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3D Printing Leadership Dynamics: Emotional Intelligence, Organizational Emotional Climate, Job Performance Linkages in South Africa

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Abstract: Research on the 3D printing industry in South Africa has predominantly focused on engineering and technical aspects, leaving a gap in studies related to management and organizational dynamics. To address this gap, our study aimed to examine the direct and mediating relationships between leader emotional intelligence, organizational emotional climate and employee job performance among 3D printing firms in South Africa. We employed a deductive research approach, a quantitative research method and a cross-sectional explanatory correlational research design. We used simple random sampling to select 148 employees of 3D printing firms in South Africa. Questionnaires served as the data collection instruments, and online data gathering was done using Google Forms. The Statistical Package for Social Sciences (SPSS) version 26 software was used for data coding, data entry, and descriptive statistics. Smart PLS 4 was used to conduct Partial Least Squares (PLS) Structural Equation Modelling. The study's findings demonstrate that a significant positive relationship exists between leader emotional intelligence and employee job performance. A significant positive relationship also exists between leader emotional intelligence and organizational emotional climate. A significant positive relationship was found to exist between organizational emotional climate and employee job performance. The finding also showed that organizational emotional climate mediates the relationship between a leader's emotional intelligence and employee job performance. The findings emphasize that fostering emotional intelligence among leaders in South African 3D printing firms could enhance both employee job performance and organizational emotional climate. Our findings emphasize that by prioritizing leader training and development in emotional intelligence, 3D printing firms could create a positive emotional atmosphere conducive to improved employee job performance.

Keywords: leader emotional intelligence; organizational emotional climate; employee job performance; 3D printing firms.

Introduction

3D printing is one of the world's most contemporary and booming industries, and South Africa is at the forefront, especially in Africa (Dzogbewu et al., 2022; Signé, 2023). According to Hossain et al. (2020), successful implementation of 3D printing technology requires employees with advanced skills and experience to operate and manage 3D printing machines to achieve optimum company performance. Highly skilled workers are hard to come by, making it imperative that, as 3D printing firms employ people, managers must possess and apply appropriate managerial practices to manage and create a

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conducive work environment to ensure that employees perform their jobs according to expectations (Hull, 2015). Amid this focus on the job performance of 3D printing employees, the role of leaders' emotional intelligence in promoting employee performance has emerged as a popular topic in contemporary organizational management research and practice (Pradhan et al., 2017). Emotional intelligence has gained research and practice attention because of its relevance to various employee-related outcomes, including job performance (Parke et al., 2015). Leaders' emotional intelligence involves leaders leveraging emotions at the workplace for the productive purposes of their employees (Afrifa et al., 2021; Fianko et al., 2020; Goleman, 2014). Leaders' emotional intelligence and employee performance are, therefore, inextricably related and important to organizational success (Khan et al., 2017; Sony & Mekoth, 2016). Therefore, it is crucial for research to fully understand how leadership emotional intelligence can enhance employee job performance.

According to Pascucci et al. (2018), although 3D printing has gained much attention in research, the debates are more focused on its technical dimension and the economic implications at the institutional level. However, there has been less exploration of the managerial and business performance issues (Pascucci et al., 2018). An extensive literature review on 3D printing research identified four thematic areas: the adoption and use of 3D printing technology (Khorram Niaki & Nonino, 2017; Musso et al., 2022; Yeh & Chen, 2018); the impact of 3D printing on supply chain structures and processes (Chaudhuri et al., 2017; Ghadge et al., 2022; Oettmeier & Hofmann, 2016); the relationship between 3D printing and business models and the relationship between 3D printing and sustainability (Bogers et al., 2016; Flammini et al., 2017; Holzmann et al., 2017).

Successful implementation of 3D printing technology requires employees with advanced scarce skills and experiences to achieve economic success (Kretzschmar et al., 2018; Shahrubudin et al., 2019). At a time when highly skilled workers are difficult to come by (Sandström, 2016), there is a high demand for skilled workers in the 3D printing industry (Schniederjans, 2017). As a result, 3D printing businesses are struggling to find skilled workers, negatively impacting production, quality, innovation, and growth (Woodson et al., 2019). Due to these problems, 3D printing firms need appropriate managerial skills to manage and retain their employees (Paritala et al., 2017). Leadership emotional intelligence has emerged as a potent organizational practice that can influence employees' job performance by creating an appropriate work environment in which they can perform optimally (Miao et al., 2018). This implies that 3D printing firms should pay attention to their leaders' emotional intelligence. Moreover, although 3D printing has grown over the years, research in the industry has focused on engineering, neglecting the managerial side (Pascucci et al., 2018). For all of these reasons, there is a need for management-related research to bridge the research gap while providing an understanding of how to best manage these scarcely skilled workers, based on the belief that proper management is critical to the job performance of 3D printing employees (Paritala et al., 2017).

