



Business & Social Science
IJRBS

Research in Business & Social Science

IJRBS VOL 13 NO 5 (2024) ISSN: 2147-4478

Available online at www.ssbfnct.com

Journal homepage: <https://www.ssbfnct.com/ojs/index.php/ijrbs>

Examining the moderating role of organizational emotional culture on the relationship between leader emotional intelligence and employee job performance in South Africa's additive manufacturing industry

Sampson Afrifa Jnr ^{(a)*} Thywill Cephas Dzogbewu ^(b) Dzansi Yao Dennis ^(c)

Deon Johan de Beer ^(d)



^(a) Department of Business Support Studies, Central University of Technology, Bloemfontein, Free State, South Africa

^(b) Ph.D., Department of Mechanical and Mechatronic Engineering, Faculty of Engineering, Built Environment and Information Technology, Central University of Technology, Bloemfontein, South Africa

^(c) Professor, Department of Business Support Studies, Central University of Technology, Bloemfontein, Free State, South Africa

^(d) Professor, Centre for Rapid Prototyping and Manufacturing, Central University of Technology, Bloemfontein, South Africa

ARTICLE INFO

Article history:

Received 05 May 2024

Received in rev. form 19 June 2024

Accepted 21 July 2024

Keywords:

Leader emotional intelligence; organizational emotional culture, employee job performance, additive manufacturing firms.

JEL Classification:

O15

ABSTRACT

South Africa's additive manufacturing research has mostly concentrated on engineering and technical aspects, with a lack of studies on management and organizational dynamics. To fill this gap, we conducted research on the direct and moderating links between leader emotional intelligence, organizational emotional culture, and employee job performance in South African additive manufacturing enterprises. We used a deductive research approach, a quantitative research method, and a cross-sectional explanatory correlational study design. Our study used simple random sampling to select 148 employees of additive manufacturing 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. Findings of the study showed that significant positive relationships exist between leader emotional intelligence and employee job performance as well as organizational emotional culture. A significant positive relationship also exists between organizational emotional culture and employee job performance. Organizational emotional culture was found to moderate the relationship between leader emotional intelligence and employee job performance. The finding has positive implications for adopting leader emotional intelligence as a strategic managerial resource to enhance staff performance and organizational emotional environment. Our finding therefore suggests the need for training and development on leader emotional intelligence to enhance positive organizational environment and enhance staff job performance among additive manufacturing firms in South Africa.

© 2024 by the authors. Licensee SSBFNET, Istanbul, Turkey. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

Introduction

Additive manufacturing is one of the world's contemporary and growing industries, and South Africa leads the way, particularly in Africa (Signé, 2023). The projected growth of the additive manufacturing industry is expected to reach USD 31.81 billion, with a compound annual growth rate (CAGR) of 20.81% from 2023 to 2028 (Technavio, 2024). The market's development rate in additive manufacturing is contingent upon many variables, such as the substantial demand within the medical device industry, the increasing utilization of computer-aided design/computer-aided manufacturing (CAD/CAM) technology and desktop printers, and the formation of collaborations and partnerships among providers (Technavio, 2024). However, the additive manufacturing industry faces a skills gap, with 60% of companies struggling to find qualified personnel (Noor et al., 2024). According to Hossain et al. (2020), the effective

* Corresponding author. ORCID ID: 0000-0002-1693-1200

© 2024 by the authors. Hosting by SSBFNET. Peer review under responsibility of Center for Strategic Studies in Business and Finance.

<https://doi.org/10.20525/ijrbs.v13i5.3447>

application of additive manufacturing technology necessitates individuals with advanced skills and expertise operating and managing additive manufacturing machines in order to achieve optimal corporate performance. Highly skilled workers are hard to come by, so as additive manufacturing firms hire people, managers must possess and apply appropriate managerial practices to manage and create a conducive work environment that ensures employees perform their jobs as expected (Hull, 2015).

In light of this emphasis on additive manufacturing employees' job performance, the importance of leaders' emotional intelligence in fostering employee performance has arisen as a hot issue in modern organizational management research and practice (Pradhan et al., 2017). Emotional intelligence has received study and practical attention due to its significance in a variety of employee-related outcomes, including work performance (Parke et al., 2015). According to the Padhy et al. (2024), leaders who possess high emotional intelligence (EI) have the ability to enhance team performance by up to 20% and elevate staff engagement by 40%. Moreover, according to Othman et al (2024), a significant 90% of top performers demonstrate a notable level of emotional intelligence (EI), which greatly enhances their overall performance. Leaders' emotional intelligence entails using emotions in the workplace for the benefit of their people (Goleman, 2014). Leaders' emotional intelligence and staff performance are therefore intricately linked and critical to organizational success (Khan et al., 2017; Sony & Mekoth, 2016). As a result, properly knowing the methods via which leadership emotional intelligence might be leveraged to boost the work performance of employees is considered crucial for research.

According to Pascucci et al. (2018), while additive manufacturing has received a lot of attention in research, the discussions are more focused on its technical aspects and the economic consequences at the institutional level. However, management and business performance challenges have received less attention (Pascucci et al., 2018). An extensive literature review on additive manufacturing research identified four thematic areas: 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; 2017; Holzmann et al., 2017); and additive manufacturing and sustainability (Despeisse et al., 2017; Ford & Despeisse, 2016).

To achieve economic success through the successful deployment of additive manufacturing technology, employees with advanced rare skills and experiences are required (Kretschmar et al., 2018; Shahrubudin et al., 2019). At a time when highly skilled professionals are in short supply (Sandström, 2016), there is a significant need for competent personnel in the additive manufacturing sector. As a result, additive manufacturing companies are having difficulty finding competent staff, which has a detrimental influence on productivity, quality, innovation, and growth. Because of these issues, additive manufacturing companies require adequate managerial abilities to manage and retain their staff (Paritala et al., 2017).

Leaders' emotional intelligence has emerged as a significant organisational strategy that may affect employee job performance by providing an ideal work environment (Miao et al. 2018). This means that additive manufacturing companies should focus on their executives' emotional intelligence. Furthermore, although additive manufacturing has developed over the years, research in the sector has focused on engineering and ignored the management 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 insight into how to best manage these scarce skilled workers, as proper management is believed to be critical to the job performance of additive manufacturing employees (Paritala et al., 2017).

