in their research.

According to Ng et al.'s (2010) research, the ECI demonstrated strong internal consistency, test-retest reliability and construct validity compared to assessments of emotional intelligence, personality traits and job performance. From the findings of O'Sullivan et al. (2013), the ECI showed strong criterion validity by accurately predicting leadership effectiveness.

Leaders emotional behaviour was measured using the Differential Emotion Scale (DES). The Differential Emotion Scale (DES), developed by Izard (1997), is a self-report questionnaire that assesses the strength of various emotions an individual experience. The DES comprises 30 questions that measure the strength of ten distinct emotions: joy, interest, surprise, sadness, anger, disgust, contempt, fear, humiliation and guilt (Izard, 1997).

The DES has been used to assess emotional behaviour in various contexts; for example, it has been used in parenting studies to examine the emotional

climate of the home and the extent to which parents communicate positive and negative emotions with their children (Cole et al., 2003).

The DES has been used in clinical settings to measure the emotional experiences of people suffering from diseases such as depression (Rottenberg et al., 2002) and anxiety (Chapman et al., 2006).

Employee job performance was measured using the Individual Work Performance Questionnaire (IWPQ). Koopmans (2015) developed the IWPQ, an 18-item tool, to evaluate the three primary components of job performance: task performance, contextual performance and counterproductive work behaviour (CWB). The IWPQ employs a five-point Likert scale ranging from 0 (never) to 4 (always). Research has been carried out to evaluate the psychometric characteristics of the IWPQ.

Blomme et al. (2010) have reported that the IWPQ exhibits good internal consistency and test-retest reliability, with Cronbach's alpha coefficients ranging from 0.74 to 0.95 and intra-class correlation coefficients ranging from 0.74 to 0.87, respectively. According to De Gieter et al. (2011), the IWPQ demonstrates sound construct validity, criterion-related validity and predictive validity, and can effectively distinguish between high and low performers. Konradt et al. (2015) reported that the IWPQ shows sound convergent and discriminant validity and can effectively distinguish between task performance, contextual performance and counterproductive work behaviour.

3.4 Data analysis

First, the data gathered from Google Forms was extracted into Microsoft Excel format and then imported into the Statistical Package for Social Sciences (SPSS) version 26 software. The data was coded by assigning appropriate numerical values and entered into the SPSS software. The SPSS software was also used to analyse the demographic data of the participants as well as descriptive statistics of the variables, such as minimum, maximum, mean and standard deviations. After importing the data from SPSS, the researcher utilised Smart PLS 4 software to conduct direct and indirect (moderation) analysis for testing the proposed hypotheses. This analysis was performed using Partial Least Squares (PLS) Structural Equation Modeling (SEM). PLS-SEM is a statistical technique commonly employed in social sciences research to examine direct and indirect relationships between variables (Hair et al., 2021). It allows researchers to assess both the direct and indirect effects of variables on the outcome of interest (Cepeda-Carrion et al., 2018). In this study therefore, we utilised PLS-SEM to examine the direct and mediating relationships between leader emotional intelligence, leader emotional behavior and employee job performance among 3D printing firms in South Africa.

4 Results

4.1 Demographic data of respondents

According to results from the demographic data, the majority of respondents had ages ranging from 36–40 years (33.1%), 20.9% from 31–35 years, 19.6% from 26–30 years, 14.9% from 41–45 years, 8.1% from 45–50 years, and 3.4% were older than 50 years. The results on gender show that the 3D printing industry in South Africa is male-dominated as 79.7% of the participants were males and 20.3% were females. In terms of participants' highest educational qualification, the majority of them have achieved their master's (39.9%), 25% have honours or postgraduate diplomas, and 13.5% have bachelor's or advanced diplomas. However, a minority of participants have diplomas (9.5%), doctorates (8.8%), and advanced certificates (3.4%). Regarding the work title of participants, it was found that 19.6% were CAD designers, 17.6% were researchers, 16.2% were operations officers, 13.5% were sales and IT personnel, 11.5% were business developers, and 8.1% were marketing officers. In terms of the 3D printing firm category, the majority of participants work in firms that deal with 3D printing consulting (35.8%), 31.8% are in 3D software and related technologies, 14.2% work in firms supplying 3D printing materials, 10.8% are in 3D design and tool making, and 7.4% work in 3D machine reselling companies. From the results, it could be deduced that most of the participants have worked in their respective 3D printing firms for 4–6 years, as they constituted 48%, 23% for 7–10 years, 14.9% for 1–3 years and 14.2% for more than 10 years.

