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THE MODERATING ROLE OF ARTIFICIAL INTELLIGENCE IN THE JOB DEMANDS-RESOURCES MODEL: IMPLICATIONS FOR WORK ENGAGEMENT, JOB SATISFACTION, AND FIRM PERFORMANCE

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ABSTRACT

By viewing AI as both a job demand and a job resource, this study incorporates AI into the Job Demands-Resources (JD-R) framework. Automation, smart analytics, and decision-support systems are examples of AI technologies that lower routine workloads, increase accuracy, and facilitate better decision-making. But they also bring with them difficulties, such as technostress, heightened surveillance, and the requirement for ongoing skill improvement. Along with productivity benefits, workers must adjust to data-driven procedures and algorithmic systems, which create new emotional and cognitive demands. AI is a resource that supports competence development and engagement by improving autonomy, streamlining workflows, and offering personalised learning opportunities and real-time feedback. By lowering errors and providing performance insights, AI can increase job satisfaction; nevertheless, over-reliance on AI or inadequate training may erode confidence and autonomy. Similar to this, AI increases employee engagement at work by encouraging creativity and streamlining processes, but too much system control may diminish workers' sense of ownership. By boosting productivity, fostering creativity, and bolstering predictive capacities, AI also improves business success. AI improves service delivery, demand forecasting, and operational stability for Iraq's Ministry of Electricity. This study examines the relationships among job demands, job resources, job satisfaction, work engagement, and firm performance within the JD-R model. It suggests that the relationship between demands, resources, and work engagement—all of which have an impact on company performance—is mediated by job satisfaction. The study expands JD-R theory and provides useful insights for striking a balance between demands and resources to improve performance, engagement, and happiness by connecting employee-level issues to organisational outcomes.

KEYWORDS: Job Demands, Job Resources, Artificial Intelligence, Work Engagement, Job Satisfaction, Firm Performance.

1. INTRODUCTION

For most people, work is a significant part of their life. Work provides structure, meaning, and purpose, on the one hand. Through their employment, people can positively influence clients, customers, or coworkers and truly make a difference. Every day, doctors save lives, private equity investors generate company value, and educators motivate pupils. However, the same work can also be extremely taxing and cause a great deal of psychological stress. How can a rewarding and significant profession become a stressful and burdensome one? Workplace pressure, position conflicts, bureaucracy, and repetitive tasks can all lead to job stress (Bakker & De Vries, 2021).

2. LITERATURE REVIEW

2.1. Job Demand

In recent decades, job demand research has attracted growing attention for demonstrating that each occupation has its own unique risk factors associated with job-related stress. Job demands are likely among the most influential frameworks for analyzing the effects of work features on employees (Bakker & Demerouti, 2017). Job demands have been conceptually delineated by scholars as encompassing the social, physical, and organizational aspects of work that necessitate sustained effort and are consequently linked to psychological and physiological costs (Qureshi et al., 2023). According to Manuti et al. (2022), the relationship between job demand and the work environment is characterized by two types of job features that may affect well-being and employee motivation. The process of job demand comprises emotional and cognitive skills and effort and is consequently associated with psychological and physiological costs. According to Manuti et al. (2022), considering the job demands may result in energy demotivation, depletion, and health issues. In this regard, research in the discipline has repeatedly shown that challenging job demands are associated with lower job satisfaction (e.g., workload demands). The requirements of a job are intricately linked to and encapsulate a range of job characteristics, such as organizational, social, physical, and psychological (Bakker et al., 2003). The presence of high job demands, such as role conflicts, work pace, and emotional demands, may impede the employee's ability to perform their job successfully, which in turn may hinder their ability to satisfy basic work needs, such as autonomy, competence, and positive social relationships. It has been demonstrated by Schaufeli and Bakker (2004) that job

demands not only necessitate physical exertion, but also psychological expenditure, which then imposes its own costs on the workers. There is a relationship between job demand and burnout (Khan et al., 2014). There is a limitation of studies that examine the psychological and organizational processes that lead to employee burnout, despite the abundance of evidence suggesting that an increase in job demands leads to employee burnout (Bakker and de Vries, 2021). Self-regulation theory can explain the psychological mechanisms underlying job burnout. The self-regulation theory asserts that "individuals direct their own development by selecting and pursuing goals and modifying their pursuit based on personal and environmental possibilities and restrictions. Hence, psychological processes and organizational procedures may influence the association between job demands and burnout. Bakker and de Vries (2021) emphasize the significance of employee practices in the connection between job demands and burnout.