This study aims to contribute to the literature on the managerial aspects of additive manufacturing by examining the direct and moderating relationships between leader emotional intelligence, organizational emotional culture and employee job performance among additive manufacturing firms in South Africa. Practically, the findings of the study seek to contribute towards more effective management of additive manufacturing employees for them to perform optimally. Our study is therefore guided by the following research questions:

- i. What is the relationship between leaders' emotional intelligence and employee job performance in additive manufacturing firms?
- ii. What is the relationship between leaders' emotional intelligence and organizational emotional culture in additive manufacturing firms?
- iii. What is the relationship between organizational emotional culture and employee job performance in additive manufacturing firms?
- iv. Does organizational emotional culture moderate the relationship between leaders' emotional intelligence and organizational emotional culture?

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

Theoretical and conceptual background

Job demand-resources theory (JDRT)

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).

Linking the JDRT to this study, it is argued that exposure of employees in the additive manufacturing 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 vigour, 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 additive manufacturing industry based on the availability and accessibility of appropriate job resources. In this regard, firms in the additive manufacturing industry may improve employee well-being and work performance if they properly manage the job demands and resources. For instance, companies may lessen the pressures of jobs by instituting flexible work arrangements, offering social support, and encouraging a healthy balance between work and personal life. They may also be able to provide employment resources such as access to opportunities for training and development, feedback and recognition, and work autonomy.

Leader emotional intelligence

Leader emotional intelligence is defined as the ability of leaders to be aware of and regulate their emotions, as well as understand and control the emotions of their subordinates within their organizations (Goleman, 2014). According to Goleman, leaders' emotional intelligence can be categorized into four dimensions: self-awareness, self-management, social awareness, and relationship management. Self-awareness is the awareness of one's emotions at work, which allows leaders to monitor their own emotions and the consequences they have on others around them (Goleman, Kaplan, David & Eurich, 2018). Self-management involves the ability to regulate one's emotions and behaviors in the workplace (Goleman & Nevarez, 2018). Social awareness refers to an individual's ability to perceive and interpret the emotions of others, and it is distinguished by empathy for subordinates' sentiments (Goleman, 2015). Relationship management is the skilled managing of relationships with others, which includes the abilities to influence, collaborate, and cultivate deep partnerships with followers (Goleman, 2015).

Organizational emotional culture

Maamari and Majdalani (2017) define the emotional culture of an organization as how members perceive the emotional environment of their workplace, which includes the emotions of their colleagues, their job duties, the organization itself, and its management. An emotional culture of love is characterized by affection, compassion, care, and tenderness toward others, as well as a sense of connection and interdependence based on empathy and real concern for others (O'Neill & Rothbard, 2017). An emotional culture of joy is characterized by dominating positive feelings such as enjoyment, pleasure, satisfaction, and pride, and it fosters creativity, fun, and an enthusiastic attitude to exploring new possibilities in a business (Barsade & Knight, 2015). An emotional culture of fear is defined by anxiety, uncertainty, and apprehension, as this organizational environment frequently prompts caution, increased awareness, and defensive reactions to perceived dangers or hazards (Enwereuzor, Onyishi, & Ekwesaranna, 2023). An emotional culture of sadness expresses a sense of loss, disappointment, or grief, and it leads to reflection, low energy, and a focus on overcoming difficult situations (Du Bray, Wutich, Larson, White, & Brewis 2019).

Employee job performance

Job performance is defined as the actions, behaviours and results of employees at work that are related to and contribute to the organization's objectives (Rahiman & Kodikal, 2017). Task performance is defined as employees' work-related behaviors, which could vary greatly depending on their job descriptions (Singh, 2019). Contextual performance also refers to efforts that go beyond one's allocated tasks and contribute to the efficiency and productivity of the firm as a whole (Sackett et al., 2017).

Empirical review and hypotheses development

Leaders' emotional intelligence and employee job performance

Pant and Yadav (2016) examined the relationship between a leader's emotional intelligence and their staff's job performance in five software enterprises in Moradabad, India. The study's findings imply that a leader's emotional intelligence significantly enhances employees' job performance by enabling effective stress management. Suhairy et al. (2022) evaluated the influence of emotional intelligence on the job performance of telecommunication enterprises in Malaysia. The research findings demonstrated a significant positive association between the emotional intelligence of telecommunication professionals and their job performance. Another research by Gaffoor (2020) examined the connection between leaders' emotional intelligence and their workers' job performance in Sri Lankan higher education institutions. The research findings indicated that a significant positive association exists between the emotional intelligence of leaders and the job performance of employees in higher education institutions in Sri Lanka. Although literature has established positive relationships between leaders' emotional intelligence and employee job performance, none of such studies was conducted within the context of additive manufacturing firms. This therefore creates a research gap on the relationships between leaders' emotional intelligence and employee job performance within the additive manufacturing context, which is yet to be explored by this current study. Based on the literature, therefore, it is hypothesised in this study as follows:

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

Leaders' emotional intelligence and organisational emotional culture

Maddocks (2023) conducted a quantitative survey to investigate the influence of leaders' emotional intelligence on the emotional culture of the organization. The research finding suggested that a significant positive association existed between a leader's emotional intelligence and the emotional culture of the company. The research findings also indicate that interpersonal aspects of emotional intelligence in leaders, such as social awareness and relationship management, are more strongly associated with the workplace's emotional culture than intrapersonal aspects of emotional intelligence, such as self-awareness and self-management. Sembiring et al. (2020) conducted a quantitative study to investigate the impact of leaders' emotional intelligence on organizational justice, work happiness, organizational caring atmosphere, and criminal investigator performance in Indonesia. Research findings indicated a significant and positive correlation between the emotional intelligence of corporate executives and the caring work culture fostered within their organisations. In as much as studies have established positive relationship leaders' emotional intelligence and organizational emotional culture, these studies were not conducted within the organizational context of additive manufacturing firms, which creates a gap in literature. Hence, based on the literature, the researchers hypothesized as follows:

H2: A significant positive relationship exists between leaders' emotional intelligence and organisational emotional culture.