Table 1: Demographic information of participants

Variable	Sub-category	Frequency	Percentage (%)
Age	26-30 years	29	19.6
	31-35 years	31	20.9
	36-40 years	49	33.1
	41-45 years	22	14.9
	46-50 years	12	8.1
	Over 50 years	5	3.4
	Total	148	100
Gender	Male	118	79.7
	Female	30	20.3
	Total	148	100
Highest Educational Qualification	Advanced Certificate	5	3.4
	Diploma	14	9.5
	Bachelor's/Advanced Diploma	20	13.5
	Honours/Postgraduate Diploma	37	25
	Master's	59	39.9
	Doctorate	13	8.8
	Total	148	100

IJARBM – International Journal of Applied Research in Business and Management
Vol. 05 / Issue 02, July 2024
ISSN: 2700-8983 | an Open Access Journal by Wohllebe & Ross Publishing

This paper is available online at
www.ijarbm.org

Work title	Business devel-oper	17	11.5
	IT personnel	20	13.5
	CAD designer	29	19.6
	Operations officers	24	16.2
	Sales personnel	20	13.5
	Researcher	26	17.6
	Marketing officer	12	8.1
	Total	148	100
3D printing firm category	3D Machine re-seller	11	7.4
	3D Material sup-plier	21	14.2
	Consulting	53	35.8
	3D Software and related technolo-gies	47	31.8
	Design and tool making	16	10.8
	Total	148	100
Number of Years Spent Working in Your 3D Printing Firm	1–3 years	22	14.9
	4–6 years	71	48
	7–10 years	34	23
	More than 10 years	21	14.2
	Total	148	100

4.2 Validity and reliability analysis

We used Smart PLS 4 software to conduct validity and reliability analysis on the variables of the study namely: construct validity, convergent validity, discriminant validity and reliability statistics.

4.3 Construct validity

Construct validity refers to the degree to which the measurement model accurately reflects the measured construct (Xiong et al., 2015). According to Tabachnick and Fidell (2019), construct validity is typically assessed by examining the factor loadings of the observed indicators on the latent variable. Factor loadings represent the strength of the relationship between the latent variable and the observed indicator. Factor loadings of 0.5 or above are considered a good indicator of construct validity. From Table 2, all 12 items for measuring leader emotional intelligence had factor loadings that were greater than 0.5 and therefore met the criteria for construct validity. For employee job performance, the five items for measuring task performance and the seven (7) items for measuring contextual performance had factor loadings greater than 0.5, achieving construct validity. Again, all six (6) items used for measuring leader emotional behaviour had factor loadings greater than 0.5 and therefore met the criteria for construct validity.

Table 2: Construct Validity

Leaders emotional intelligence	Factor loadings
SA1 <- leader emotional intelligence	0.644
SA2 <- leader emotional intelligence	0.676
SA3 <- leader emotional intelligence	0.635
SM3 <- leader emotional intelligence	0.691
SOA1 <- leader emotional intelligence	0.768
SOA2 <- leader emotional intelligence	0.874
SOA3 <- leader emotional intelligence	0.865
RM1 <- leader emotional intelligence	0.868
RM2 <- leader emotional intelligence	0.816
RM3 <- leader emotional intelligence	0.767
Leader emotional behaviour	**Factor loadings**
VIG1 <- leader emotional behaviour	0.839
VIG2 <- leader emotional behaviour	0.887
VIG3 <- leader emotional behaviour	0.908
FRI1 <- leader emotional behaviour	0.918
FRI2 <- leader emotional behaviour	0.907
FRI3 <- leader emotional behaviour	0.843
Employee job performance	**Factor loadings**
TP1 <- employee job performance	0.688
TP2 <- employee job performance	0.690
TP3 <- employee job performance	0.703
TP4 <- employee job performance	0.764
TP5 <- employee job performance	0.779
CP1 <- employee job performance	0.733
CP2 <- employee job performance	0.786
CP3 <- employee job performance	0.799
CP4 <- employee job performance	0.799
CP5 <- employee job performance	0.782
CP6 <- employee job performance	0.759
CP7 <- employee job performance	0.685

4.4 Convergent validity

Convergent validity is a type of validity that examines the extent to which multiple measures of the same construct are positively related to each other (Henseler, 2017). Convergent validity is typically assessed by examining each construct's average variance extracted (AVE) (Guay et al., 2015). The AVE is

a measure of the amount of variance in the observed indicators that is explained by the construct. A rule of thumb for AVE suggests that the AVE value should be 0.5 to indicate good convergent validity (Urueña & Hidalgo, 2016).

