

EXAMINING THE PARADOX OF AI/ROBOTIC AUTOMATION AWARENESS ON AUTOMOBILE MANUFACTURING EMPLOYEES' WORK PERFORMANCE: THE ROLES OF EMOTIONAL INTELLIGENCE, JOB CRAFTING AND JOB INSECURITY

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ABSTRACT

Automation and robotics have revolutionized various sectors, including automobile manufacturing. This research explores how automation/robotics awareness impacts the work performance of employees in this industry, with a focus on the job crafting and job insecurity, as well as emotional intelligence. Based on the transactional model of stress and coping, the study proposes a dual-path framework where challenge-hindrance appraisals toward automation/robotics influence work performance through job crafting and job insecurity. Challenge appraisals are predicted to foster job crafting and reduce job insecurity, while hindrance appraisals are expected to hinder job crafting and worsen job insecurity. Additionally, the study examines how emotional intelligence moderates these relationships, amplifying the positive effects of challenge appraisals on job crafting and work performance while mitigating their negative impact on job insecurity. Conversely, emotional intelligence is anticipated to alleviate the detrimental effects of hindrance appraisals on job crafting and work performance while alleviating their positive impact on job insecurity. Through a cross-sectional survey design and structural equation modeling (SEM) techniques, data is collected from automobile manufacturing employees to test the proposed model and hypotheses. The analysis assesses the direct and indirect effects of automation/robotics awareness on work performance through job crafting and job insecurity pathways, as well as the moderating role of emotional intelligence. This study contributes to both theoretical and practical realms, enhancing understanding of how automation/robotics awareness influences work performance and providing insights for organizations navigating technological disruptions in the automobile industry.

Keywords: Automation/Robotics Awareness, Work Performance, Job Crafting, Job Insecurity, Emotional Intelligence, Automobile Manufacturing.

INTRODUCTION

The advent of AI and robotics technologies, especially in the automobile industry, has brought about significant transformations its workflows, operations and service delivery (Raj et al., 2020; Xu et al., 2018). AI has a limitless possibility in the automobile sector and is not tied

up only to the assembly/ production line or manufacturing plant, which might be true for other sectors. AI offers huge promises for various other activities in this sector, such as work designing, after sale services, AI powered audits etc. As AI and robotics continue to pervade the workplace, employees in the automobile service sector are faced with the inevitable reality of these technologies impacting their jobs and prospects (Frey & Osborne, 2017; Zhu et al., 2024).

The research studies conducted so far in this and allied domain has underlined the dual nature of AI/robotics awareness, wherein employees may perceive it as both a challenge and a hindrance (Ding, 2021; Tan et al., 2024; Liang et al., 2022). While on one side, considering AI/robotics as challenge is being seen as an opportunity for growth and skill development. Resulting into motivating employees to engage in proactive and productive work behaviours such as job crafting (Bakker & Demerouti, 2017; Teng, 2019). On the other hand, hindrance appraisals toward AI/robotics may be perceived as a threat, leading to increased job insecurity concerns among employees (Darvishmotevali & Ali, 2020). As AI and robotics technologies continue to advance, employees may fear potential job loss or obsolescence of their skills, resulting in reduced motivation, productivity, and overall work performance (Zhu et al., 2022). This strain pathway, where hindrance appraisals toward AI/robotics lead to job insecurity and, consequently, lower work performance, is particularly relevant in the context of the manufacturing industry, which is experiencing rapid technological transformations (Raj et al., 2020).

Against this backdrop, it becomes crucial to understand the underlying mechanisms through which challenge-hindrance appraisals of robotics/AI influence work performance of automobile employees. Drawing from the transactional stress model/theory (Lazarus & Folkman, 1987), this study proposes a dual-path model wherein job crafting and job insecurity serve as motivational and strain pathways, respectively, linking challenge-hindrance appraisals to individual work performance in the automobile context.

Furthermore, emotional intelligence, defined as the “ability to perceive, understand, and regulate one's own and others' emotions” (Mayer et al., 2008), may play a critical role in moderating these relationships. Emotionally intelligent individuals are better equipped to manage the demands and challenges posed by AI/robotics and may be more adept at channelling their appraisals toward proactive behaviours like job crafting while mitigating job insecurity concerns (Buonocore et. al., 2020).