Organisational emotional culture and employee job performance

A study by Amah (2023) has indicated that organisations that nurture positive emotional cultures, such as emotional cultures of love and of 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. O'Neill et al. (2023) also attests that organizations are focusing their efforts on creating healthy emotional cultures in the workplace and that, positive employee emotions like joy, satisfaction and companionate love are highlighted in these organizational cultures. Positive organizational emotional culture therefore increases employee attention to clients as well as job performance (O'Neill et al., 2023). According to a study conducted on 426 employees working in the higher education institutions in Egypt (Kassem et al., 2022), the emotional environment significantly and positively affected job performance. From the literature, it could be deduced that, none of the studies which has established that positive relationships exist between organizational emotional culture and employee job performance was conducted in the context of additive manufacturing firms. The lack of studies on the relationships between organizational emotional culture and job performance in the additive manufacturing industry, creates a gap in literature that this study seeks to explore. Therefore, based on the literature, the study proposes a hypothesis as follows: *H3: There will be a significant positive relationship between organisational emotional culture and employee job performance among additive manufacturing firms.*

Moderating role of organizational emotional culture on the relationship between leader emotional intelligence and employee job performance

Lee et al. (2023) employed a quantitative survey methodology to examine the influence of leader emotional intelligence, transformational and transactional leadership styles on employee job performance, using organizational emotional culture of trust in supervisors as a moderating variable. The organizational emotional culture of trust in supervisors moderated 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 results of the study indicated that creating positive organizational emotional culture of managerial job satisfaction positively moderated the relationship between leader emotional intelligence and employee job performance. Although studies show that organizational emotional culture moderates the relationship between leader emotional intelligence and employee job performance, such studies were not conducted in the additive manufacturing context, thereby creating a gap in literature. Hence, based on the empirical results, the researcher hypothesised as follows:

H4: Organisational emotional culture will mediate the relationship between leaders’ emotional intelligence and organisational emotional culture.

Conceptual framework

We dwelled on the job demands resources theory to propose four (4) hypotheses in this conceptual framework, for the direct and moderating relationships between leader emotional intelligence, organizational emotional culture and employee job performance among additive manufacturing firms. Our hypotheses as shown in this conceptual framework, were also based on previous empirical literature that have found positive relationships between leader emotional intelligence and employee job performance (Pant & Yadav, 2016; Gaffoor, 2020; Suhairy et al., 2022), leader emotional intelligence and organizational emotional culture (Sembiring et al., 2020; Maddocks, 2023), organizational emotional culture and employee job performance (Barsade & Knight, 2015; O’Neill et al., 2023; Amah, 2023), as well as moderating role of organizational emotional culture on the relationship between leader emotional intelligence and employee job performance (Doğru, 2022; Lee et al., 2023).

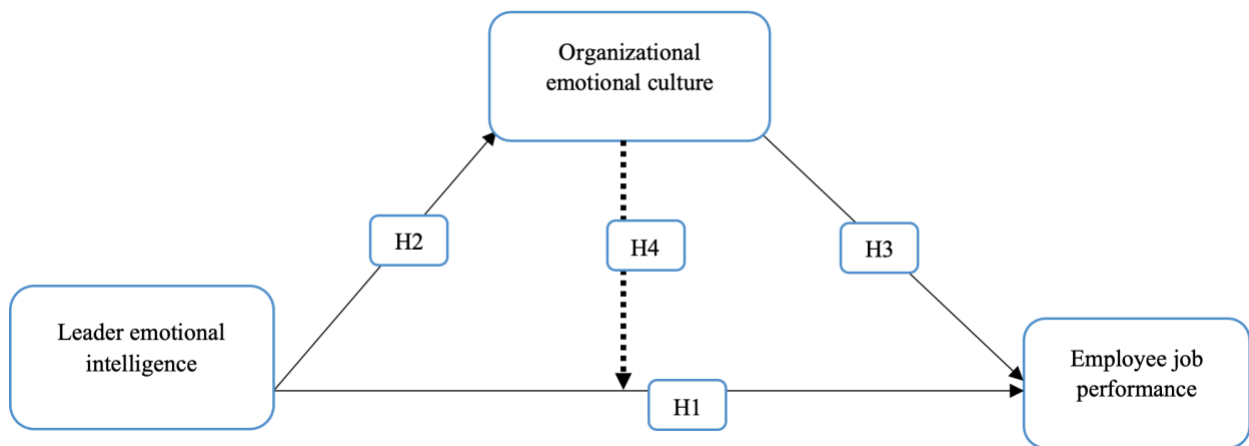


Figure 1: Conceptual framework; *Source:* Authors’ construct, 2024

Research & 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, organisational emotional culture, and employee job performance specifically within the context of additive manufacturing firms. Regarding research approach, the 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 (moderating) relationships between leader emotional intelligence, organisational emotional culture, and employee job performance within the context of additive manufacturing firms in South Africa.

In this study, a quantitative research method was utilised to examine the relationships between leader emotional intelligence, organisational emotional culture, and employee job performance in additive manufacturing firms in South Africa. The use of quantitative research method, allowed for the collection of numerical data, enabling the researchers to test hypotheses and analyze the data using statistical techniques. The population of the study comprised of employees of additive manufacturing 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. However, out of 161 employees selected to participate in the study, 148 returned their questionnaires, giving a response rate of 91.9%. According to Saunders, Lewis and Thornhill (2019), when conducting a quantitative survey, a response rate greater than 70% makes the data appropriate for data analysis. Since this study had a response rate of 91.9%, the researcher deemed it appropriate to commence with data analysis.

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 of 18 items. Organizational emotional culture was measured using the Emotional culture Scale and 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 moderating effects among the variables used for the study.

Data collection was done online using Google Forms. The questionnaire was converted to an online version using Google Forms. The questionnaire was emailed to participants randomly selected by the researchers 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.

The study was limited in scope as the 3D printing industry in South Africa is relatively small so gathering data from employees in 3D printing firms was a key challenge for this study. However, good collaborative efforts with colleagues in South Africa who attended the RAPDASA conference made it possible to gather emails from attendants that played an instrumental role in 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 the emails of participants in the RAPDASA conference did not receive the expected response rate. However, tracking respondents through phone calls made reaching an appropriate response rate possible.

Findings and Discussion

Our study presented results on the response rate and demographic data of respondents using descriptive statistics. Using Smart PLS software, we presented results on validity, reliability, multicollinearity, r-square statistics, direct and moderating relationships. Our results therefore comprised of construct validity using factor loadings, convergent validity using Average Variance Extracted (AVE), reliability statistics, discriminant validity using Fornell-Larcker criterion, multicollinearity statistics using Variance Inflation Factor (VIF) and R-Square statistics. The direct and indirect (moderating) 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 (moderating) analysis were discussed with the relevant literature.

Response rate

A total of one hundred and sixty-one (161) questionnaires were administered to additive manufacturing employees that participated in the 23rd RAPDASA Conference in South Africa. However, one hundred and forty-eight (148) of the respondents, representing 91.9% returned their questionnaires. We considered this response rate to be appropriate for our data analysis since it was greater than 70% of the responses and eligible for a quantitative study as posited by Creswell and Creswell (2018).