Scholars increasingly highlight job demands as central to understanding how work characteristics influence employee well-being. Job demands represent the organizational, social, and physical aspects of work that require sustained mental or physical effort, often leading to psychological strain or health costs if prolonged (Bakker & Demerouti, 2017; Qureshi et al., 2023). These demands may include workload, role ambiguity, conflict, time pressure, and emotional requirements (Bakker et al., 2003). While such challenges can sometimes stimulate growth and learning, excessive or poorly managed demands typically undermine satisfaction and contribute to burnout (Schaufeli & Bakker, 2004; Khan et al., 2014). Self-regulation theory further explains how unmet demands can deplete personal resources, leading to disengagement and exhaustion (Bakker & de Vries, 2021). Consequently, understanding how job demands shape employee experiences remains vital in preventing negative outcomes such as burnout and diminished performance.

2.2. Job Resource

A job resource can be defined as the physical, psychological, social, or organizational components of the job that are both instrumental in realizing work objectives and helpful in lowering job requirements and the corresponding physiological and psychological repercussions; additionally, they can stimulate personal growth, training, and improvement (Demerouti, 2022). However, Job resources are those qualities of a position that

facilitate the attainment of objectives, minimize job demands, and frequently foster personal growth and development. Physical, psychological, social, and organizational job resources include equipment, participation in decision-making, social support from coworkers, and flexible work hours. Work resources are intrinsically motivating because they satisfy fundamental human needs, such as relatedness, competence, and autonomy (Van den Broeck et al., 2008). Work resources are also extrinsically motivating because they facilitate the achievement of work-related objectives. When employees have access to a variety of employment resources, they can meet demanding job requirements. Personal resources may also play a vital role. Personal resources are employee cognitions or beliefs on the perception of control over their environment (Mäkikangas et al., 2022). Research indicates that employees are more engaged at work when they have higher levels of personal resources, such as self-efficacy, optimism, and resilience. Consequently, job resources are perceived as having significance in their own right as well as being essential to handle job expectations. Bakker et al. (2023) suggest that job resources can be found at the organizational level (e.g., job security), through interpersonal and social relationships (e.g., supervisor support), in the organization of work (e.g., involvement in decision making), and through the task itself. (e.g., autonomy). Schaufeli and Bakker (2004) asserted that job resources play a dual motivational role, both intrinsic and extrinsic, due to their provision of opportunities for growth, learning, and development on the one hand, and the encouragement of the employee to commit their efforts and abilities to their work on the other, thus providing a means of accomplishing work objectives. The job resources model is thus a comprehensive system that accounts for multiple job-related requirements and assets. From the job resources viewpoint, it is suggested that a range of job resources ought to encourage company results (Kumar et al., 2023). Job resources are those features of a job that facilitate the attainment of work objectives and promote personal growth, learning, and progress (Tisu et al., 2022). To this end, job resources might be understood from the perspective of fundamental necessities. The job resources encourage learning, personal growth, and progress. The presence of job resources in the psychosocial work environment, such as influence, a positive team climate, and quality of leadership, may therefore contribute to the satisfaction of fundamental psychological and social needs regarding feelings of autonomy, competence, and positive social

relationships at work (Yulita et al., 2022).

2.3. Job Satisfaction

Job satisfaction is defined as a pleasant or positive psychological state resulting from an evaluation of one's job or experience (Winkelhaus et al., 2022). Toropova et al. (2021) defined job satisfaction as the sum of sentiments regarding the task performed. An employee's job satisfaction results from his opinion of how well his employment offers the items deemed essential. According to Roberts and David (2020), job satisfaction is the goal for which positions and administrative policies of an organization are formed. Positions are created to meet employees' demands to the greatest extent possible. Hence, a higher level of job satisfaction is related to the willingness to experience greater job satisfaction. There are five characteristics of job satisfaction: salary, promotion, work, supervision, and coworkers. Job satisfaction is described as the employee's assessment of how effectively a job delivers the items deemed important, such as the work itself, salary, promotion possibility, supervision, and happiness (Davidescu et al., 2020). Job satisfaction is characterized as a fit between the features of the work and the employee's needs (Dartey-Baah et al., 2020). There is a relationship between performance and job satisfaction. However, performance is considered a key factor in job satisfaction. Work satisfaction, as assessed by indicators of job, orientation, target, compensation, and rewards, significantly influenced employee and company performance. To this end, Workers with the highest level of job satisfaction will deliver the best results (Eliyana & Ma'arif, 2019). Job satisfaction comprises attitudes while at work, sentiments regarding work, and performance-influencing experiences. Employees in the service business are required to have a high level of job satisfaction to give high-quality service to consumers and achieve customer satisfaction and firm performance. Attitudes and participation are considered significant job satisfaction factors. Individual attitudes about work arise in the sense of uniformity between individuals and companies; this can be achieved by granting employees greater autonomy and decision-making participation options (Latifah et al., 2023). The concept of job satisfaction is characterized as a pleasurable affective condition and holds a noteworthy capacity to forecast organizational employees' behavior (Bellmann & Hübner, 2021). Wu et al. (2021) suggested that job satisfaction comprises two distinct elements, namely an affective component and a non-affective