4.5 Discriminant validity

Discriminant validity is a type of construct validity that assesses the degree to which a measure is distinct from other unrelated measures. Fornell-Larcker criterion is a method for assessing discriminant validity in structural equation modelling, which assesses discriminant validity by comparing the square root of the AVE for each construct to the correlation among the constructs. According to Hanafiah (2020), discriminant validity is achieved if the square root of AVE for each construct is greater than the correlation between that construct and any other construct.

4.6 Reliability statistics

Cronbach's alpha, composite reliability (rho_A), and composite reliability (rho_C) are all measures of the internal consistency of a scale or set of items, commonly used to assess the reliability of a measure. According to Chan and Idris (2017), cronbach alpha values greater than 0.7 indicate a good measure of internal consistency or reliability of items used for measuring the constructs.

Table 3: Convergent validity

Variables	Average variance extracted (AVE)
Employee job performance	0.560
Leader emotional behaviour	0.782
Leader emotional intelligence	0.586

According to Table 3, the AVE values attained for the constructs comprised: leader emotional intelligence = 0.586, employee job performance = 0.560, leader emotional behaviour = 0.782. From the AVE values for the constructs, it could be concluded that convergent validity was achieved since AVE values for each construct (leader emotional intelligence, leader emotional behaviour and employee job performance) were greater than 0.5.

Table 4: Discriminant validity

	employee job performance	leader emotional behaviour	leader emotional intelligence
employee job performance	0.748		
leader emotional behaviour	0.688	0.884	
leader emotional intelligence	0.845	0.698	0.766

IJARBM – International Journal of Applied Research in Business and Management
Vol. 05 / Issue 02, July 2024
ISSN: 2700-8983 | an Open Access Journal by Wohllebe & Ross Publishing

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From table 4, discriminant validity was achieved because, the square root of the AVE for each variable (leader emotional intelligence, leader emotional behaviour and employee job performance) was greater than the correlation between each construct and any other construct.

Table 5: Reliability statistics and convergent validity

	Cronbach's alpha	**Composite reliability (rho_a)**	**Composite reliability (rho_c)**
Employee job performance	0.928	0.928	0.938
Leader emotional behaviour	0.944	0.944	0.956
Leader emotional intelligence	0.920	0.929	0.933

From Table 5, cronbach alpha values attained were greater than 0.9 showing strong internal consistency of the items used for measuring the variables/constructs. Composite reliability (rho_A) is a measure of the internal consistency of a set of items which is based on the factor loadings of the items on the underlying construct. Values that are greater than 0.7 indicate a good measure of internal consistency (Mohamad et al., 2015). For this study, composite reliability (rho_A) values were greater than 0.9, which shows a strong measure of reliability of items used for measuring leader emotional intelligence, employee job performance and leader emotional behaviour.

4.7 R-Square statistics

From table 6, the r-square value of 0.733, it could be rightly inferred that 73.3% of the variation in employee job performance could be explained by leader emotional intelligence in the 3D printing sector in South Africa. However, the r-square value of 0.487 indicates that 48.7% of the variation in leader emotional behaviour is explained by leader emotional intelligence in the 3D printing sector in South Africa.

Table 6: R-Square statistics

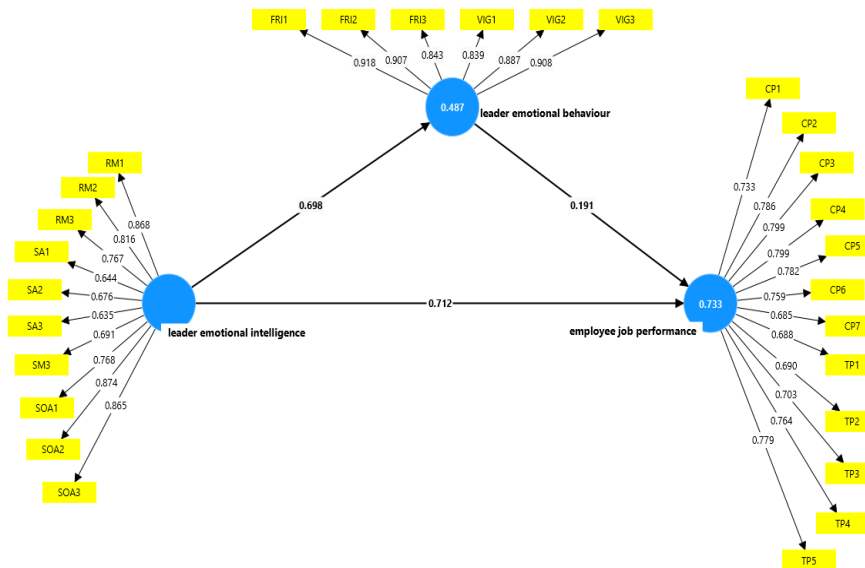|	**R-Square**	**R-Square adjusted**
Employee job performance	0.733	0.730
Leader emotional behaviour	0.487	0.484