Demographic information 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 additive manufacturing 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 additive manufacturing firm category, the majority of participants work in firms that deal with additive manufacturing consulting (35.8%), 31.8% are in 3D software and related technologies, 14.2% work in firms supplying additive manufacturing 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 additive manufacturing 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 respondents

| Age | Frequency | Percentage (%) |
|---------------|------------------|-----------------------|
| 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 | Frequency | Percentage (%) |
|---------------|------------------|-----------------------|
| Male | 118 | 79.7 |
| Female | 30 | 20.3 |
| Total | 148 | 100 |

| Highest Educational Qualification | Frequency | Percentage (%) |
|--|------------------|-----------------------|
| 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 |

| Work title | Frequency | Percentage (%) |
|---------------------|------------------|-----------------------|
| Business developer | 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 |

| Additive manufacturing Firm Category | Frequency | Percentage (%) |
|---|------------------|-----------------------|
| 3D Machine reseller | 11 | 7.4 |
| 3D Material supplier | 21 | 14.2 |
| Consulting | 53 | 35.8 |
| 3D Software and related technologies | 47 | 31.8 |
| Design and tool making | 16 | 10.8 |
| Total | 148 | 100 |

| Number of Years Spent Working in Your additive manufacturing Firm | Frequency | Percentage (%) |
|--|------------------|-----------------------|
| 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 |

Validity and reliability of the measurement instrument

Construct validity refers to the degree to which the measurement model accurately reflects the measured construct (Xiong et al., 2015). In SEM, 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. 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 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 six items

for measuring contextual performance had factor loadings greater than 0.5, achieving construct validity. Again, all 12 items used for measuring organisation emotional culture 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 |
| 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 culture | Factor Loadings |
| OCF1 <- Organizational emotional culture | 0.620 |
| OCF2 <- Organizational emotional culture | 0.635 |
| OCF3 <- Organizational emotional culture | 0.584 |
| OCJ1 <- Organizational emotional culture | 0.796 |
| OCJ2 <- Organizational emotional culture | 0.796 |
| OCJ3 <- Organizational emotional culture | 0.874 |
| OCL1 <- Organizational emotional culture | 0.835 |
| OCL2 <- Organizational emotional culture | 0.808 |
| OCL3 <- Organizational emotional culture | 0.790 |
| OSF1 <- Organizational emotional culture | 0.848 |
| OSF2 <- Organizational emotional culture | 0.798 |
| OSF3 <- Organizational emotional culture | 0.674 |

Convergent validity and measures of internal consistency or reliability

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). According to Table 2, the AVE values attained for the constructs comprised: leader emotional intelligence = 0.518, employee job performance = 0.563, and organisational emotional culture = 0.578. From the AVE values for the constructs, it could be concluded that convergent validity was achieved since AVE values for each construct were greater than 0.5.

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. From Table 2, 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 internal consistency of items used for measuring leader emotional intelligence, employee job performance and organizational emotional culture.

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 culture | 0.933 | 0.947 | 0.578 |

Discriminant validity using 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, organisational emotional culture) 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 culture |
|----------------------------------|---------------------------------|--------------------------------------|---|
| Employee job performance | 0.751 | | |
| Leader emotional intelligence | 0.845 | 0.720 | |
| Organizational emotional culture | 0.743 | 0.654 | 0.760 |

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. From Table 4, there was no incidence of multicollinearity since the VIF values of valid items used in the structural equation modelling was 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 culture | 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 |

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. 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 additive manufacturing sector in South Africa. The r-square value of 0.428 implies that 42.8% of the variation in organisational emotional culture is explained by leader emotional intelligence in the additive manufacturing sector.

Table 5: R-square and adjusted R-square

| | R-square | R-square adjusted |
|----------------------------------|----------|-------------------|
| Employee job performance | 0.777 | 0.774 |
| Organizational emotional culture | 0.428 | 0.424 |

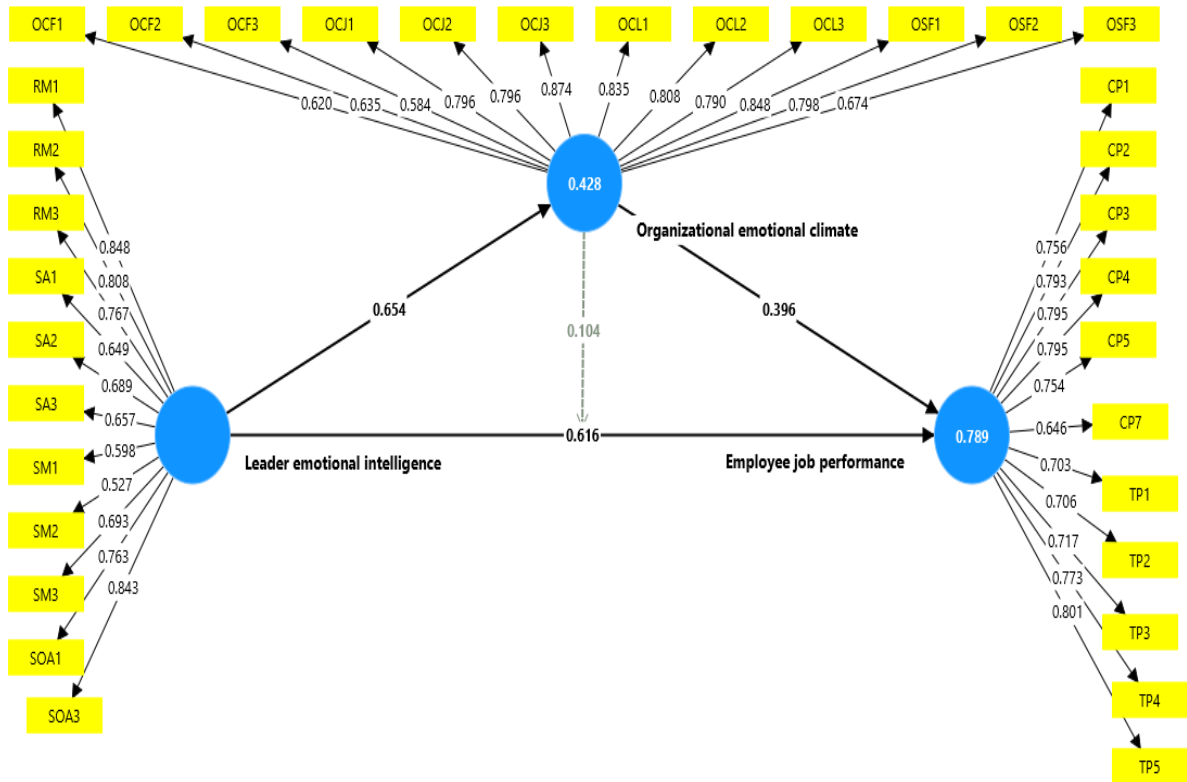


Figure 2: Structural Equation modelling for direct and moderating effects among leader emotional intelligence, employee job performance and organizational emotional culture