The problem that necessitates this current study is the dearth of research on the direct and mediating relationships between leader emotional intelligence, organizational emotional climate, and employee job performance among 3D printing firms in South Africa. Previous studies have examined the direct relationships between leader emotional intelligence and employee job performance (Pant & Yadav, 2016; Suhairy et al., 2022), the relationship between leader emotional intelligence and organizational emotional climate (Maddocks, 2023; Sembiring et al., 2020), and the relationship between organizational emotional climate and employee job performance (Amah, 2023; O'Neill et al., 2023). However, none of these studies have specifically examined the 3D printing environment in South Africa. Research on the mediating role of organizational emotional climate in the relationship between leader emotional intelligence and employee job performance among 3D printing firms in South Africa is scarce, as noted by Doru (2022) and Lee et al. (2023). Conducting this study will provide industry-specific insights that are directly applicable to the unique operational, cultural, and economic environment of 3D printing firms in South Africa. This study aims to contribute to the literature on the managerial aspects of

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3D printing by examining the direct and mediating relationships between leader emotional intelligence, organizational emotional climate, and employee job performance among 3D printing firms in South Africa. Practically, the study's findings aim to contribute to more effective management of 3D printing employees in order for them to perform optimally.

The structure of this paper is as follows: after the introductory section, the second part reviews existing literature, focusing on theoretical and empirical studies that bridge the gap between theory and practice. The third part presents the research context and outlines the methodology used in this study. Following that, the fourth part delves into the analysis and findings. The discussion and implications are explored in the fifth section. Finally, the conclusion highlights key insights, recommendations, future research directions, and the limitations of the study.

Literature review and hypotheses development

The underlying theories

We used transformational leadership theory and organizational support theory to serve as the foundation for explaining the direct and mediating relationships between leader emotional intelligence, organizational emotional climate, and employee job performance among 3D printing firms in South Africa. According to Korejan and Shahbazi (2016), transformational leadership theory posits that transformational leaders inspire and motivate employees by fostering a shared vision, providing intellectual stimulation, and showing individualized consideration. Leaders with high emotional intelligence are more likely to exhibit transformational leadership behaviors, which can positively influence the emotional climate of the organization (Mathew & Gupta, 2015). Based on the transformational leadership theory, we argue that leaders with transformational leadership exhibit emotional intelligence, which has a positive impact on organizational climate and employee job performance.

Organizational support theory suggests that perceptions of organizational support, including emotional support from leaders, positively influence employee attitudes and behaviors (Kurtessis, Eisenberger, Ford, Buffardi, Stewart, & Adis, 2017). This perception of support fosters a sense of loyalty and commitment among employees, leading to higher job performance (Kurtessis et al., 2017). Moreover, organizational emotional climate is a crucial aspect of organizational support, where positive emotional interactions between leaders and employees contribute to a supportive environment conducive to job performance (Battistelli, Galletta, Vandenberghe, & Odoardi, 2016). Based on the organizational support theory, we argue that among 3D printing firms, leaders who exhibit emotional intelligence could provide emotional support for employees, thereby creating positive support to enhance organizational emotional climate and employee job performance.

Leader emotional intelligence

A leader's emotional intelligence is defined as a leader's ability to be aware of their emotions, manage their emotions, and also understand and manage the emotions of their subordinates in the organization (Goleman, 2014). According to Goleman, leader emotional intelligence has four dimensions: self-awareness, self-management, social awareness, and relationship management (Goleman, 2015). Self-awareness refers to an awareness of one's emotions at work that enables leaders to monitor their own emotions and their effects on those 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 a subordinate's feelings (Goleman, 2015). Relationship management

refers to the skilful management of relationships with others, which includes the ability to influence, collaborate, and foster strong bonds with followers (Goleman, 2015).

Organizational emotional climate

According to Maamari and Majdalani (2017), the emotional climate of the organization refers to how members perceive the emotional atmosphere of their workplace, including the emotions of their colleagues, their job tasks, the organization itself, and its management. An emotional climate of love revolves around affection, compassion, care, and tenderness towards others, fostering a sense of connection and interdependence rooted in empathy and genuine concern for others (O'Neill & Rothbard, 2017). An emotional climate of joy features predominant positive emotions, such as happiness, pleasure, contentment, and pride, and promotes creativity, playfulness, and an energetic approach to exploring new possibilities in an organization (Barsade & Knight, 2015). An emotional climate of fear is characterized by anxiety, uncertainty, and apprehension, as this organizational environment often triggers caution, heightened awareness, and defensive responses to perceived threats or risks (Enwereuzor, Onyishi, & Ekwesaranna, 2023). An emotional climate of sadness reflects a mood of loss, disappointment, or grief, leading to introspection, subdued energy, and a focus on overcoming challenging circumstances (Du Bray, Wutich, Larson, White, & Brewis, 2019).