This research inquiry intends to offer a comprehensive understanding of how automobile manufacturing employees' challenge-hindrance appraisals toward AI/robotics influence their work performance. This comprehensive understanding is built upon the dual pathways of job crafting and job insecurity, and the moderating role of emotional intelligence. This research carries significant theoretical and practical implications for organizations seeking to effectively manage and support their workforce in the face of technological disruptions, particularly in the rapidly evolving automobile industry.

LITERATURE REVIEW

AI Adaptation in Automobile Manufacturing Industry

The adaptation of AI in Automobile manufacturing is regarded as the game changer for the automotive manufacturing industry. With an outstanding market growth trajectory

Automotive AI market, the reached a worth of \$ 4.29 billion in 2023¹, and is projected to reach \$405.3 billion by 2032 with a CAGR of 40.7% from 2023 to 2032 (Markets and Markets, 2023). In the automobile sector, AI is often associated with autonomous or self-driving cars, which have become the face of innovation in the automotive industry, despite being just a fraction of its entirety. According to Britannica definition, “*The automotive industry comprises a wide range of companies and organizations involved in the design, development, manufacturing, marketing, selling, repairing, and modification of motor vehicles*”.

The automotive AI market encompasses the use of artificial intelligence technologies across all functions and aspects of the automotive industry - from design and development, to manufacturing, marketing/sales, repair/maintenance, and vehicle modifications. For example Hyundai Vest Exoskeleton (H-VEX) an AI-assisted wearable robot was integrated by Kia Motors minimise the risk of injuries. In 2020, the Volkswagen Group used AI for their supplier audits and assessed the sustainability practices of 1,300 suppliers. The outcome was a substantial reduction in production time and errors, resulting in better quality parts and cost savings.

Academic research primarily revolves around the technology development and implementation related or user/ customer centric perspective/experience towards the use of AI in automotive industry Thomas et al., 2025. Recent studies have explored the use of various AI enabled Chatbots (Sonntag et al., 2023). Tuomi et al., (2020) studies provide insights into how automotive AI is shaping services, focusing on sociomateriality to analyse changes in service dynamics. It highlights the increasing importance of material actors (e.g., technology) over social ones, emphasizing how AI transforms service encounters, sequences, and environments, offering innovative ways to capture value. Recent studies, such as the bibliometric analysis by Cretu et al. (2024), have examined the effects of implementing AI-based technologies on the skills required in the automotive industry. Their research highlights the evolving skill demands driven by AI integration and offers insights into workforce competency alignment within this sector (Jog, 2025).

Rana and Khatri (2024) have conducted a study highlighting how big data, AI, and machine learning have further revolutionized the automotive sector, providing human-like capabilities to computers and enhancing autonomy, security, and efficiency. Automated Guided Vehicles (AGVs) now utilize AI-powered systems to optimize emissions, prevent failures, and improve predictive maintenance, significantly reducing costs and enhancing reliability. Furthermore, AI algorithms integrated with sensor technology safeguard vehicles and passengers, while neural networks and machine learning enhance traffic control and communication in connected vehicle systems. These advancements highlight the transformative potential of AI, though challenges such as data security and system efficiency remain critical. These advancements underscore AI's transformative potential in the automotive sector, but they also bring challenges that require careful management. These ties into the next section on Challenge-Hindrance Appraisals toward AI/Robotics and Job Crafting, where the complexities of adapting to AI and robotics in the workplace are explored.

Challenge-Hindrance Appraisals toward AI/Robotics and Job Crafting

Job crafting refers to the self-initiated changes employees make in their job demands and resources to align their work with their preferences, motives, and abilities (Tims et al., 2012). It

is considered a proactive behavior that employees engage in as a direct reaction to job demands in the workplace (Wrzesniewski & Dutton, 2001). The Job Demands-Resources (JD-R) theory suggests that employees who are motivated by their work are more likely to engage in job crafting behaviors (Bakker & Demerouti, 2017). Accordingly, we propose that employees' challenge-hindrane appraisals toward AI/robotics, as job demands, will significantly influence their job crafting tendencies.

Specifically, we argue that challenge appraisals toward AI/robotics, as challenging job demands, promote job crafting by increasing employees' motivational state. When employees perceive AI/robotics as a challenge, they may view these technologies as opportunities for personal growth and goal attainment (Bakker & Demerouti, 2017). Consequently, they are more motivated to seek proactive strategies, such as job crafting, to cope with these challenging demands (Meijerink et al., 2020; Zhang & Parker, 2019). Therefore, we hypothesize:

H_{1a}: Employees' challenge appraisals toward AI/robotics are positively associated with job crafting.