Hypotheses testing

This section tests the hypotheses proposed for direct and indirect (moderating) 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 | 0.616 | 8.033 | 0.000 | Supported |
| H2: Leader emotional intelligence -> organizational emotional culture | 0.654 | 10.016 | 0.000 | Supported |
| H3: Organizational emotional culture -> employee job performance | 0.396 | 5.091 | 0.000 | Supported |
| H4: Organizational emotional culture x Leader emotional intelligence -> Employee job performance | 0.104 | 2.650 | 0.008 | Supported |

Discussions

The findings indicate a significant positive relationship between leaders' emotional intelligence and employees' job performance in South African additive manufacturing firms (B = 0.628, p = 0.000). This implies that leaders of additive manufacturing firms in South Africa with high levels of emotional intelligence impact positively on the job performance of their employees. This supports the validation of Hypothesis 1 and is consistent with 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 on job performance of their employees 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. The job demands-resources theory highlights the positive impact of leaders' emotional intelligence on employees' job performance in South African additive manufacturing companies. According to this theory, leaders with high emotional intelligence effectively manage and mitigate emotional demands, creating a supportive work environment. By recognizing and addressing employees' emotional needs, emotionally intelligent leaders reduce stress and enhance job satisfaction, which in turn boosts overall job performance. This supportive atmosphere enables employees to better manage their job demands, leading to increased productivity and engagement. Therefore, integrating emotional intelligence into leadership practices aligns with the job demands-resources theory by fostering a positive work environment that enhances employee performance and well-being.

The result of the study also indicated that a significant positive relationship exists between leader's emotional intelligence and organisational emotional culture among additive manufacturing firms in South Africa ($B = 0.654, p = 0.000$). The implication is that, leaders with high levels of emotional intelligence contribute to positive organizational emotional culture 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). The study conducted by Maddocks (2023) study supports this result since it revealed that the interpersonal dimensions of leaders' emotional intelligence (social awareness and relationship management) have a stronger link with the emotional culture 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 organisational caring culture, emphasizing that a caring atmosphere is associated with higher levels of job satisfaction, organisational 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 culture within their organisations, resulting in improved employee job performance outcomes. The study's results affirm the job demands-resources theory by demonstrating that a leader's increased emotional intelligence acts as a crucial resource in fostering a positive emotional culture within the organization. According to the theory, personal resources like emotional intelligence positively influence the work environment. The study shows that leaders with high emotional intelligence contribute to shaping a supportive and constructive atmosphere, effectively mitigating emotional demands and enhancing overall job satisfaction and performance. This alignment with the theory underscores the value of emotional intelligence as a key personal resource that improves organizational dynamics and employee well-being. Additionally, the research revealed that a significant positive relationship exists between organizational emotional culture and employees' job performance among additive manufacturing firms in South Africa ($B = 0.332, p = 0.000$). This gives the implication that, organizational emotional cultures of additive manufacturing firms in South Africa, characterized by love and joy improves employee job performance. Hypothesis 3 was therefore supported. This finding was consistent with previous studies conducted by Barsade and Knight (2015) who found that positive emotional culture in the workplace, positively impacts on 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 cultures at the workplace such as emotional cultures of love and joy, improve the job performance of their employees. A study by O'Neill et al. (2023) also noted that organizations that focus on establishing healthy organizational emotional cultures enhance positive employee emotions such as joy, satisfaction and love, thereby improving employee job performance. The findings are consistent with the job demands-resources theory, which posits that an improved emotional culture serves as a valuable organizational resource that positively impacts employee work performance. The study argues that a supportive and positive emotional environment, fostered by leaders with high emotional intelligence, enhances employee performance. This aligns with the theory's claim that a favorable work atmosphere contributes significantly to improved job performance, as it helps mitigate job demands and supports employees' well-being. The study's results underscore the importance of cultivating a happy and supportive work environment to boost overall employee effectiveness.

The result also demonstrated that organizational emotional culture positively moderates the relationship between leader emotional intelligence and employee job performance ($0.104, p = 0.008$). The moderation suggests that leaders with higher emotional intelligence create an environment that fosters a positive emotional culture, 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 culture plays a moderating role in the relationship between leader emotional intelligence and employee job performance (Doğru, 2022; Lee et al., 2023). The confirmed positive moderation effect of organizational emotional culture on the relationship between leader emotional intelligence and employee job performance aligns with the Job Demands-Resources (JD-R) theory. According to the theory, a positive organizational emotional culture acts as a valuable resource that amplifies the benefits of leader emotional intelligence on job performance. By enhancing the supportive environment, this culture strengthens the positive impact of emotionally intelligent leadership, thereby improving employee performance. This finding resonates with the JD-R theory's emphasis on how resources can significantly enhance positive work outcomes and overall organizational effectiveness.

Implications

Theoretical implications

Our study contributes to the job demands resources theory by demonstrating its impact not just on individual job performance, which is commonly studied, but also on the broader leader emotional intelligence and organizational emotional culture. This extension enriches existing models and frameworks of leader emotional intelligence, organizational emotional culture 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 organizational culture, 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 organizational emotional culture as a moderator 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.

Practical implications

Organizations can use our findings to design more effective leadership development programs that focus on enhancing emotional intelligence among leaders. Knowing the positive impact of such leadership traits on the organizational emotional culture and employee performance can justify investments in this area. Additionally, our research supports policies aimed at fostering a positive emotional culture 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 emotional culture moderates the relationship between leader emotional intelligence and job performance makes it imperative for organizations to consider emotional culture enhancement as a strategy for boosting overall performance. Performance management systems are therefore advised to start or intensify incorporating culture assessments as part of their regular evaluations. For roles involving leadership and team management, organizations are advised to prioritize emotional intelligence as a key selection criterion, informed by its proven link to beneficial outcomes via organizational emotional culture.

In times of organizational crisis, leaders with high emotional intelligence might be particularly effective, as they can maintain or restore a positive emotional culture, 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 emotional culture and job performance but also offers actionable insights that organizations can implement to enhance their operational effectiveness and employee well-being.