Figure 2: Structural Equation Modelling for direct and mediating relationships

4.8   Hypotheses testing for direct and mediating relationships

Results from table 7 showed that a significant positive relationship exists between leader emotional intelligence and employee job performance among 3D printing firms (B=0.712, p=0.000). Hypothesis 1 was accepted. The result also shows that a significant positive relationship exists between leader emotional intelligence and leader emotional behaviour among 3D printing firms in South Africa (B=0.698, p=0.000). Hypothesis 2 was therefore accepted. The result also indicated that a significant positive relationship exists between leader emotional behaviour and employee job performance among 3D printing firms in South Africa (B=0.191, p=0.000). The fourth hypothesis was also accepted as the result showed that leader emotional behaviour mediated the relationship between leader emotional intelligence and employee job performance among 3D printing firms in South Africa (B=0.133, p=0.000).

Table 7: Hypotheses testing

Hypotheses	B-value	t-statistic	p-value
H1: Leader emotional intelligence -> employee job performance	0.712	9.643	0.000

H2: Leader emotional intelligence -> leader emotional behaviour	0.698	11.027	0.000
H3: Leader emotional behaviour -> employee job performance	0.191	2.370	0.018
H4: Leader emotional intelligence -> leader emotional behaviour -> employee job performance	0.133	0.064	0.038

5   Discussion of results

The result that a significant positive relationship exists between leaders' emotional intelligence and employee job performance confirmed the first hypothesis. This result is an indication that, increase in leaders' emotional intelligence improved the job performance of employees among 3D printing firms in South Africa. This finding was consistent with previous studies by Lakshmi and Rao (2018), Pant and Yadav (2016) and Suhairy et al. (2022). This is because, these empirical studies have also found that a significant positive relationship exists between leaders' emotional intelligence and employee job performance.

The result which showed that a significant positive relationship exists between leaders' emotional intelligence and leaders' emotional behavior, confirmed the second hypothesis. The result is an indication that, leaders of 3D printing firms who are emotionally intelligent also exhibit positive emotional behaviour such as friendliness and vigor. This finding was consistent with a studies conducted by Walter et al. (2012) whose study found that leaders' level of emotional intelligence has direct positive correlation with emotional behaviours. The study's finding was also consistent with the study by Dabke (2016) who found that emotional intelligence of leaders gives them the ability to exhibit good emotional behaviours such as empathy, positive reinforcement, gratitude, active listening and optimism.

The third hypothesis was also confirmed as the result of the study showed that a significant positive relationship exists between leaders' emotional behaviour and employee job performance gives the implication that positive emotional behaviour of leaders improves the job performance of employees among 3D printing firms. This finding was consistent with previous studies that were conducted by Dulebohn et al. (2012), Choudhary et al. (2017) as well as Bambale et al. (2016). The result from the study by Dulebohn et al. (2012) showed that employees' positive opinions regarding their leaders' emotional behaviours contribute to favourable work outcomes such as employee job performance. The result from the study conducted by Choudhary et al. (2017)

also indicated that leaders' emotional management abilities at universities have a strong positive association with workers' job performance.

The result of the study which showed that leader emotional behaviour mediates the relationship between leader emotional intelligence and employee job performance, confirmed the fourth hypothesis. The result gives the indication that leaders with high emotional intelligence exhibit positive emotional behaviours, which in turn positively influence employees' performance among 3D printing firms in South Africa. The result of the study was consistent with previous literature. In a study that was conducted by Ashkanasy and Dorris (2017), it was found that leaders who exhibit appropriate emotional conduct may successfully encourage their colleagues, reduce stress, and raise job satisfaction, resulting in improved performance results. Similarly, Jiang and Luo (2018) discovered that leaders who regulate their emotions well foster a supportive and trusting work environment, which increases staff engagement and productivity.