Conversely, we propose that hindrance appraisals toward AI/robotics, serving as hindering demands, inhibit job crafting behaviors. According to JD-R theory, meeting hindering demands consumes employees' energy and resources (Bakker & Demerouti, 2017). As job crafting requires extra effort and determination (Bakker & Oerlemans, 2019), employees who perceive AI/robotics as a hindrance may reduce their job crafting endeavors due to the depletion of resources caused by worrying about potential job threats. Hence, we hypothesize:

H_{1b}: Employees' hindrance appraisals toward AI/robotics are negatively related to job crafting.

Challenge-Hindrane Appraisals toward AI/Robotics and Job Insecurity

Job insecurity refers to employees' overall concern about the continued availability and existence of their job roles (Witte, 1999). It is considered a negative outcome closely associated with technological changes in the workplace (Darvishmotevali & Ali, 2020; Shoss, 2017). Drawing from JD-R theory, we argue that challenge-hindrane appraisals toward AI/robotics might influence employees' job insecurity perceptions.

We posit that challenge appraisals toward AI/robotics reduce job insecurity. When employees perceive these technologies as challenges, they may be motivated to acquire new skills and collaborate with AI/robotics systems (Ivanov et al., 2020). By gaining complementary skills that are difficult to automate, such as social and problem-solving abilities, employees may feel more confident in their ability to maintain their current job or find new opportunities, thereby reducing their job insecurity concerns. Therefore, we hypothesize:

H_{2a}: Employees' challenge appraisals toward AI/robotics are negatively associated with job insecurity.

On the other hand, hindrance appraisals toward AI/robotics are proposed to increase job insecurity. According to JD-R theory, coping with hindering demands consumes employees' energy and resources (Bakker & Demerouti, 2017). In the context of AI/robotics, employees who perceive these technologies as threats to their jobs may experience negative emotions and emotional exhaustion (Liang et al., 2022), leading to heightened perceptions of job insecurity (Shoss, 2017; Koo et al., 2021). Additionally, employees may interpret their employers' adoption of AI/robotics as evidence of actively seeking replacements, further exacerbating job insecurity concerns (Brougham & Haar, 2018; Vatan & Dogan, 2021). Hence, we hypothesize:

H_{2b}: Employees' hindrance appraisals toward AI/robotics are positively related to job insecurity.

Mediating Role of Job Crafting and Job Insecurity

Job crafting has been identified as a key factor influencing employees' work performance, including in the manufacturing context (Hulshof et al., 2020; Teng, 2019). By actively adapting their job demands and resources, employees can find new ways to enhance their productivity and efficiency (Teng, 2019). Conversely, job insecurity has been found to undermine employees' work performance, as insecure employees may be reluctant to devote resources and energy to improving their work (Shin et al., 2021; Shoss, 2017).

Based on JD-R theory, we propose that job crafting and job insecurity act as mediating mechanisms linking challenge-hindrance appraisals toward AI/robotics to work performance. Specifically, we argue that challenge appraisals toward AI/robotics enhance work performance by promoting job crafting behaviors (H3a), while reducing job insecurity perceptions (H4a). Conversely, hindrance appraisals toward AI/robotics inhibit work performance by decreasing job crafting (H3b) and increasing job insecurity (H4b).

Moderating Role of Emotional Intelligence

In addition to AI knowledge as a personal resource, emotional intelligence is proposed to play a critical moderating role in the relationships between challenge-hindrance appraisals of AI/robotics and work outcomes (job crafting, job insecurity, and work performance). Emotional intelligence refers to an individual's ability to accurately perceive, understand, manage, and reason about emotions in one and others (Mayer et al., 2008).

Emotionally intelligent individuals are better equipped to regulate their emotional responses and channel their appraisals toward constructive behaviors (Bindl et al., 2019). In the context of AI/robotics in the manufacturing industry, employees with higher emotional intelligence may be more adept at managing the demands and challenges posed by these technologies.

Specifically, we propose that emotional intelligence amplifies the positive effects of challenge appraisals toward AI/robotics on job crafting and work performance, while attenuating the negative effects on job insecurity. When employees perceive AI/robotics as challenges, those with higher emotional intelligence can effectively harness their emotional responses and leverage their emotions to fuel proactive behaviors like job crafting (Bindl et al., 2019). Additionally, emotionally intelligent individuals may be better able to recognize and capitalize on the opportunities presented by AI/robotics, further enhancing their work performance (Mayer et al., 2008).