Conclusions

Our study examined the direct and moderating relationships between leader's emotional intelligence, organizational emotional culture and employee job performance among additive manufacturing firms in South Africa. We employed a deductive research approach, quantitative research method and a cross sectional explanatory correlational research design in order to achieve the purpose of our study. The findings of our study highlight the value of emotional intelligence for improving employee job performance in South Africa's additive manufacturing industry. By focusing on the organizational emotional culture, our study demonstrates that a positive work environment contributes significantly to employee engagement and productivity. This transition from a purely technical to a managerial perspective that includes emotional intelligence as a managerial asset implies that additive manufacturing 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 suggest that additive manufacturing companies in South Africa should integrate emotional intelligence into their management policies. To effectively integrate emotional intelligence (EI) into management policies for additive manufacturing companies in South Africa, a detailed roadmap should be implemented. The first step involves assessing the current emotional intelligence levels and gaps within the organization. This can be done using EI assessment tools and gathering feedback through surveys and interviews to understand the existing emotional culture and areas for improvement. Following this, a strategic plan should be developed to integrate EI, setting clear goals and objectives, defining the scope and resources needed, and establishing timelines and key performance indicators (KPIs) for measuring progress.

The study's finding also shed light on the need for additive manufacturing 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. This can be implemented by creating or sourcing EI training modules that focus on self-awareness, self-regulation, motivation, empathy, and social skills. Practical training can be enhanced with case studies and role-playing exercises. Regular workshops and seminars should be scheduled to facilitate learning. Additionally, continuous learning opportunities should be established, such as a library of resources on EI, a mentorship program for guidance, and online courses for flexible learning.

Furthermore, policies of additive manufacturing firms should encourage regular assessments of organizational emotional culture to ensure a supportive atmosphere. This can be achieved by updating HR policies to emphasize the importance of EI in recruitment,

performance evaluations, and promotions. It is also essential to establish EI-focused programs like peer feedback systems and employee assistance programs (EAPs) that offer counseling and support for emotional well-being.

Additionally, additive manufacturing firms should create platforms for open communication and feedback, reinforcing a culture that values empathy, teamwork, and emotional awareness. In order to implement this, regular team meetings and feedback sessions should be set up, and anonymous feedback tools should be used to gather honest opinions on the emotional culture and identify areas for improvement. Reinforcing a supportive culture through recognizing and rewarding high EI behaviors, and sharing success stories related to EI, will help promote a culture that values empathy and teamwork.

Our study has also made a valuable contribution to managerial practices within the additive manufacturing industry in South Africa by shedding light on the significance of emotional intelligence, and organizational emotional culture on employee job performance. Unlike previous research that primarily focused on the technical and engineering aspects of additive manufacturing, this study emphasizes 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 additive manufacturing companies.

Limitations and recommendations for future research

Our study was limited in scope as the additive manufacturing industry in South Africa is relatively small so gathering data from employees in additive manufacturing firms was a key challenge for this study. However, good collaborative efforts with colleagues in South Africa who attended the RAPDASA conference held in November 2022 made it possible to gather emails from attendants that played an instrumental role in 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 the emails of participants in the RAPDASA conference did not receive the expected response rate. However, tracking respondents through phone calls made reaching an appropriate response rate possible.

Future research should investigate the relationship between emotional intelligence and employee job performance across various sectors within the additive manufacturing industry to validate and generalize findings. Specific research questions could include: "How does emotional intelligence impact job performance in different additive manufacturing sectors?" and "What sector-specific factors influence the effectiveness of emotional intelligence in leadership?" Methodologies might involve cross-sector surveys, case studies, and longitudinal analyses to capture diverse perspectives and trends. Utilizing multiple sectors will provide a comprehensive understanding of emotional intelligence's role and help tailor strategies for different contexts within the additive manufacturing industry.

Furthermore, investigating cultural factors in other geographic regions in South Africa could shed light on varying emotional cultures 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 additive manufacturing firms in South Africa. Research could also focus on identifying the most effective methods for integrating emotional intelligence into management practices among additive manufacturing firms in South Africa.

Acknowledgment

All authors have read and agreed to the published version of the manuscript.

Author Contributions: Conceptualization, Methodology, Data Collection, Formal Analysis, Original Draft Writing, and Review and Editing were carried out equally by all authors. All authors have read and approved the final version of the manuscript for publication.

Funding: This research was funded by the Central University of Technology, South Africa

Informed Consent Statement: Informed consent was obtained from all respondents involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

References

- 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>
- 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). Job demands–resources theory. *Wellbeing: A Complete Reference Guide*, 1–28. DOI: 10.1002/9781118539415.wbwell019
- Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology*, 22(3), 273. <https://doi.org/10.1037/ocp0000056>
- 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>