(cognitive) component. The affective component pertains to employees' emotional indicators, while the non-affective (cognitive) component pertains to the satisfaction derived from evaluating firm performance

2.4. Work Engagement

In the past two decades, the quantity of studies on work engagement has expanded significantly. Work engagement is a pleasant, affective state of high energy mixed with high levels of strong focus on work and commitment (Schaufeli and Bakker, 2010). Work engagement is usually described as a good, rewarding, work-related state of consciousness characterized by vitality, devotion, and immersion (Schaufeli et al., 2002). Work engagement contributes to a significant work attitude characterized by dedication, absorption, and vigor (De Waal and Pienaar, 2013). Engaged employees have high levels of energy, are excited about their work, and are fully absorbed in their professional activities. Most studies have taken a between-person approach, demonstrating that there are mean-level differences in job engagement between people because of working conditions, personal attributes, and behavioral methods (Bakker & Albrecht, 2018). To this end, dedication means large participation in the concerns, inspiration, and job, willingness, and the ability to tackle challenges. While absorption implies an employee's experience of engagement in processing a contribution, and the reality of enjoying the job. Finally Work-related vigor is defined by a high level of motivation and intellectual strength. However, research over the past 10 years has shown that work engagement may also shift within individuals over time and in different circumstances. For instance, research indicates that workers are most engaged during tough two-hour work episodes (Reina-Tamayo et al., 2017), workdays preceded by evenings in which workers have recovered well (Sonnentag, 2003), and workdays in which they have access to a variety of resources (Bakker & Albrecht, 2018). Work engagement is a relatively accurate predictor of crucial organizational outcomes, including employee and team performance, which is one reason for its widespread popularity. Due to their strong commitment to focusing on their work tasks, engaged employees demonstrate superior in-role task performance and financial results (Christian et al., 2011). Moreover, because companies are more interested in new experiences, work engagement is more likely to be innovative and adventurous (Gawke et al., 2017). Moreover, to these individual-level performance benefits, the literature review

indicates that engaged employees are more likely to assist coworkers. Work engagement extends from one worker to the next and, hence, has significant consequences for teams (Van Mierlo and Bakker, 2018)

2.5. Firm Performance

Many companies attempt to enhance their performance in any way available. Those who strive to innovate, attain, and maintain performance are in possession of the winning card. Consequently, it is essential to perceive and track performance in a continuously shifting environment (Eliyana & Ma'arif, 2019). Successful companies are essential for countries that are developing. Numerous economists compare them to a machine in determining a nation's social, political, and economic development. To survive in a competitive work environment, every company must operate under performance-based parameters (Sassanelli et al., 2019). Liozu (2015) identifies performance with company effectiveness and specifies productivity, institutionalization, and conformity as evaluation criteria. There is a relationship between firm performance and employees. Superior performance by employees can be a valuable asset, and management plays a crucial role in influencing employee performance and the success of the firm (Swanson et al., 2020). Firm performance is the level of fulfillment of achievement of a certain task, job, or work. To this end, this means that firm performance is a fulfillment of the period as a work achievement by employees and management from the firm (Wernerfelt & Montgomery, 1988). Firm performance in a company is heavily influenced by three primary factors: abilities or management effectiveness, organizational support, and the work performance of every employee working at that company. According to Wirda & Rivai (2019), firm performance comprises work and tasks and the outcomes of that work and task, as well as what to do and how to do it. While Beuren et al. (2022) defined firm performance as an employee's capacity to carry out activities that aid the growth of the firm's development core. There is a relationship between Firm performance and firm managers (Boiko, 2022). Firm performance describes the manager's accomplishments in administering the firm's operational activities by utilizing the firm's resources (Rajapathirana & Hui, 2018). Various factors can influence firm performance, one of which is political, economic, and social connections (Yao et al., 2021). Because politics is the most essential economic ingredient in firm performance and profitability, politically connected firms tend to generate

substantial profits and high productivity levels (Fan Ren et al., 2017).