Employee job performance

Job performance is also defined as the actions, behaviors, and results of workers at work that are connected to and contribute to the organization'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). 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).

Leaders' emotional intelligence and employee job performance among 3D printing firms

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. Another study by Gaffoor (2020) investigated the potential relationship between leaders' emotional intelligence and their employees' job performance in Sri Lankan higher education institutions. The research findings indicated that a significant positive association exists between leaders' emotional intelligence and employees' job performance in higher education institutions in Sri Lanka. Based on the literature, therefore, it is hypothesized in this study as follows:

H1: There is a significant positive relationship between leaders' emotional intelligence and employee job performance in 3D printing firms.

Leaders' emotional intelligence and organizational emotional climate among 3D printing firms

Maddocks (2023) used a quantitative survey approach to investigate the impact of leaders' emotional intelligence on the organization's emotional climate. The research findings indicated that a significant positive connection exists between a leader's emotional intelligence and the emotional climate within the organization. The research

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findings further suggest that the interpersonal aspects of emotional intelligence in leaders, such as social awareness and relationship management, are more strongly associated with the emotional climate of the workplace than the intrapersonal aspects of emotional intelligence, such as self-awareness and self-management. Sembiring et al. (2020) conducted a quantitative research study to examine further the influence of leaders' emotional intelligence on organizational justice, job satisfaction, organizational caring climate, and the performance of criminal investigators in Indonesia. The research findings revealed a significant and positive correlation between the emotional intelligence of corporate executives and the caring work climate fostered within their organizations are significant factors. Based on the literature, the researchers hypothesised as follows:

H2: A significant positive relationship exists between leaders' emotional intelligence and organizational emotional climate.

Organizational emotional climate and employee job performance among 3D printing firms

A study by Amah (2023) has indicated that organizations that nurture positive emotional climates, such as emotional climates of love and joy, can improve company and staff performance. Another study by Barsade and Knight (2015) has also found that a positive emotional environment in the workplace positively impacts employees' moods and emotions, resulting in a suitable working environment for people to reach their full potential. Organizations are focusing their efforts on creating healthy emotional cultures in the workplace, highlighting positive employee emotions like joy, satisfaction, and companionate love. A positive organizational climate, therefore, increases employee attention to clients as well as job performance (O'Neill et al., 2023). A study by Kassam et al. (2022) on 426 employees in Egyptian higher education institutions revealed the emotional environment's significant and positive impact on job performance. Based on the literature, the study proposes a hypothesis as follows:

H3: There is a significant positive relationship between organizational emotional climate and employee job performance among 3D printing firms.

The mediating role of organizational emotional climate on the relationship between leader emotional intelligence and employee job performance among 3D printing firms

Lee et al. (2023) employed a quantitative survey methodology to examine the influence of leader emotional intelligence and transformational and transactional leadership styles on employee job performance, using the organizational emotional climate of trust in supervisors as a moderating variable. The organizational emotional climate of trust in supervisors mediated the relationships between leader emotional intelligence and employee job performance. Doğru (2022) conducted a study to investigate the relationships between leader emotional intelligence, organizational commitment, organizational citizenship behaviour, managerial job satisfaction and job performance. The study results indicated that creating a positive organizational climate of managerial job satisfaction positively mediated the relationship between leader emotional intelligence and employee job performance. Based on the empirical results, the researcher hypothesised as follows:

H4: Organizational emotional climate will mediate the relationship between leaders' emotional intelligence and organizational emotional climate.

Conceptual framework

We dwelled on both the theories of transformational leadership (Korejan & Shahbazi, 2016; Mathew & Gupta, 2015) and organizational support (Battistelli et al., 2016; Kurtessis et al., 2017) to propose four (4) hypotheses in this conceptual framework for

the direct and mediating relationships between leader emotional intelligence, organizational emotional climate, and employee job performance among 3D printing firms. Our hypotheses, as shown in this conceptual framework, were also based on previous empirical literature that has found positive relationships between leader emotional intelligence and employee job performance (Gaffoor, 2020; Pant & Yadav, 2016; Suhairy et al., 2022), leader emotional intelligence and organizational emotional climate (Maddocks, 2023; Sembiring et al., 2020), organizational emotional climate and employee job performance (Amah, 2023; Barsade & Knight, 2015; O'Neill et al., 2023), as well as the mediating role of organizational emotional climate on the relationship between leader emotional intelligence and employee job performance (Doğru, 2022; Lee et al., 2023).