H_{5a}: Emotional intelligence strengthens the positive relationship between challenge appraisals toward AI/robotics and job crafting.

H_{5b}: Emotional intelligence strengthens the negative relationship between challenge appraisals toward AI/robotics and job insecurity.

Conversely, emotional intelligence is expected to buffer the negative effects of hindrance appraisals toward automation/robotics on job crafting and work performance, while mitigating the positive effects on job insecurity. Employees with higher emotional intelligence may be more resilient to the strains and negative emotions associated with perceiving automation/robotics as

threats (Darvishmotevali & Ali, 2020). They can effectively regulate their emotions and adopt more constructive coping strategies, reducing the likelihood of experiencing job insecurity and maintaining their job crafting and work performance levels.

The role of emotional intelligence in moderating the relationships between challenge-hindrane appraisals and work outcomes is supported by the Job Demands-Resources (JD-R) theory (Bakker & Demerouti, 2017). Emotional intelligence can be considered a personal resource that aids in coping with job demands, amplifying the positive effects of challenging demands and buffering the negative effects of hindering demands.

H_{6a}: *Emotional intelligence weakens the negative relationship between hindrance appraisals toward automation/robotics and job crafting.*

H_{6b}: *Emotional intelligence can weakens the positive relationship between hindrance appraisals toward automation/robotics and job insecurity.*

The proposed theoretical model is as follows Figure 1.

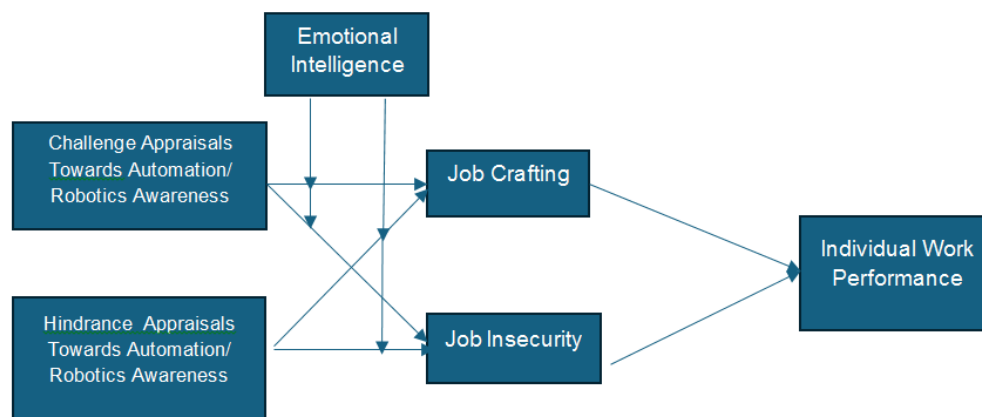


FIGURE 1
THEORETICAL MODEL

Source: Authors Creation.

RESEARCH METHODOLOGY

Sample and Data Collection

Empirical data for this study was gathered from Talbros Automotive Components Limited's manufacturing plants in Bawal, Rewari (Haryana), and Sitaragnj (Uttarakhand). The Assistant Vice President (AVP) of the Haryana unit, along with HR support, facilitated data collection. To ensure accurate responses, the questionnaire was translated into Hindi using a rigorous TRAPD approach. Initial translation employed online tools like Anuvadini¹ and ChatGPT, refined by expert translators proficient in Hindi, Sociology, and Management. Discrepancies were resolved through adjudication by a third expert. A pretest phase ensured clarity and cultural appropriateness, with refinements made based on respondent feedback, ensuring suitability for data collection. Participants filled out a self-report questionnaire, which

they then submitted to HR, who forwarded it to us. Out of 343 participants initially agreeing to take part, thirteen were excluded due to incomplete information. Additionally, 20 questionnaires were not returned, 8 had identical responses of "strongly disagree" for all questions and were discarded, and five had missing responses. Ultimately, data analysis was conducted using the responses from the remaining 297 participants. Detailed demographic information of the respondents is presented in Table 1.