2.6. Artificial Intelligence

Artificial Intelligence (AI) has emerged as one of the most transformative technologies of the 21st century, influencing a broad range of sectors, including healthcare, finance, education, and retail. At its core, AI refers to systems capable of performing tasks that traditionally require human intelligence, such as learning, reasoning, problem-solving, and decision-making (Russell & Norvig, 2021). The evolution of AI has been driven by advances in computational power, data availability, and algorithmic sophistication. The origins of AI trace back to the mid-20th century, with early work focusing on symbolic reasoning and logic-based systems. Initial AI systems were rule-based, relying on pre-defined instructions to solve specific problems. However, these early approaches faced limitations in handling complexity and uncertainty (McCarthy et al., 2006). The introduction of machine

learning (ML) in the late 20th century marked a significant shift, enabling systems to learn patterns from data rather than rely solely on explicit programming. AI can be categorized into several subfields, including machine learning, deep learning, natural language processing (NLP), and robotics. Machine learning focuses on algorithms that improve their performance with experience. Deep learning, a subset of ML, employs artificial neural networks to model complex patterns in large datasets (LeCun et al., 2015). NLP allows machines to understand, interpret, and generate human language, which has applications in virtual assistants and automated customer service. Robotics integrates AI with physical systems to perform autonomous tasks in manufacturing, healthcare, and transportation.

3. HYPOTHESES DEVELOPMENT

The conceptual framework of this work is shown in Figure 1.

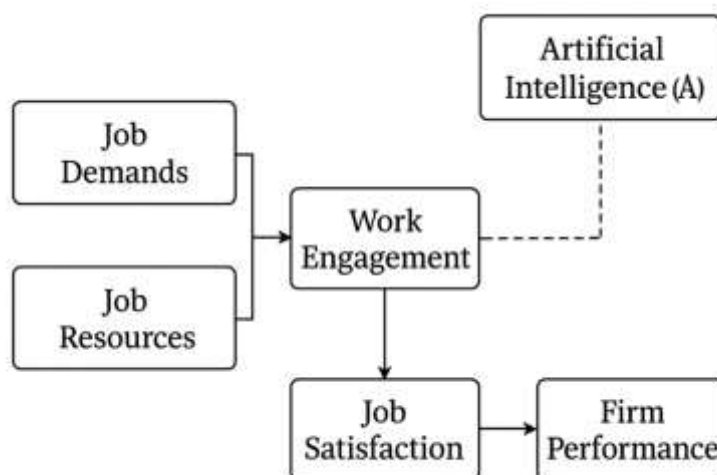


Figure 1: Conceptual Framework.

3.1. Job Demand and Job Satisfaction

In addition to job demands, a specific component that is closely linked to decreased job demand as well as general well-being is a lack of job satisfaction (Yeh, 2015). Job satisfaction is related to how easily a company can hire a replacement and how much the employee fears losing their job. Wang et al. (2020) investigated the connection between job satisfaction and work intensification and discovered that, in addition to the threat of job loss, a lack of job satisfaction is also linked to the possibility of being exposed to a flexible labor market, work intensification, and a loss of control over individual

work. The job demand pressure method proposes that job demands are a prediction of burnout, which is characterized by feelings of exhaustion, cynicism or indifference, and reduced productivity. According to Bakker and Demerouti (2017), burnout is a predictor of adverse job and health outcomes. In accordance with the JD-R model proposed by Bakker and Demerouti (2017), it has been observed that job demands have a negative impact on psychological outcomes, including job satisfaction, as noted by Yeh (2015). Several studies have consistently found a negative correlation between job demands and job satisfaction (Fila et al., 2014). Job demands, specifically challenge demands, have the potential to

positively influence work engagement, in addition to their direct effect (Breevaart and Bakker, 2018; Crawford et al., 2010). Alegre et al. (2016) discovered a positive correlation between work engagement and cognitive challenge demands in a group of teachers. Van den Tooren and Rutte (2016) conducted a study utilizing data from the Longitudinal Internet Studies for Social Sciences. The results indicated a positive correlation between cognitive challenge demands, emotional challenge demands, and work engagement. As previously posited, there exists a positive correlation between work engagement and job satisfaction, as evidenced by studies conducted by Pujol-Cols and Lazzaro-Salazar (2018) and McVicar (2016). Consistent with prior research that has demonstrated support for the notion of work engagement serving as a mediator (Jawahar & Liu, 2016), we propose that job demands exert an influence on work engagement, which subsequently affects job satisfaction.

H1: Job Demand is positively correlated with Job Satisfaction.

3.2. Job Resource and Job Satisfaction

In the context of our ongoing discourse, we posit that variances in job contentment among public and private sector workers are attributable to dissimilarities in their job demands and resources. The JD-R model posits that job resources are evaluated positively as aspects of employment, while job satisfaction is appraised negatively as an attribute of job demand (Yeh, 2015). These factors have been found to impact a range of employee job-related attitudes, as demonstrated in studies by Bakker et al. (2003), Martinussen et al. (2007), Schaufeli and Bakker (2004), and Yener and Coskun (2013). The JD-R model posits that organizational outcomes, such as job satisfaction, are determined by the simultaneous interaction of job demands and resources. Job resources are essential for promoting a balance between work and other facets of life since they will result in favorable attitudes toward work on the side of employees and job satisfaction on the other. We specifically propose that work resources, such as coworker support, job autonomy, and employee support, may improve employees' sense of fit because the availability and use of work resources fosters high-performance job satisfaction in a supportive workplace culture, and as a result, employees contribute to a sense of job satisfaction about themselves (Rashmi and Kataria, 2021). We demonstrate that job resources can equip employees with the skills to bounce back from environmental uncertainties, manage their work and personal