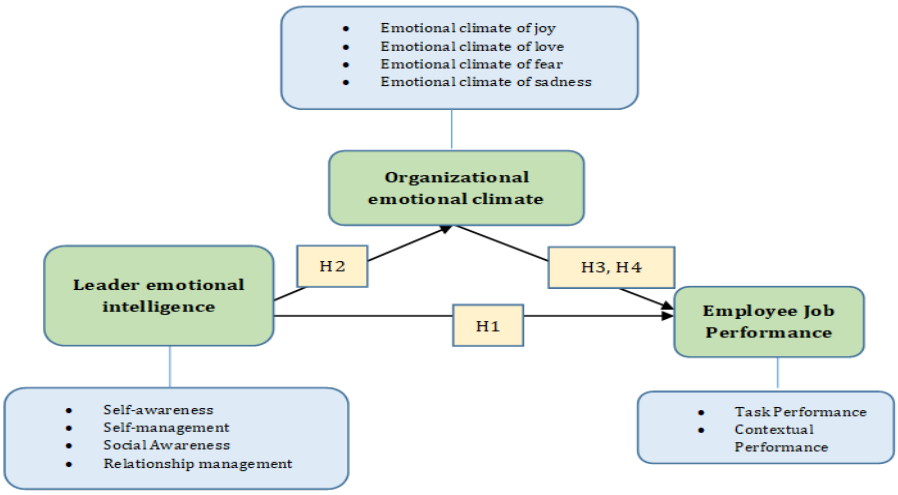

Figure 1. Hypothesized conceptual framework
Source: own processing

Methodology

The research design employed in this study was a cross-sectional explanatory correlational approach. This design was chosen to shed light on the relationships between leader emotional intelligence, organizational emotional climate, and employee job performance, specifically within the context of 3D printing firms. A deductive research approach was adopted. According to Woiceshyn and Daellenbach (2018), the deductive approach involves starting with a general theory or hypothesis and then proceeding towards specific observations or conclusions. In this study, the choice of a deductive research approach was justified by formulating hypotheses based on existing theories, such as the transformational leadership theory and organizational support theory, to establish direct and indirect (mediating) relationships between leader emotional intelligence, organizational emotional climate, and employee job performance within the context of 3D printing firms in South Africa.

The study employed a quantitative research method to investigate the correlations among leader emotional intelligence, organizational emotional climate, and employee job performance in 3D printing firms in South Africa. The use of quantitative research methods allowed for the collection of numerical data, enabling the researchers to test hypotheses and analyse the data using statistical techniques. The study population was comprised of employees of 3D printing firms that participated in the 23rd Annual RAPDASA Conference in South Africa. A sample size of 161 employees was selected from a population of 275 using the simple random sampling technique. We assigned numbers to the emails of the 275 employees of 3D printing firms and institutions that participated in the conference to implement the simple random sampling technique. The Statistical

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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. However, out of 161 employees selected to participate in the study, 148 returned their questionnaires, giving a response rate of 91.9%.

Questionnaires served as the data collection instruments. Emotional intelligence was measured using the Emotional Competence Inventory (ECI), which consisted of 12 items. Employee job performance was measured using the Individual Work Performance Questionnaire comprising 18 items. Organizational emotional climate was measured using the Emotional Climate Scale, which was comprised of 12 items. Data gathered from questionnaires were analysed using Statistical Package for Social Sciences (SPSS) version 26 and Smart PLS 4 software. Partial least squares (PLS) structural equation modelling was used to assess the direct and mediating effects among the variables used for the study.

Empirical results

This section presents results on structural equation modelling using the Smart PLS 4 software. First, results were presented to check for validity and model fit indices such as construct validity using factor loadings, convergent validity using Average Variance Extracted (AVE), reliability statistics, discriminant validity using the Fornell-Larcker criterion, multicollinearity statistics using the Variance Inflation Factor (VIF), and R-Square statistics. The direct and indirect (mediating) effects among the variables were also checked, and decisions were taken on the acceptance or rejection of the proposed hypotheses. Results from the direct and indirect (mediating) analyses were discussed with reference to the relevant literature.

Construct validity

In structural equation modelling (SEM), construct validity refers to the degree to which the measurement model accurately reflects the measured construct (Xiong et al., 2015). Typically, SEM assesses construct validity 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. According to Roni et al. (2015), factor loadings of 0.5 or above are considered a good indicator of construct validity.

From Table 1, all 12 items for measuring leader emotional intelligence had factor loadings 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 six items for measuring contextual performance had factor loadings greater than 0.5, achieving construct validity. Again, all 12 items used for measuring organizational emotional climate had factor loadings greater than 0.5 and, therefore, met the criteria for construct validity.