6   Conclusion

Our study examined the direct and mediating relationships between leader's emotional intelligence, leader emotional behaviour and employee job performance 3D printing firms in South Africa. The findings of our study highlights the value of emotional intelligence for improving employee job performance in South Africa's 3D printing industry. Our study further demonstrates that a positive work environment contributes significantly to employee engagement and productivity through the exhibition of positive leader emotional behaviour such as friendliness, empathy and vigor. Our study also contributes to managerial research in 3D printing research by emphasizing the need for emotional intelligence as a managerial asset for 3D printing firms that is capable for enhancing employee job performance. The study concludes that embracing emotional intelligence within management practices can foster a more effective and productive workforce in the 3D printing industry.

6.1   Theoretical Implications

- The result of the study has theoretical implications. This is because, the study contributes to the job demands resources theory by demonstrating its impact on the broader leader emotional intelligence, emotional behaviour and employee job performance relationships. This extension enriches existing models and frameworks of leader emotional intelligence, emotional behaviour and job performance with regards to the interplay between job demands and job resources in organizational settings.
- Moreover, by showing how emotional intelligence affect job performance through positive emotional behaviour, the research helps in integrating these constructs into a cohesive framework. This should inspire future research to explore these dynamics in other contexts or industries, thus broadening the applicability of our findings.

- Additionally, the identification of leader emotional behaviour as a mediator adds complexity and depth to the understanding of how leader traits and behaviours trickle down to affect employee outcomes. This highlights the importance of intermediary factors in organizational behaviour studies, which could be pivotal in developing more nuanced theories.
- Given the geographical focus on South Africa, our study also contributes to the cross-cultural understanding of emotional intelligence and organizational behaviour. This is crucial because much of the existing research is centered on Western contexts, and our findings could challenge or reinforce these in a different cultural setting.

6.2   Practical Implications

- Regarding practical implications, the study's findings suggest that 3D printing firms in South Africa should integrate emotional intelligence into their management policies.
- The study's finding also shed light on the need for 3D printing firms in South Africa to implement training programs to develop emotional intelligence skills among leaders and employees, promoting a positive work environment that fosters engagement and productivity.
- Furthermore, policies of 3D printing firms should encourage regular assessments of organizational environment to ensure a supportive atmosphere.
- Additionally, 3D printing firms should create platforms for open communication and feedback, reinforcing a culture that values empathy, teamwork, and emotional awareness.
- The study has also made a valuable contribution to managerial practices within the 3D printing industry in South Africa by shedding light on the significance of emotional intelligence, emotional behaviour on employee job performance.
- Unlike previous research that primarily focused on the technical and engineering aspects of 3D printing, this study emphasises the importance of emotional intelligence as a strategic managerial asset that could contribute positively to employee job performance.
- The findings of the study also practically suggest that incorporating emotional intelligence as a critical managerial skill can effectively enhance employee job performance in 3D printing firms.

6.3   Limitations and future research

A key limitation that confronted our study is its primary focus on 3D printing industry in South Africa, which could restrict the generalizability of the findings across different organizational and cultural contexts. This is because, the effectiveness of leader emotional behavior and emotional intelligence might vary

significantly depending on the organizational environment and cultural background of the employees. Future research should therefore explore the direct and mediating relationships between leader emotional intelligence, leader emotional behaviour and employee job performance across diverse industries and cultural contexts to understand how cultural differences influence leadership effectiveness.

Another limitation of this study is its cross-sectional nature, as the study was conducted within a specified time frame, thereby making the results screwed to only the short term. In this regard, conducting longitudinal studies would offer a deeper understanding of the long-term effects of leader emotional behavior and emotional intelligence on employee performance. Such studies could help establish causality and assess the sustainability of the positive outcomes associated with effective emotional management in leadership among 3D printing firms in South Africa.

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8 References

Afrifa, S., Fianko, S. K., & Dzogbewu, T. C. (2021). Goleman's Intrapersonal Dimension of Emotional Intelligence: Does it Predict Effective Leadership? *Organizational Cultures,* 21(2), 35–50. https://doi.org/10.18848/2327-8013/CGP/V21I02/35-50

Altındağ, E., & Kösedağı, Y. (2015). The relationship between emotional intelligence of managers, innovative corporate culture and employee performance. *Procedia-Social and Behavioral Sciences,* 210, 270–282.

Amah, O. E. (2023). Examining leaders' emotional intelligence as a distal antecedent of employee engagement: The role of employee voice and trust in direct leadership. *Africa Journal of Management*, 9(2), 117–133. https://doi.org/10.1080/23322373.2023.2187612

Ashkanasy, N. M., & Dorris, A. D. (2017). Emotions in the workplace. Annual Review of *Organizational Psychology and Organizational Behavior*, 4, 67-90.