commitments, and thereby lower their risk of feeling unsatisfied at work, improve their performance, and boost their engagement. Job resources aimed at facilitating balance among employees should encourage the reduction of conflict between work and workers and the various aspects of working life that secure the appropriate environment for ideal work. Based on the JD-R theory, Shin and Enoh (2020) suggest that when employees are able to use work resources, they may feel obligated to display positive attitudes and behaviors, such as increased job satisfaction, which benefits the organization and higher company performance, which enhances the company's position. In essence, the JD-R theory asserts that by treating resources as a primary facilitator, organizations may become more resilient and can achieve positive organizational outcomes (Kumar et al., 2021).

H2: Job Resource is positively correlated with Job Satisfaction.

3.3. Job Satisfaction and Work Engagement

The concept of job satisfaction is defined as a constructive and enjoyable condition that arises from an individual's assessment or experience of their job, as stated by Locke (1976). This notion continues to be a focal point in organizational research, driven by both ethical and practical considerations. The experience of contentment in employees' jobs has been linked to favorable consequences, including but not limited to a sense of loyalty to the organization (Porter et al., 1974) and the display of behaviors that benefit the organization (Podsakoff et al., 1996; Organ and Ryan, 1995). Conversely, discontentment can result in unfavorable consequences for both the individual and the organization, including counterproductive work behaviors (Hershcovis et al., 2007), thoughts of disengagement (Mobley, 1977; Tett and Meyer, 1993), and voluntary departure (Griffeth et al., 2000). Numerous studies have demonstrated the significance of job satisfaction for the health and well-being of individuals and organizations, as well as their sustained operation. This construction has been extensively researched in organizational literature, as evidenced by the multitude of reviews available. It is expected that employees who exhibit high levels of energy and commitment and are fully engaged in their work will experience elevated levels of job satisfaction. According to Bakker and Demerouti (2017), employees who are engaged in their work tend to perceive their job as interesting, significant, and invigorating, and are likely to encounter affirmative emotions such as happiness, joy, and enthusiasm. According to Fisher (2000), it is

probable that favorable emotional encounters can lead to a rise in job contentment. Previous studies have established a favorable correlation between work engagement and job satisfaction, as evidenced by the works of Pujol-Cols and Lazzaro-Salazar (2018) and Saks (2006). Mazzetti et al. (2021) conducted a study that revealed a significant association between work engagement, assessed at Time 1, and job satisfaction, evaluated at Time 2, after a duration of eight months. Furthermore, it has been observed that work engagement serves as a proximal precursor to job satisfaction, acting as a mediator for the impact of personality traits (such as those studied by Jawahar and Liu, 2017; Li et al., 2017) on job satisfaction.

H3: Job Satisfaction is positively correlated with Work Engagement.

3.4. Work Engagement and Firm Performance

According to Friesenbichler & Selenko (2017), performance is determined by ability, motivation, and environmental factors. Work engagement is highly correlated with company performance. Besides, Anitha (2014) confirmed that work engagement has a substantial effect on the performance of a company. Numerous studies by Sopia et al. (2020) and Kim and Koo (2017) indicate that organizations employ a variety of strategies to remain competitive and enhance performance. Work engagement is characterized by improved employee dedication and outstanding organizational performance (Sarwar et al., 2020). Work engagement is a crucial factor in a company's ability to obtain a competitive advantage over its rivals in terms of human capital. It is one of the factors that cannot be replicated by rivals and is regarded as the most valuable asset if managed and utilized well (Anitha, 2014). This can be accomplished by enhancing firm performance by boosting employee engagement with the organization. If employees have a strong attachment to their company and work, they will exhibit an increase in three broad behaviors: say, stay, and drive. As a result, they will be more productive at work, more loyal to their employer, and more motivated to improve their performance. Worker engagement involves undetermined amounts of additional time and effort; however, the payoff is unidentified (Van Zyl et al., 2021). Employees evaluate their work engagement based on job happiness, inventiveness, and company interest and performance when they feel a sense of belonging and conformity. Employees desire to link their interests with the organization in terms of mutual interest and performance, and they aim to build trust

in order to enhance their creativity for the company (Tian et al., 2022). Employees with a high level of engagement are familiar with their position as well as the work material, and they are aware of its flaws; if their performance and creativity were encouraged, many outstanding suggestions for change would arise (Enwereuzor et al., 2018; Katou et al., 2021). Since the social exchange hypothesis promotes motivation and firm performance, employee engagement is higher when employees strongly agree with the firm (Goyal & Patwardhan, 2021). Higher work engagement can drive workers to exhibit positive working emotions, job satisfaction, and to work without a break for extended periods of time (Gupta and Sharma, 2016), in addition to boosting company performance.