Table 1. Construct validity

Leader emotional intelligence	**Factor loadings**
RM1 <- Leader emotional intelligence	0.848
RM2 <- Leader emotional intelligence	0.808
RM3 <- Leader emotional intelligence	0.767
SA1 <- Leader emotional intelligence	0.649
SA2 <- Leader emotional intelligence	0.689
SA3 <- Leader emotional intelligence	0.657
SM1 <- Leader emotional intelligence	0.598
SM2 <- Leader emotional intelligence	0.527
SM3 <- Leader emotional intelligence	0.693

Leader emotional intelligence	**Factor loadings**
SOA1 <- Leader emotional intelligence	0.763
SOA3 <- Leader emotional intelligence	0.843
Employee job performance	**Factor Loadings**
TP1 <- Employee job performance	0.703
TP2 <- Employee job performance	0.706
TP3 <- Employee job performance	0.717
TP4 <- Employee job performance	0.773
TP5 <- Employee job performance	0.801
CP1 <- Employee job performance	0.756
CP2 <- Employee job performance	0.793
CP3 <- Employee job performance	0.795
CP4 <- Employee job performance	0.795
CP5 <- Employee job performance	0.754
CP7 <- Employee job performance	0.646
Organizational Emotional Climate	**Factor Loadings**
OCF1 <- Organizational emotional climate	0.620
OCF2 <- Organizational emotional climate	0.635
OCF3 <- Organizational emotional climate	0.584
OCJ1 <- Organizational emotional climate	0.796
OCJ2 <- Organizational emotional climate	0.796
OCJ3 <- Organizational emotional climate	0.874
OCL1 <- Organizational emotional climate	0.835
OCL2 <- Organizational emotional climate	0.808
OCL3 <- Organizational emotional climate	0.790
OSF1 <- Organizational emotional climate	0.848
OSF2 <- Organizational emotional climate	0.798
OSF3 <- Organizational emotional climate	0.674

Source: own processing

Convergent validity and measures of internal consistency or reliability

Convergent validity assesses the positive relationship between multiple measures of the same construct (Henseler, 2017). Convergent validity is typically assessed by examining each construct's average variance extracted (AVE) (Guay et al., 2015). The AVE quantifies the extent to which the construct explains the variance in the observed indicators. A rule of thumb for AVE suggests that the AVE value should be 0.5 to indicate high convergent validity (Urueña & Hidalgo, 2016). According to Table 2, the AVE values attained for the constructs were: leader emotional intelligence = 0.518, employee job performance = 0.563, and organizational emotional climate = 0.578. Given that the AVE values for each construct exceeded 0.5, we can conclude that the constructs achieved convergent validity.

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 a measure's reliability. According to Chan and Idris (2017), Cronbach alpha values greater than 0.7 indicate a good measure of the internal consistency or reliability of the items used for measuring the constructs. The Cronbach alpha values obtained from Table 2 were greater than 0.9, indicating strong internal consistency of the items used for measuring variables and constructs. Composite reliability, also known as rho_A, measures the

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internal consistency of a set of items based on the factor loadings of the items on the underlying construct. Values greater than 0.7 indicate a good internal consistency (Mohamad et al., 2015). For this study, composite reliability (rho_A) values were greater than 0.9, showing a strong internal consistency of items used for measuring leader emotional intelligence, employee job performance and organizational emotional climate (Table 2).

Table 2. Convergent validity and measures of internal consistency

	Cronbach's alpha	Composite reliability (rho_a)	Average variance extracted (AVE)
Employee job performance	0.922	0.922	0.563
Leader emotional intelligence	0.904	0.914	0.518
Organizational emotional climate	0.933	0.947	0.578

Source: own processing

Discriminant validity using the Fornell-Larcker criterion

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. Discriminant validity is achieved if the square root of the AVE for each construct is greater than the correlation between that construct and any other construct (Hanafiah, 2020). From Table 3, discriminant validity was achieved because the square root of the AVE for each variable (leader emotional intelligence, employee job performance, organizational emotional climate) was greater than the correlation between each construct and any other construct.

Table 3. Discriminant validity using Fornell Lacker Criterion

	Employee job performance	Leader emotional intelligence	Organizational emotional climate
Employee job performance	0.751		
Leader emotional intelligence	0.845	0.720	
Organizational emotional climate	0.743	0.654	0.760

Source: own processing

Multicollinearity statistics using variance inflation factor (VIF)

Multicollinearity is a statistical phenomenon that occurs when two or more predictor variables are highly correlated, making it difficult to distinguish the unique effects of each predictor on the outcome variable. One commonly used measure of multicollinearity is the Variance Inflation Factor (VIF). The rule of thumb for interpreting VIF values is that a VIF value greater than 10 indicates the presence of significant multicollinearity. Table 4 shows no incidence of multicollinearity since the VIF values of valid items used in the structural equation modelling were less than 10.