Bakker, A. B., & De Vries, J. D. (2021). Job Demands–Resources theory and self-regulation: new explanations and remedies for job burnout. *Anxiety,*

Stress, & Coping, 34(1), 1–21. https://doi.org/10.1080/10615806.2020.1797695

Bakker, A. B., & Demerouti, E. (2014). J*ob demands–resources theory.* Wellbeing: A Complete Reference Guide, 1–28.

Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology,* 22(3), 273.

Bakker, A. B., Demerouti, E., & Sanz-Vergel, A. (2023). Job Demands–Resources Theory: Ten Years Later. *Annual Review of Organizational Psychology and Organizational Behavior*, 10(1), 25–53. https://doi.org/10.1146/annurev-orgpsych-120920-053933

Bambale, A. J., Kassim, S. I., & Musa, L. (2016). Effect of emotional leadership on employee performance among staff of tertiary institutions in Gombe. *Journal of Resources Development and Management*, 19, 23-30.

Barrick, M. R., Thurgood, G. R., Smith, T. A., & Courtright, S. H. (2015). Collective Organizational Engagement: Linking Motivational Antecedents, Strategic Implementation, and Firm Performance. *Academy of Management Journal,* 58(1), 111–135. https://doi.org/10.5465/amj.2013.0227

Barsade, S. G., & Knight, A. P. (2015). Group Affect. *Annual Review of Organizational Psychology and Organizational Behavior*, 2(1), 21–46. https://doi.org/10.1146/annurev-orgpsych-032414-111316

Chan, L. L., & Idris, N. (2017). Validity and Reliability of the Instrument Using Exploratory Factor Analysis and Cronbach's alpha. *International Journal of Academic Research in Business and Social Sciences*, 7(10), 400–410.

Chen, A., Bian, M., & Hou, Y.-H. (2015). Impact of transformational leadership on subordinate's EI and work performance. *Personnel Review*, 44, 438–453. https://doi.org/10.1108/PR-09-2012-0154

Cherniss, C., & Roche, C. W. (2020). How Outstanding Leaders Use Emotional Intelligence. Leader to Leader, 2020(98), 45–50. https://doi.org/10.1002/ltl.20517

Chong, S., Pan, G.-T., Chin, J., Show, P. L., Yang, T. C. K., & Huang, C.-M. (2018). Integration of 3D printing and Industry 4.0 into engineering teaching. *Sustainability,* 10(11), 3960.

Dabke, D. (2016). Impact of Leaders Emotional Intelligence and Transformational Behavior on Perceived Leadership Effectiveness: A Multiple Source View. *Business Perspectives and Research*, 4, 27–40. https://doi.org/10.1177/2278533715605433

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology,* 86(3), 499.

Doğru, Ç. (2022). A Meta-Analysis of the Relationships Between Emotional Intelligence and Employee Outcomes. *Frontiers in Psychology*, 13.

Dzogbewu, T. C. (2020). *Additive manufacturing of TiAl-based alloys.* In Manufacturing Review (Vol. 7, p. 35). EDP Sciences. https://doi.org/10.1051/mfreview/2020032

Dzogbewu, T. C., Amoah, N., Fianko, S. K., Afrifa, S., & De Beer, D. (2022). *Additive manufacturing towards product production: A bibliometric analysis.* In

Manufacturing Review (Vol. 9, p. 1). https://doi.org/10.1051/mfreview/2021032

Dzogbewu, T. C., Fianko, S. K., Amoah, N., Afrifa Jnr, S., & de Beer, D. (2022). *Additive manufacturing in South Africa: critical success factors.* In Heliyon (Vol. 8, Issue 11, p. e11852). Elsevier. https://doi.org/10.1016/j.heliyon.2022.e11852

Fianko, S. K., Afrifa Jnr, S., & Dzogbewu, T. C. (2020). Does the interpersonal dimension of goleman's emotional intelligence model predict effective leadership? *African Journal of Business and Economic Research*, 15(4), 221–245. https://doi.org/10.31920/1750-4562/2020/V15N4A10

Goleman, D. (2021). *Leadership: The power of emotional intelligence.* More Than Sound LLC.

Gooty, J., Connelly, S., Griffith, J., & Gupta, A. (2010). *Leadership, affect and emotions: A state of the science review.* In Leadership Quarterly (Vol. 21, Issue 6, pp. 979–1004). https://doi.org/10.1016/j.leaqua.2010.10.005

Goswami, A., Nair, P., Beehr, T., & Grossenbacher, M. (2016). The relationship of leaders' humor and employees' work engagement mediated by positive emotions: Moderating effect of leaders' transformational leadership style. *Leadership & Organization Development Journal*, 37(8), 1083-1099.