H4: Job Satisfaction is positively correlated with Work Engagement.

3.5. Job Satisfaction and Firm Performance

The term job satisfaction has received widespread acclaim and scholarly interest across many industries. It refers to a worker's emotional reaction to his employment based on the degree to which it delivers his desired outcomes. Employees' job happiness is vital for maintaining excellent working relationships and a healthy work environment. To retain their most valuable, loyal, and seasoned employees, business leaders have the ability to impact the work environment through job satisfaction (Rajak and Pandey, 2017). Low levels of job satisfaction are indicative of an unhealthy work environment. People seek to maintain status, high positions, and power in exchange for their knowledge, abilities, education, and expertise (Ayranci and Ayranci, 2017), and those who are unable to meet their job expectations become dissatisfied. So, dissatisfaction influences the overall performance of the company and the work ability of its employees (Wnuk, 2017). According to Kanyurhi and Akonkwa (2016), managing performance is a continuous activity that seeks to boost employee productivity by encouraging positive behavior and focusing on employee awareness, with the main objective of improving the business's effectiveness and strategy. There is a correlation between the overall management strategies of a company, job satisfaction, and organizational performance. To this aim, salary, working hours, motivational factors, leadership, organizational infrastructure, and professional development are the most important factors influencing employee satisfaction and company performance (Wnuk, 2017). There is a relationship between emotional and job satisfaction

(Torlak & Kuzey, 2019). The firm's performance is significantly impacted by job satisfaction and emotional factors (Gong et al., 2020). Deb et al. (2023) stated that employees' talent, such as technical skills, cognitive, and emotional intelligence, is important in the work environment for job satisfaction and company performance, as the above-mentioned variables are related.

H5: Job Satisfaction is positively correlated with Firm Performance.

3.6. Artificial Intelligence and Work Engagement

The integration of AI in the workplace significantly influences work engagement by reshaping the nature of work and employee experiences. AI technologies can automate routine and repetitive tasks, allowing employees to focus on more meaningful and creative activities, which often leads to higher levels of engagement and fulfillment. Additionally, AI-driven tools can provide real-time feedback, performance analytics, and personalized support, helping employees improve their skills and achieve professional goals. However, the impact on job satisfaction is not uniformly positive; excessive reliance on AI may create stress or uncertainty about job security, particularly if employees perceive their roles as being replaced by machines. Therefore, the relationship between AI and work engagement is complex and moderated by factors such as organizational support, employee autonomy, and the transparency of AI implementation.

H6: Artificial Intelligence is positively correlated with work engagement.

3.7. The Mediating Role of Job Satisfaction

Job satisfaction plays a mediating role in various relationships pertaining to job and work engagement. According to Biswas' (2009) findings, there exists a mediating effect of job satisfaction on the association between job demand, job resources, and firm performance. According to the study conducted by Holtschlag et al. (2019), job satisfaction serves as a mediator in the relationship between vision difficulty, vision specificity, and job performance. According to Huffman et al. (2014), the correlation between work interference and employee turnover is mediated by job satisfaction. According to Malik et al. (2010), Job Satisfaction pertains to an individual's affective or emotional response towards different aspects of their job and is indicative of the degree to which they enjoy their work. Job satisfaction is considered to be a crucial work attitude. The correlation between job demand, job

resources, and job satisfaction is a crucial aspect, with firm performance being the most significant factor in this regard (Elmi et al., 2020). Scholarly literature suggests that a correlation exists between job attitudes and job performance, as evidenced by various studies (Karem et al., 2019). Several studies have indicated a negative correlation between job satisfaction and firm performance (Zimmerman and Darnold, 2009). Additionally, a negative association has been observed between job demand and resources (Heimerl et al., 2020). Job dissatisfaction can be indicative of an employee's intention to resign. According to Kreitner and Kinicki (2010), the enhancement of employee job satisfaction is a viable strategy for managers to mitigate employee turnover. Alotaibi (2001), Parnell and Crandall (2003), and Lovett et al. (2004) have highlighted the significance of job satisfaction as a prominent area of research in industrial, organizational psychology, organizational behavior, and social psychology. This factor has been a central focus of study in the literature of these fields. The assessment of the work environment is significantly influenced by job satisfaction, as noted by Sharma and Singh (2016). Moreover, Al Jenaibi (2010) posits that job satisfaction tends to have a favorable impact on employees and firm performance. Additionally, engaged team members are more likely to assist their peers because they exhibit a wider variety of work behaviors. In conclusion, our study suggests that the positive relationship among job demand, job resources, and business performance is mediated by work satisfaction.