Table 4. Multicollinearity statistics using variance inflation factor (VIF)

Leader emotional intelligence	**VIF value**
RM1	4.210
RM2	3.637
RM3	2.954
SA1	2.394
SA2	2.945
SA3	2.051
SM1	1.820
SM2	1.354
SM3	1.945
SOA1	2.487
SOA3	3.386
Employee job performance	**VIF value**
TP1	2.964
TP2	3.041
TP3	2.450
TP4	4.099
TP5	4.210
CP1	2.583
CP2	4.206
CP3	3.895
CP4	3.677
CP5	3.177
CP7	1.997
Organizational emotional climate	**VIF value**
OCF1	2.940
OCF2	2.889
OCF3	2.907
OCJ1	2.867
OCJ2	3.492
OCJ3	3.997
OCL1	4.145
OCL2	3.850
OCL3	3.031
OSF1	3.562
OSF2	3.251
OSF3	2.547

Source: own processing

R-square and adjusted R-square

In Structural Equation Modelling (SEM), the R-square measures the proportion of variance in the dependent variable that can be explained by the independent variables in the model. The adjusted R-square is a modified version of the R-square that considers the number of independent variables in the model.

Table 5. R-square and adjusted R-square

	R-square	**R-square adjusted**
Employee job performance	0.777	0.774
Organizational emotional climate	0.428	0.424

Source: own processing

According to the R-square value of 0.777, it could be rightly inferred that 77.7% of the variation in employee job performance could be explained by leader emotional intelligence in the 3D printing sector in South Africa. The r-square value of 0.428 implies that 42.8% of the variation in organizational emotional climate is explained by leader emotional intelligence in the 3D printing sector.

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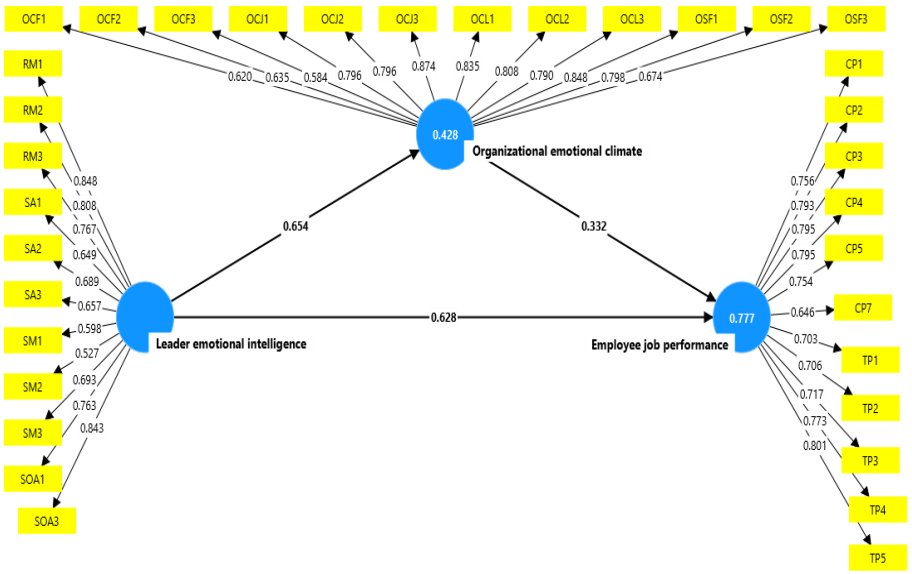

Figure 2. Structural Equation modelling for direct and mediating effects among leader emotional intelligence, employee job performance and organizational emotional climate
Source: own processing

Hypotheses testing

This section tests the hypotheses proposed for direct and indirect (mediating) effects. Decisions were taken as to whether the hypotheses tested were supported or not. Furthermore, the results based on the research hypotheses were discussed in line with the relevant literature.

Table 6. Hypotheses testing

Hypotheses	B-value	t-statistic	p-value	Decision
H1: Leader emotional intelligence -> employee job performance	0.628	7.379	0.000	Supported
H2: Leader emotional intelligence -> organizational emotional climate	0.654	10.016	0.000	Supported
H3: Organizational emotional climate -> employee job performance	0.332	3.804	0.000	Supported
H4: Leader emotional intelligence -> Organizational emotional climate -> Employee job performance	0.217	3.069	0.002	Supported

Source: own processing

Discussions

The findings indicate a significant positive relationship between leaders' emotional intelligence and employees' job performance in South African 3D printing firms (B = 0.628, p = 0.000). This implies that leaders of 3D printing firms in South Africa with high levels of emotional intelligence have a positive impact on their employees' job performance. This supports the validation of Hypothesis 1 and is consistent with the relevant literature. A study by Pant and Yadav (2016) found that leaders with high emotional intelligence who effectively manage their emotions at the workplace positively impact their employees' job performance in Indian software companies. Similarly, Suhairy et al. (2022) discovered a significant positive correlation between leaders' emotional intelligence and employees' job performance in Malaysian telecommunication firms. Additionally, Gaffoor (2020) demonstrated that leaders' emotional intelligence significantly predicted employee job performance in higher education institutions in Sri Lanka. This finding highlights the

significance of integrating emotional intelligence training and development programmes for leaders in the 3D printing business. By bolstering the emotional intelligence of leaders, companies can not only boost employee performance but also stimulate innovation, improve quality, and achieve sustainable development in a fiercely competitive market.