In this study, six constructs were assessed using measurement scales adopted or adapted from existing literature, employing a five-point Likert scale, except for job crafting, which was rated by frequency (1 = never, 5 = always). Emotional Intelligence (EI) was evaluated using the validated brief Emotional Intelligence Scale (BEIS-10) (Davies et al., 2010). Challenge and hindrance stress towards automation were measured using the Searle and Auton (2015) scale, with four items for challenge appraisals ($\alpha = 0.76$) and three items for hindrance appraisals ($\alpha = 0.81$) adapted from Ding (2021). Job crafting ($\alpha = 0.77$) was assessed with four items derived from Leana et al. (2009), while job insecurity ($\alpha = 0.73$) utilized five items borrowed from Mauno et al., (2001). Additionally, Individual Work Performance was assessed using the Individual Work Performance Questionnaire (IWQP) as validated by Koopmans et al., (2013).

Characteristic	Group	Frequency	Percentage (%)
Age	18–20	6	2.0
	21-28 (new)	60	20.2
	29-35 (new)	70	23.6
	36-42 (new)	80	27.0
	43-50 (new)	50	16.8
	51-58 (new)	31	10.4
Gender	Male	133	44.8
	Female	164	55.2
	Others (new)	0	0
Marital Status	Single	120	42.6
	Married	130	46.1
Occupational Qualification	Trade and Technical School Training	57	19.2
	Technical College Degree	52	17.5
	University Degree (%)	75	25.3
	Foreign Training Programme (%)	17	5.7
	Vocational Training (%)	8	2.7
Working Area	Assembly (%)	66	22.2
	Production (%)	58	19.5
	Product Development (%)	58	19.5
	Logistics (%)	25	8.4
	Maintenance (%)	25	8.4
	Other (%)	25	8.4
	Production Scheduling (%)	25	8.4
	Quality Management (%)	17	5.7
	Service (%)	17	5.7

RESULTS

Descriptive Statistics

Table 2 summarizes the means, standard deviations (SD), correlations and reliabilities coefficients of each variable.

TABLE 2 Descriptive Statistics						
Variables	1	2	3	4	5	6
1.EI	0.85	1	0.60***	0.45***	0.20*	0.55***
2.CA	0.76	0.60***	1	0.25**	0.10	0.35***
3.HA	0.81	0.45***	0.25**	1	0.30**	0.40***
4.JC	0.77	0.20*	0.10	0.30**	1	0.60***
5. JIS	0.73	0.55***	0.35***	0.40***	0.60***	1
6. IWP	0.78	0.25**	0.40***	0.15*	0.35**	0.30**
Mean	3.98	3.29	3.63	3.05	4.00	2.94
Standard Deviation	0.74	0.81	0.79	0.85	0.72	0.90

Notes: N = 297. Values in the table represent correlation coefficients. ***p < 0.001; **p < 0.01; *p < 0.05. CA = Challenge Appraisal toward AI, HA = Hindrance Appraisal toward AI, JC = Job Crafting, JIS = Job Insecurity, IWP = Individual Work Performance

Hypothesis Testing

The study employed path analysis to examine the direct and mediating effects of the proposed model. The results of the structural model path analysis were mixed. Firstly, job crafting was found to be positively predicted by challenge appraisal toward AI/Automation (b = 0.63, p < 0.001), supporting H1a. However, the influence of hindrance appraisal toward AI/Automation on job crafting was not significant (b = 0.10, p > 0.05), thus not supporting H1b.

Additionally, while the influence of challenge appraisal toward AI/ Automation on job insecurity was insignificant (b = -0.02, p > 0.05), hindrance appraisal toward AI/ Automation positively influenced job insecurity (b = 0.42, p < 0.001), supporting H2b but not H2a.

Regarding the mediating effects, the study utilized bias-corrected bootstrapping to assess mediation. Results showed that job crafting significantly mediated the relationship between challenge appraisal toward AI/ Automation and work performance (indirect effect = 0.151, 95% CI = [0.091, 0.229]), supporting H3a. However, the indirect impact of hindrance appraisal toward AI/ Automation on work performance through job crafting was not significant (indirect effect = 0.001, 95% CI = [-0.026, 0.028]), thus not supporting H3b. Similarly, job insecurity did not significantly mediate the relationship between challenge appraisal toward AI/ Automation and work performance (indirect effect = 0.008, 95% CI = [-0.002, 0.026]), whereas the indirect effect of hindrance appraisal toward AI/ Automation on work performance through job insecurity was significant (indirect effect = -0.028, 95% CI = [-0.055, -0.011]), supporting H4b but not H4a.