3.8. The Moderating Role of Work Engagement

AI serves as an important moderator in the connection between work engagement and organizational results. When employees are highly engaged in their roles, AI can enhance this engagement by reducing routine tasks, offering timely feedback, and supporting informed decision-making. These functions allow workers to focus on the meaningful and innovative aspects of their jobs, thereby improving satisfaction and productivity. In addition, AI tools can customize workflows, improve collaboration, and create a more supportive work environment. Through these contributions, AI strengthens the positive effects of work engagement, helping organizations achieve higher levels of employee motivation, satisfaction, and overall performance. The integration of AI in the workplace significantly influences job satisfaction by reshaping the nature of work and employee experiences. AI technologies can automate routine and repetitive

tasks, allowing employees to focus on more meaningful and creative activities, which often leads to higher levels of engagement and fulfillment. Additionally, AI-driven tools can provide real-time feedback, performance analytics, and personalized support, helping employees improve their skills and achieve professional goals. However, the impact on job satisfaction is not uniformly positive; excessive reliance on AI may create stress or uncertainty about job security, particularly if employees perceive their roles as being replaced by machines. Therefore, the relationship between AI and job satisfaction is complex and mediated by factors such as organizational support, employee autonomy, and the transparency of AI implementation.

Although the moderating influence of AI and work engagement on job satisfaction associations has been largely ignored in the domain of firm performance (Britt & Bliese, 2003; Greenier et al. 2021), the limited existing literature provides valuable insights into the examination of job satisfaction among scholars in response to job demand and resource factors. The authors discovered that work engagement played a moderating role in the association between supportive supervision, confidence in management, effective communication, work meaningfulness, and acceptance of change. Amor et al. (2020) discovered empirical support for the protective function of engagement in mitigating firm performance. The study findings indicate that soldiers who were more engaged with their job reported lower levels of elevation in job resources compared to their less engaged counterparts, particularly during periods of high job demand and performance. In addition to the factors of job demand and resources mentioned earlier, work engagement is a promising construct in the investigation of the mechanisms that contribute to scholars' job satisfaction in the face of psychosocial risks. AI and Work engagement are typically utilized to measure work and employee satisfaction (Lee et al., 2019). The scale under consideration defines work engagement as a constructive and satisfying state at the workplace, characterized by the presence of vigor, dedication, and absorption, as per the conceptualization of Bakker (2022). According to the change management theory (Shamir et al., 1993), remarkable managers have extraordinary influence over their followers. Such managers change the preferences, values, and needs of their followers from self-interest to firm goals. Additionally, managers are more likely to inspire followers to be dedicated to these objectives, ready to make sacrifices for the good of the firm and eventually go above and beyond the

call of duty (Chun et al., 2016).

Vigor can be defined as a state of heightened energy, mental fortitude, and unwavering perseverance in the face of challenges encountered during work. The second fundamental aspect of engagement is dedication, which is marked by a feeling of importance, eagerness, difficulty, motivation, and resolute achievement. Absorption is defined as a state of deep concentration and immersion in one's work, resulting in a subjective experience of time passing quickly and difficulty disengaging from work and performance. According to this study, this beneficial influence is supported by workplace engagement. Job satisfaction specifically increases members' work engagement by expressing a meaningful goal, creating a secure and encouraging workplace, and making resources easily accessible. These motivated employees are then more eager to devote their physical, mental, and emotional resources to carrying out their job duties (Lai et al., 2020).

4. METHODOLOGY

4.1. Research Design

This study employs a quantitative, explanatory research design to empirically examine the relationships specified in the proposed conceptual framework, which is grounded in the Job Demands–Resources (JD-R) theory. The choice of a quantitative design is justified by the objective of testing causal relationships among constructions (Job Demand, Job Resource, AI, Job Satisfaction, Work Engagement, and Firm Performance).

4.2. Research Context and Population

The study is conducted within the Ministry of Electricity in Iraq, which represents a critical public service institution facing substantial demands, resource constraints, and the need to improve organizational performance. The target population includes all categories of employees – technical staff, engineers, administrative personnel, and managers – across various departments (generation, transmission, distribution, and administration).

4.3. Sampling Strategy and Sample Size

A stratified random sampling technique was adopted to ensure representation from different departments and job categories. Based on Krejcie and Morgan's (1970) sample size table for large populations, a minimum of 250 respondents was considered sufficient. To increase statistical power and account for potential non-responses, 300 questionnaires were distributed.