The study's findings also indicated a significant positive relationship between a leader's emotional intelligence and organizational emotional climate among 3D printing firms in South Africa (B = 0.654, p = 0.000). The implication is that leaders with high levels of emotional intelligence contribute to a positive organizational emotional climate characterized by joy and love. Hypothesis 2 was therefore supported. The finding was consistent with previous research, such as studies conducted by Maddocks (2023) and Sembiring et al. (2020). Maddocks (2023) conducted a study that supports this result, revealing a stronger link between the interpersonal dimensions of leaders' emotional intelligence (social awareness and relationship management) and the emotional climate of the workplace than the intrapersonal dimensions (self-awareness and self-management). The study by Sembiring et al. (2020) confirms a positive relationship between leader emotional intelligence and organizational caring climate, emphasizing that a caring atmosphere is associated with higher levels of job satisfaction, organizational fairness, and productivity. The study by Sembiring et al. (2020) further argued that leaders with high emotional intelligence are more adept at creating a caring climate within their organizations, resulting in improved employee job performance outcomes. The finding emphasizes the significance of leaders' emotional intelligence in building a favorable organizational climate within South African 3D printing firms. A positive emotional climate can improve worker engagement, fulfilment, and overall productivity. Emotionally intelligent leaders can improve creativity and productivity in highly competitive 3D printing by cultivating a supportive and rewarding work environment.

Additionally, the research revealed a significant positive relationship between organizational emotional climate and employees' job performance among 3D printing firms in South Africa (B = 0.332, p = 0.000). This implies that the organizational climates of 3D printing firms in South Africa, characterized by love and joy, improve employee job performance. Hypothesis 3 was therefore supported. This finding was consistent with previous studies conducted by Barsade and Knight (2015), who found that a positive emotional climate in the workplace positively impacts employee moods and emotions, which contributes to increased job performance. The finding was also consistent with a study by Amah (2023), which found that organizations that nurture positive emotional climates at the workplace, such as emotional climates of love and joy, improve their employees' job performance. A study by O'Neill et al. (2023) also noted that organizations that focus on establishing healthy organizational climates enhance positive employee emotions such as joy, satisfaction, and love, thereby improving employee job performance.

The findings indicate that it is essential for South African 3D printing enterprises to have a positive emotional climate within their organization. A working climate characterized by affection and happiness has the potential to cultivate a staff that is more involved and efficient, therefore promoting creativity and productivity in this highly technological industry. By placing a high value on the emotional well-being of employees, 3D printing companies may improve job performance, which is crucial for staying ahead of competitors and attaining long-term success.

The result also demonstrated that organizational climate positively mediates the relationship between a leader's emotional intelligence and employee job performance (0.217, p = 0.002). The mediation suggests that leaders with higher emotional intelligence create an environment that fosters a positive emotional climate, leading to improved job performance among employees. Hypothesis 4 was, therefore, confirmed. This finding aligns with prior research, which has shown that the organizational emotional climate plays a mediating role in the relationship between leader emotional intelligence and employee job performance (Doğru, 2022; Lee et al., 2023). The findings indicate that improving the emotional intelligence of leaders in South African 3D printing companies

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may significantly influence the overall organizational emotional climate and, consequently, employee performance. High emotional intelligence (EI) leaders can cultivate a work environment characterized by emotional support, joy, and mutual respect. The presence of a healthy emotional climate in a workplace could significantly enhance employee engagement, creativity, and productivity.

Conclusions

Our study examined the direct and mediating relationships between a leader's emotional intelligence, organizational emotional climate, and employee job performance among 3D printing firms in South Africa. We employed a deductive research approach, a quantitative research method, and a cross-sectional explanatory correlational research design to achieve our study's purpose. The findings of our study highlight the value of emotional intelligence for improving employee job performance in South Africa's 3D printing industry. Our study demonstrates that a positive work environment significantly contributes to employee engagement and productivity by focusing on the organizational emotional climate. This transition from a purely technical to a managerial perspective, which includes emotional intelligence as a managerial asset, implies that 3D printing organizations can increase performance by developing these skills and capabilities in their managers and employees. The study concludes that embracing emotional intelligence within management practices can foster a more effective and productive workforce in this innovative industry.