Henseler, J. (2017). Bridging Design and Behavioral Research with Variance-Based Structural Equation Modeling. *Journal of Advertising*, 46(1), 178–192. https://doi.org/10.1080/00913367.2017.1281780

Hossain, M. A., Zhumabekova, A., Paul, S. C., & Kim, J. R. (2020). *A review of 3D printing in construction and its impact on the labor market. In Sustainability* (Switzerland) (Vol. 12, Issue 20, pp. 1–21). Multidisciplinary Digital Publishing Institute. https://doi.org/10.3390/su12208492

Huang, J., Wang, Y., & You, X. (2016). The Job Demands-Resources Model and Job Burnout: The Mediating Role of Personal Resources. *Current Psychology*, 35(4), 562–569. https://doi.org/10.1007/s12144-015-9321-2

Jiang, H., & Luo, Y. (2018). Crafting employee trust: from authenticity, transparency to engagement. *Journal of Communication Management,* 22(2), 138-160.

Knight, C., Patterson, M., & Dawson, J. (2017). Building work engagement: A systematic review and meta-analysis investigating the effectiveness of work engagement interventions. *Journal of Organizational Behavior,* 38(6), 792–812. https://doi.org/10.1002/job.2167

Lee, C.-C., Yeh, W.-C., Yu, Z., & Lin, X.-C. (2023). The relationships between leader emotional intelligence, transformational leadership, and transactional leadership and job performance: A mediator model of trust. *Heliyon,* 9(8), e18007. https://doi.org/10.1016/j.heliyon.2023.e18007

Lei, C., Hossain, M. S., Mostafiz, M. I., & Khalifa, G. S. (2021). Factors determining employee career success in the Chinese hotel industry: A perspective of Job-Demand Resources theory. *Journal of Hospitality and Tourism Management*, 48, 301–311.

Maddocks, J. (2023). Introducing an attitude-based approach to emotional intelligence. Frontiers in Psychology, 13.

Meira, J. V. de S., & Hancer, M. (2021). Using the social exchange theory to explore the employee-organization relationship in the hospitality industry.

International *Journal of Contemporary Hospitality Management*, 33(2), 670–692.

Miao, C., Humphrey, R. H., & Qian, S. (2018). A cross-cultural meta-analysis of how leader emotional intelligence influences subordinate task performance and organizational citizenship behavior. *Journal of World Business,* 53(4), 463–474.

Mohamad, M., & Jais, J. (2016). Emotional intelligence and job performance: A study among Malaysian teachers. *Procedia Economics and Finance,* 35, 674–682.

Mohamad, M. M., Sulaiman, N. L., Sern, L. C., & Salleh, K. M. (2015). Measuring the Validity and Reliability of Research Instruments. *Procedia - Social and Behavioral Sciences,* 204, 164–171. https://doi.org/10.1016/j.sbspro.2015.08.129

Naidoo-Chetty, M., & du Plessis, M. (2021). Job demands and job resources of academics in higher education. *Frontiers in Psychology*, 12, 631171.

O'Neill, O. A., Barsade, S. G., & Sguera, F. (2023). The psychological and financial impacts of an emotional culture of anxiety and its antidote, an emotional culture of companionate love. *Social Science & Medicine*, 317, 115570. https://doi.org/10.1016/j.socscimed.2022.115570

Ozyilmaz, A. (2020). Hope and human capital enhance job engagement to improve workplace outcomes. *Journal of Occupational and Organizational Psychology,* 93(1), 187–214. https://doi.org/10.1111/joop.12289

Pant, I., & Yadav, R. (2016). Impact of Emotional Intelligence on the Job Performance of Employee. International Research *Journal of Management, IT & Social Sciences*, 3, 9. https://doi.org/10.21744/irjmis.v3i1.83

Park, J.-G., Lee, H., & Lee, J. (2015). Applying social exchange theory in IT service relationships: exploring roles of exchange characteristics in knowledge sharing. *Information Technology and Management,* 16(3), 193–206. https://doi.org/10.1007/s10799-015-0220-x

Reijseger, G., Peeters, M. C. W., Taris, T. W., & Schaufeli, W. B. (2017). From Motivation to Activation: Why Engaged Workers are Better Performers. *Journal of Business and Psychology*, 32(2), 117–130. https://doi.org/10.1007/s10869-016-9435-z

Schaufeli, W. B. (2017). Applying the job demands-resources model. *Organizational Dynamics*, 2(46), 120–132.

Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: a multi-sample study. *Journal of Organizational Behavior*, 25(3), 293–315. https://doi.org/10.1002/job.248

Schniederjans, D. G. (2017). Adoption of 3D-printing technologies in manufacturing: A survey analysis. *International Journal of Production Economics*, 183, 287–298. https://doi.org/10.1016/J.IJPE.2016.11.008

Schonwetter, T., & Van Wiele, B. (2018). 3D printing: Enabler of social entrepreneurship in Africa? The roles of FabLabs and low-cost 3D printers. Cape Town, South Africa: *Open African Innovation Research* (Open AIR).[Google Scholar].

Schonwetter, T., & Van Wiele, B. (2020). Social Entrepreneurs' Use of Fab Labs and 3D Printing in South Africa and Kenya. The African *Journal of Information and Communication,* 26(26), 1–24. https://doi.org/10.23962/10539/30356

Sembiring, N., Nimran, U., Astuti, E. S., & Utami, H. N. (2020). The effects of emotional intelligence and organizational justice on job satisfaction, caring climate, and criminal investigation officers' performance. *International Journal of Organizational Analysis*, 28(5), 1113–1130. https://doi.org/10.1108/IJOA-10-2019-1908

Sharma, A., Agrawal, R., & Khandelwal, U. (2019). Developing ethical leadership for business organizations: A conceptual model of its antecedents and consequences. *Leadership & Organization Development Journal,* 40(6), 712–734. https://doi.org/10.1108/LODJ-10-2018-0367

Siegling, A. B., Nielsen, C., & Petrides, K. V. (2014). Trait emotional intelligence and leadership in a European multinational company. *Personality and Individual Differences*, 65, 65–68. https://doi.org/10.1016/j.paid.2014.01.049

Sony, M., & Mekoth, N. (2016). The relationship between emotional intelligence, frontline employee adaptability, job satisfaction and job performance. *Journal of Retailing and Consumer Services*, 30, 20–32.

Suhairy, M. S., Mohamed, N., Ahmad, N., Kaidi, H. M., Dziyauddin, R. A., & Sam, S. M. (2022). Emotional Intelligence Impacts on Work Performance: The Case in Telecommunication Malaysia Research Company. *International Journal of Innovation and Technology Management,* 19(03), 2240003. https://doi.org/10.1142/S021987702240003X

Taris, T. W., & Schaufeli, W. B. (2015). *The Job Demands-Resources Model.* In S. Clarke, T. M. Probst, F. Guldenmund, & J. Passmore (Eds.), The Wiley Blackwell Handbook of the Psychology of Occupational Safety and Workplace Health (1st ed., pp. 155–180). Wiley.

Tummers, L. G., & Bakker, A. B. (2021). Leadership and Job Demands-Resources Theory: A Systematic Review. In Frontiers in Psychology (Vol. 12, p. 722080). *Frontiers Media* S.A. https://doi.org/10.3389/fpsyg.2021.722080

Urueña, A., & Hidalgo, A. (2016). Successful loyalty in e-complaints: FsQCA and structural equation modeling analyses. *Journal of Business Research,* 69(4), 1384–1389. https://doi.org/10.1016/j.jbusres.2015.10.112

Van Woerkom, M., Bakker, A. B., & Nishii, L. H. (2016). Accumulative job demands and support for strength use: Fine-tuning the job demands-resources model using conservation of resources theory. *Journal of Applied Psychology*, 101(1), 141.

Windapo, A., Yende, M., Kala, O., Maboreke, L., & Matshidze, L. (2023). *The Adoption of 3D Printing as a Construction Methodology in South Africa: What Are the Barriers?* In T. C. Haupt, M. Akinlolu, F. Simpeh, C. Amoah, & Z. Armoed (Eds.), Construction in 5D: Deconstruction, Digitalization, Disruption, Disaster, Development (pp. 79–89). Springer International Publishing. https://doi.org/10.1007/978-3-030-97748-1_7

Wong, C.-S., & Law, K. S. (2017). *The effects of leader and follower emotional intelligence on performance and attitude: An exploratory study.* In Leadership Perspectives (pp. 97–128). Routledge.

Yan, Y., Zhang, J., Akhtar, M. N., & Liang, S. (2023). Positive leadership and employee engagement: The roles of state positive affect and individualism-collectivism. *Current Psychology*, 42(11), 9109–9118. https://doi.org/10.1007/s12144-021-02192-7

IJARBM – International Journal of Applied Research in Business and Management
Vol. 05 / Issue 02, July 2024
ISSN: 2700-8983 | an Open Access Journal by Wohllebe & Ross Publishing