- 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>
- Bogers, M., Hadar, R., & Bilberg, A. (2016). Additive manufacturing for consumer-centric business models: Implications for supply chains in consumer goods manufacturing. *Technological Forecasting and Social Change*, 102, 225–239. <https://doi.org/10.1016/j.techfore.2015.07.024>
- 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. <https://ideas.repec.org/a/hur/ijarbs/v7y2017i10p400-410.html>
- Chaudhuri, A., Rogers, H., Sjøberg, P., Baricz, N., & Pawar, K. (2017). *Identifying future additive manufacturing related services: Insights from Denmark and Germany*. <https://www.researchgate.net/publication/315027084>
- 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>
- Creswell, J.W. and Creswell, J.D. (2018) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage, Los Angeles. <https://www.scirp.org/reference/referencespapers?referenceid=2895169>
- 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. <https://doi.org/10.1037/0021-9010.86.3.499>
- Despeisse, M., Baumers, M., Brown, P., Charnley, F., Ford, S. J., Garmulewicz, A., Knowles, S., Minshall, T. H. W., Mortara, L., Reed-Tsochas, F. P., & Rowley, J. (2017). Unlocking value for a circular economy through additive manufacturing: A research agenda. *Technological Forecasting and Social Change*, 115, 75–84. <https://doi.org/10.1016/j.techfore.2016.09.021>
- Doğru, Ç. (2022). A Meta-Analysis of the Relationships Between Emotional Intelligence and Employee Outcomes. *Frontiers in Psychology*, 13. <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.611348>
- Du Bray, M., Wutich, A., Larson, K. L., White, D. D., & Brewis, A. (2019). Anger and sadness: Gendered emotional responses to culture threats in four island nations. *Cross-Cultural Research*, 53(1), 58-86. <https://doi.org/10.1177/10693971187592>
- Enwereuzor, I. K., Onyishi, A. B., & Ekwesaranna, F. (2023). culture of fear and job apathy as fallout of supervisory nonphysical hostility toward casual workers in the banking industry. *Journal of Organizational Effectiveness: People and Performance*. <https://doi.org/10.1108/JOEPP-07-2023-0300>
- Flammini, S., Arcese, G., Lucchetti, M. C., & Mortara, L. (2017). Business model configuration and dynamics for technology commercialization in mature markets. *British Food Journal*, 119(11), 2340–2358. <https://doi.org/10.1108/BFJ-03-2017-0125>
- Ford, S., & Despeisse, M. (2016). Additive manufacturing and sustainability: An exploratory study of the advantages and challenges. *Journal of Cleaner Production*, 137, 1573–1587. <https://doi.org/10.1016/j.jclepro.2016.04.150>
- Gaffoor, S. (2020). *Impact of Emotional Intelligence on Job Performance of Academic Heads with Special Reference to State Universities in Eastern Province of Sri Lanka*. 82, 13173–13194. <http://ir.lib.seu.ac.lk/handle/123456789/4338>
- Ghadge, A., Mogale, D. G., Bourlakis, M., M. Maiyar, L., & Moradlou, H. (2022). Link between Industry 4.0 and green supply chain management: Evidence from the automotive industry. *Computers & Industrial Engineering*, 169, 108303. <https://doi.org/10.1016/j.cie.2022.108303>
- Goleman, D. (2014). Leading for the Long Future. *Leader to Leader*, 2014(72), 34–39. <https://doi.org/10.1002/ltl.20124>
- Goleman, D. (2015). How to be emotionally intelligent. *The New York Times*. <https://cuny.manifoldapp.org>
- Goleman, D. & Nevarez, M. (2018). *Boost your emotional intelligence with these 3 questions*. Harvard Business Press. <https://membership.amavic.com.au>
- Goleman, D., Kaplan, R. S., David, S., & Eurich, T. (2018). *Self-Awareness* (HBR Emotional Intelligence Series) (1st ed.). Harvard Business Review Press. <https://www.eiconsortium.org>
- Gooty, J., Gavin, M., Johnson, P., Frazier, M., & Snow, D. (2009). In the Eyes of the Beholder: Transformational Leadership, Positive Psychological Capital, and Performance. *Journal of Leadership & Organizational Studies*, 15, 353–367. <https://doi.org/10.1177/1548051809332021>
- Hanafiah, M. H. (2020). Formative Vs. Reflective Measurement Model: Guidelines for Structural Equation Modeling Research. *International Journal of Analysis and Applications*, 18(5), 876-889. <https://etamaths.com/index.php/ijaa/article/view/2166>
- 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>
- Holzmann, P., Breitenacker, R. J., Soomro, A. A., & Schwarz, E. J. (2017). User entrepreneur business models in additive manufacturing. *Journal of Manufacturing Technology Management*, 28(1), 75–94. <https://doi.org/10.1108/JMTM-12-2015-0115>
- Hossain, M. A., Zhumabekova, A., Paul, S. C., & Kim, J. R. (2020). A Review of additive manufacturing in Construction and its Impact on the Labor Market. *Sustainability*, 12(20), Article 20. <https://doi.org/10.3390/su12208492>
- Huang, J., Wang, Y., & You, X. (2016). The Job Demands-Resources Model and Job Burnout: The Moderating Role of Personal Resources. *Current Psychology*, 35(4), 562–569. <https://doi.org/10.1007/s12144-015-9321-2>
- Hull, C. W. (2015). The Birth of additive manufacturing. *Research-Technology Management*, 58(6), 25–30. <https://doi.org/10.5437/08956308X5806067>

- Kassem, M. H., Wahba, M. H., & Khourshed, N. F. (2021). The Effect of Organizational emotional culture on Employee Performance Moderating by Intrapreneurial Behaviours: Case Study. In *4th International Conference on Applied Research in Management, Business & Economics, January* (pp. 24-41). <https://www.icarbeme.org>
- Khan, A., Masrek, M. N., & Nadzar, F. M. (2017). Emotional intelligence and job satisfaction of academic librarians: An assessment of the relationship. *Journal of Librarianship and Information Science*, 49(2), 199–210. <https://doi.org/10.1177/0961000616650733>
- Khorram Niaki, M., & Nonino, F. (2017). Impact of additive manufacturing on business competitiveness: A multiple case study. *Journal of Manufacturing Technology Management*, 28(1), 56–74. <https://doi.org/10.1108/JMTM-01-2016-0001>
- Kretzschmar, N., Chekurov, S., Salmi, M., & Tuomi, J. (2018). Evaluating the Readiness Level of Additively Manufactured Digital Spare Parts: An Industrial Perspective. *Applied Sciences*, 8(10), Article 10. <https://doi.org/10.3390/app8101837>
- 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 moderator model of trust. *Heliyon*, 9(8), e18007. <https://doi.org/10.1016/j.heliyon.2023.e18007>
- Maamari, B. E., & Majdalani, J. F. (2017). Emotional intelligence, leadership style and organizational emotional culture. *International Journal of Organizational Analysis*, 25(2), 327-345. <https://doi.org/10.1108/IJOA-04-2016-1010>
- Maddocks, J. (2023). Introducing an attitude-based approach to emotional intelligence. *Frontiers in Psychology*, 13. <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1006411>.
- Mathew, M., & Gupta, K. S. (2015). Transformational leadership: Emotional intelligence. *SCMS Journal of Indian Management*, 12(2), 75-84. <https://search.ebscohost.com>
- 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. <https://doi.org/10.1016/j.jwb.2018.01.003>
- 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>
- Moorthy, K., Juan, L. M., Kamarudin, A. A., Govindarajo, N. S., & T'ing, L. C. (2023). Emotional intelligence on job performance: A study on Malaysian employees. *Work (Reading, Mass.)*. <https://doi.org/10.3233/WOR-220418>
- Musso, F., Murmura, F., & Bravi, L. (2022). Organizational and Supply Chain Impacts of 3D Printers Implementation in the Medical Sector. *International Journal of Environmental Research and Public Health*, 19(12), Article 12. <https://doi.org/10.3390/ijerph19127057>
- Noor, N. N. M., Rodzalan, S. A., Saat, M. M., Abdullah, N. H., Othman, A., Singh, H., & Emran, N. M. (2024). The Mismatch of Present and Required Future Workforce Skills of Manufacturing Industry. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 37(1), 128-138. <https://doi.org/10.37934/araset.37.1.128138>
- Oettmeier, K., & Hofmann, E. (2016). *3D-Printing: How Additive Manufacturing impacts Supply Chain Business Processes and Management Components*. <https://www.alexandria.unisg.ch/handle/20.500.14171/104238>
- 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>
- O'Neill, O. A., & Rothbard, N. P. (2017). Is love all you need? The effects of emotional culture, suppression, and work–family conflict on firefighter risk-taking and health. *Academy of Management Journal*, 60(1), 78-108. <https://doi.org/10.5465/amj.2014.0952>
- Othman, M. I., Khalifeh, A., Oweidat, I., & Nashwan, A. J. (2024). The Relationship between Emotional Intelligence, Job Satisfaction, and Organizational Commitment among First-Line Nurse Managers in Qatar. *Journal of Nursing Management*, 2024(1), 5114659. <https://doi.org/10.1155/2024/5114659>
- Padhy, T. P., Das, S., & Panda, L. P. (2024). Emotional intelligence and employee involvement: a study on the mediating effect of compassionate leadership. *International Journal of Business Performance Management*, 25(4), 565-588. <https://doi.org/10.1504/IJBPM.2024.139419>
- 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/irjm.v3i1.83>
- Paritala, P. K., Manchikatla, S., & Yarlagadda, P. K. D. V. (2017). Digital Manufacturing- Applications Past, Current, and Future Trends. *Procedia Engineering*, 174, 982–991. <https://doi.org/10.1016/j.proeng.2017.01.250>
- Parke, M. R., Seo, M.-G., & Sherf, E. N. (2015). Regulating and facilitating: The role of emotional intelligence in maintaining and using positive affect for creativity. *Journal of Applied Psychology*, 100(3), 917–934. <https://doi.org/10.1037/a0038452>
- Pascucci, F., Perna, A., Runfola, A., & Gregori, G. L. (2018). The Hidden side of additive manufacturing in management and business studies. *Symphonia*, 2, 91–107. DOI: 10.4468/2018.2.08pascucci.perna.runfola.gregori
- Pradhan, R. K., Jena, L. K., & Singh, S. K. (2017). Examining the role of emotional intelligence between organizational learning and adaptive performance in Indian manufacturing industries. *Journal of Workplace Learning*, 29(3), 235–247. <https://doi.org/10.1108/JWL-05-2016-0046>