The study's findings have implications for the need for 3D printing companies in South Africa to integrate emotional intelligence into their management policies. This can be achieved by implementing training programs to develop emotional intelligence skills among leaders and employees, promoting a positive work environment that fosters engagement and productivity. Furthermore, the study's findings have implications for 3D printing firms' policies to encourage regular assessments of the organizational emotional climate 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, thereby contributing positively to job performance.

Our 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 and organizational emotional climate on employee job performance. Unlike previous research that primarily focused on the technical and engineering aspects of 3D printing, this study emphasizes the importance of emotional intelligence as a strategic managerial asset that could contribute positively to employee job performance. The study's findings suggest that incorporating emotional intelligence as a critical managerial skill can effectively enhance employee job performance in 3D printing companies.
Due to the relatively small size of the 3D printing industry in South Africa, our study faced significant challenges in gathering data from employees of these firms. However, our collaborative efforts with colleagues in South Africa at the RAPDASA conference in November 2022 enabled us to gather emails from attendees, which significantly contributed to the data collection process. Another limitation that confronted this study was delays in the data collection process, which occurred at the initial stages. The online version of the questionnaire sent to participants' emails during the RAPDASA conference did not receive the expected response rate. Tracking respondents through phone calls, however, made reaching an appropriate response rate possible.

Additionally, using Smart PLS for structural equation modelling (SEM) analysis lacks traditional fit indices such as RMSEA and CFI commonly used in other SEM software. Instead, it utilizes metrics like R-Square values, Average Variance Extracted (AVE) values, Variance Inflation Factor (VIF) values, Fornell-Larcker criterion values, Cronbach alpha values, and factor loadings. The limited functionality of Smart PLS 4 software reduces the

robustness of model fitness evaluation as compared to alternative software options like AMOS, LISREL, and Jamovi. We recommend that researchers conducting similar studies in South African 3D printing companies utilize multiple SEM software packages or combine Smart PLS with other software that provides conventional fit indices, such as AMOS, Lisrel, and Jamovi, to overcome this constraint and improve future research. This approach would allow for a more thorough model fit and reliability assessment. This strategy would also guarantee the accuracy and dependability of outcomes across various statistical and analytical viewpoints.

Theoretical contributions

Our study contributes to the theory of emotional intelligence by demonstrating its impact not just on individual job performance or satisfaction, which is commonly studied, but also on the broader organizational emotional climate. This extension enriches existing models and frameworks of emotional intelligence in organizational settings. Furthermore, the research helps integrate these constructs into a cohesive framework by showing how emotional intelligence affects job performance through a positive organizational climate. This should inspire future research to explore these dynamics in other contexts or industries, thus broadening the applicability of our findings.

Additionally, identifying the organizational emotional climate as a mediator adds complexity and depth to understanding how leader traits and behaviors trickle down and affect employee outcomes. This highlights the importance of intermediary factors in organizational behavior 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 behavior. Our findings could potentially challenge or reinforce the Western contexts on which much of the existing research focuses.

Practical contributions

Organizations can use our findings to design more effective leadership development programmes that enhance leaders' emotional intelligence. Knowing the positive impact of such leadership traits on the organizational climate and employee performance can help justify investments in this area. Additionally, our research supports policies aimed at fostering a positive emotional climate at work. In this regard, organizations could dwell on our findings to introduce initiatives like regular emotional intelligence training, workshops on emotional management, and policies that encourage open expression of emotions at the workplace.

Furthermore, understanding that organizational climate mediates the relationship between a leader's emotional intelligence and job performance makes it imperative for organizations to consider climate enhancement as a strategy for boosting overall performance. Therefore, performance management systems are advised to start or intensify incorporating climate assessments as part of their regular evaluations. Organizations are advised to prioritize emotional intelligence as a key selection criterion for leadership and team management roles, informed by its proven link to beneficial outcomes via organizational climate.

In times of organizational crisis, leaders with high emotional intelligence might be particularly effective, as they can maintain or restore a positive emotional climate, which in turn helps sustain job performance under stress. Overall, our research not only provides a comprehensive look at the interconnectedness of emotional intelligence, organizational climate, and job performance but also offers actionable insights that organizations can implement to enhance their operational effectiveness and employee well-being.

Future research should also explore the relationship between emotional intelligence and employee job performance across different sectors of the 3D printing industry to

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generalize findings. Furthermore, investigating cultural factors in other geographic regions in South Africa could shed light on varying emotional climates and their effects on employee job performance. Additionally, studies could examine the effect of emotional intelligence development programs on the long-term organizational success and employee retention of 3D printing firms in South Africa. Research could also focus on identifying the most effective methods for integrating emotional intelligence into management practices among 3D printing firms in South Africa.

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