In terms of moderating effects, EI was found to moderate the linkage between challenge appraisal toward AI/ Automation and job crafting (b = 0.28, p < 0.05), supporting H5a. However, EI did not moderate the relationship between challenge appraisal toward AI/ Automation and job insecurity (b = -0.03, p > 0.05), thus not supporting H5b. Additionally, EI failed to moderate the linkage between hindrance appraisal toward AI/ Automation and job crafting (b = 0.01, p > 0.05), leading to the non-support of H6a. Contrary to H6b, the positive effect of hindrance appraisal toward AI/ Automation on job insecurity was strengthened by EI, as indicated by the positively significant interaction between hindrance appraisal toward AI/ Automation and EI (b = 0.18, p < 0.05) Table 3.

Hypothesis	Path	Path Coefficient	p-value	Result
H1a	Challenge Appraisal -> Job Crafting	0.63	< 0.001	Supported
H1b	Hindrance Appraisal -> Job Crafting	0.10	> 0.05	Not supported
H2a	Challenge Appraisal -> Job Insecurity	-0.02	> 0.05	Not supported
H2b	Hindrance Appraisal -> Job Insecurity	0.42	< 0.001	Supported
H3a	Challenge Appraisal -> Job Crafting -> Work Performance	0.151	95% CI = [0.091, 0.229]	Supported
H3b	Hindrance Appraisal -> Job Crafting -> Work Performance	0.001	95% CI = [-0.026, 0.028]	Not supported
H4a	Challenge Appraisal -> Job Insecurity -> Work Performance	0.008	95% CI = [-0.002, 0.026]	Not supported
H4b	Hindrance Appraisal -> Job Insecurity -> Work Performance	-0.028	95% CI = [-0.055, -0.011]	Supported
H5a	Challenge Appraisal * Emotional Intelligence -> Job Crafting	0.28	< 0.05	Supported
H5b	Challenge Appraisal * Emotional Intelligence -> Job Insecurity	-0.03	> 0.05	Not supported
H6a	Hindrance Appraisal * Emotional Intelligence -> Job Crafting	0.01	> 0.05	Not supported
H6b	Hindrance Appraisal * Emotional Intelligence -> Job Insecurity	0.18	< 0.05	Opposite

DISCUSSION AND IMPLICATIONS

This study delves into the intricate dynamics surrounding Automation/Robotics Awareness and its impact on the work performance of employees in the automobile manufacturing industry. Specifically, it investigates the pathways through which challenge and hindrance appraisals toward automation influence employees' work performance, considering the mediating roles of job crafting, job insecurity, and emotional intelligence (Sloan & Geldenhuys, 2021).

Our findings illuminate the nuanced relationship between challenge-hindrance appraisals toward automation and employees' work performance. We uncover that a positive appraisal of automation challenges fosters employees' engagement in proactive behaviours, such as job crafting, ultimately enhancing their work performance (Gaur & Pareek, 2025). Conversely, a negative appraisal of automation hindrances heightens employees' perceptions of job insecurity, leading to detrimental effects on work performance (Sonnentag & Grant, 2012).

Furthermore, our study underscores the significance of emotional intelligence in navigating the complexities of automation awareness and its impact on work performance. Employees with higher levels of emotional intelligence may exhibit greater resilience and adaptability in responding to automation challenges, thus mitigating the adverse effects of hindrance appraisals on job insecurity and subsequently improving work performance (Brackett & Mayer, 2003; Goleman, 1998).

Theoretical Implications

From a theoretical perspective, our study contributes to the burgeoning literature on automation awareness and its implications for employee performance outcomes. By elucidating the mediating mechanisms through which challenge-hindrance appraisals influence work performance, we provide a more nuanced understanding of the underlying processes at play in the context of automation in the manufacturing industry (Demerouti et al., 2001; Wrzesniewski & Dutton, 2001).

In practical terms, organizations in the automobile manufacturing industry can leverage these insights to develop targeted interventions aimed at fostering a positive automation awareness climate. By providing employees with the necessary resources, support, and training to enhance their emotional intelligence and job crafting abilities, organizations can empower employees to navigate automation challenges effectively and optimize their work performance (Mayer et al., 2016; Tims et al., 2012).

CONCLUSION

Moving forward, future research endeavours could delve deeper into the moderating factors that influence the relationships examined in this study. Exploring contextual factors such as organizational culture, leadership styles, and technological advancements could provide valuable insights into the boundary conditions that shape the impact of automation awareness on employee work performance in diverse organizational settings.

ENDNOTES

¹The 'ANUVADINI' is an AI-based translation tool for Indian languages developed by All India Council for Technical Education (AICTE), India.

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