- Roni, S. M., Djajadikerta, H., & Ahmad, M. A. N. (2015). PLS-SEM Approach to Second-order Factor of Deviant Behaviour: Constructing Perceived Behavioural Control. *Procedia Economics and Finance*, 28, 249–253. [https://doi.org/10.1016/S2212-5671\(15\)01107-7](https://doi.org/10.1016/S2212-5671(15)01107-7)
- Sandström, C. G. (2016). The non-disruptive emergence of an ecosystem for additive manufacturing—Insights from the hearing aid industry's transition 1989–2008. *Technological Forecasting and Social Change*, 102, 160–168. <https://doi.org/10.1016/j.techfore.2015.09.006>
- Saunders, M.N.K., Lewis, P. and Thornhill, A. (2019) *Research Methods for Business Students*. 8th Edition, Pearson, New York. <https://www.scirp.org/reference/referencespapers?referenceid=2907709>
- Schaufeli, W. B. (2017). Applying the job demands-resources model. *Organizational Dynamics*, 2(46), 120–132. <https://doi.org/10.1016/j.orgdyn.2017.04.008>
- 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>
- Sembiring, N., Nimran, U., Astuti, E. S., & Utami, H. N. (2020). The effects of emotional intelligence and organizational justice on job satisfaction, caring culture, and criminal investigation officers' performance. *International Journal of Organizational Analysis*, 28(5), 1113–1130. <https://doi.org/10.1108/IJOA-10-2019-1908>
- Shahrubudin, N., Te, C. L., & Ramlan, R. (2019). An overview of critical success factors for implementing additive manufacturing technology in manufacturing firms. *Journal of Applied Engineering Science*, 17(3), 379–385. <https://doi.org/10.5937/jaes17-21526>
- 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>
- Signé, L. (2023). *Africa's Fourth Industrial Revolution*. Cambridge University Press. <https://books.google.com>
- 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. <https://doi.org/10.1016/j.jretconser.2015.12.003>
- 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>
- Technavio (2024). *Additive manufacturing market analysis North America, Europe, APAC, South America, Middle East and Africa, USA, China, Germany, UK, France-Size and Forecast 2024 to 2028*. <https://www.technavio.com/report/additive-manufacturing-market-industry-analysis>
- 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 <https://doi.org/10.1037/apl0000033>
- Wan, J., Pan, K. ting, Peng, Y., & Meng, L. qiang. (2022). The Impact of Emotional Leadership on Subordinates' Job Performance: Moderation of Positive Emotions and Moderation of Susceptibility to Positive Emotions. *Frontiers in Psychology*, 13. <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.917287>
- Woiceshyn, J., & Daellenbach, U. (2018). Evaluating inductive vs deductive research in management studies: Implications for authors, editors, and reviewers. *Qualitative Research in Organizations and Management: An International Journal*, 13(2), 183–195. <https://doi.org/10.1108/QROM-06-2017-1538>
- Woodson, T., Alcantara, J. T., & do Nascimento, M. S. (2019). Is additive manufacturing an inclusive innovation?: An examination of additive manufacturing in Brazil. *Technovation*, 80–81, 54–62. <https://doi.org/10.1016/j.technovation.2018.12.001>
- Xiong, B., Skitmore, M., & Xia, B. (2015). A critical review of structural equation modeling applications in construction research. *Automation in Construction*, 49, 59–70. <https://doi.org/10.1016/j.autcon.2014.09.006>
- 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 (New Brunswick, N.j.)*, 42(11), 9109–9118. <https://doi.org/10.1007/s12144-021-02192-7>
- Yeh, C.C., & Chen, Y.-F. (2018). Critical success factors for adoption of additive manufacturing. *Technological Forecasting and Social Change*, 132, 209–216. <https://doi.org/10.1016/j.techfore.2018.02.003>

Publisher's Note: SSBFNET stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



© 2024 by the authors. Licensee SSBFNET, Istanbul, Turkey. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

International Journal of Research in Business and Social Science (2147-4478) by SSBFNET is licensed under a Creative Commons Attribution 4.0 International License.