4.4. Data Collection Instrument

Data was collected through a structured questionnaire consisting of six sections: demographics, job demands, job resources, job satisfaction, work engagement, and firm performance. All items were measured using a five-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree").

Measurement items were adapted from well-established instruments:

- Job Demands and Job Resources: Demerouti et al. (2001); Bakker & Demerouti (2007).
- Job Satisfaction: Spector (1997).
- Work Engagement: Schaufeli et al. (2006).
- Firm Performance (perceptual measures): Kaplan & Norton (1996).
- AI: Wang et al. (2020)

A pilot study was conducted with 20 respondents to refine the questionnaire and ensure clarity, reliability, and validity of the items.

4.5. Data Collection Procedure

Formal approval was obtained from the Ministry of Electricity, and informed consent was secured from participants. Questionnaires were distributed both electronically and in printed form over a six-week period. Participation was voluntary, and confidentiality was assured.

5. DATA ANALYSIS

5.1. Preliminary Data Screening

Data were screened for missing values, outliers, and normality. Missing values were minimal (<5%) and were addressed through mean substitution. Normality was assessed via skewness and kurtosis statistics, which were within acceptable thresholds (± 2).

5.2. Reliability And Validity

Reliability was assessed using Cronbach's alpha and Composite Reliability (CR), with values ≥ 0.70 considered acceptable. Convergent validity was established through Average Variance Extracted (AVE) (≥ 0.50) and significant standardized factor loadings (> 0.60). Discriminant validity was assessed using the Fornell-Larcker criterion.

5.3. Confirmatory Factor Analysis

A Confirmatory Factor Analysis (CFA) was performed to confirm the measurement model.

Model fit was evaluated using several indices:

- Chi-square/df (≤ 3.0 acceptable),
- Comparative Fit Index (CFI ≥ 0.90),

- Tucker-Lewis Index (TLI ≥ 0.90),
- Root Mean Square Error of Approximation (RMSEA ≤ 0.08),
- Standardized Root Mean Square Residual (SRMR ≤ 0.08).

5.4. Structural Equation Modeling

Structural Equation Modeling (SEM) was applied to test the hypothesized relationships:

- H1: Job Demand $\rightarrow$ Job Satisfaction (negative effect expected).
- H2: Job Resource $\rightarrow$ Job Satisfaction (positive effect expected).
- H3: Job Satisfaction $\rightarrow$ Work Engagement.
- H4: Job Satisfaction $\rightarrow$ Firm Performance.
- H5: Work Engagement $\rightarrow$ Firm Performance.
- H6: AI $\rightarrow$ Job Satisfaction (positive effect expected).

The model was estimated using maximum likelihood estimation in AMOS/SmartPLS. Path coefficients, t-values, and p-values were reported to assess significance.

5.5. Mediation Analysis

Bootstrapping with 5,000 resamples was conducted to test indirect effects. Mediation was assessed by examining confidence intervals (95%) for indirect paths:

- Job Satisfaction mediating between Job Demands/Resources and Firm Performance.
- Work Engagement mediating between Job Satisfaction and Firm Performance.

5.6. Robustness And Control Variables

A multi-group SEM was used to examine whether results vary across departments or job levels (e.g., managers vs. staff). Control variables (age, gender, education, years of experience, and department) were included to rule out alternative explanations.

5.7. Summary Of Findings

Overall, the results confirm the applicability of the JD-R framework within the Ministry of Electricity in Iraq. While high job demands reduce job satisfaction, the availability of job resources enhances it. Job satisfaction not only improves work engagement but also contributes directly and indirectly to firm performance. These findings highlight the importance of balancing job demands with adequate resources to ensure sustainable organizational effectiveness in the electricity sector.

6. HYPOTHESES DEVELOPMENT

According to previous studies (for instance,

Crawford et al., 2010), job demands, emotional demands, and job resources provided by the employer have a substantial impact on job satisfaction. As a result of the mediating effect of job satisfaction, work engagement reduced the impact of job demands and job resources on company performance as well as the influence of job demands and job resources on job satisfaction. As predicted, the association between job demands and work engagement was stronger among employees when performance was high, due to the interaction among job satisfaction, job resources, and job demands on work engagement. The indirect impact of job demands and resources on business performance through work engagement was positive and considerable for the oil sector in Iraq, according to moderated mediation analysis. Hence, work engagement on job satisfaction was significantly stronger for employees in the energy sector. Even though job demands and job resources show a substantial association with business performance, job happiness can be positively impacted by enhancing work engagement and through work engagement. Therefore, demanding or difficult occupations increase employees' work engagement and job happiness. However, employees may get distressed if their jobs become overly demanding. Therefore, determining the ideal amount of job demands is essential, keeping in mind that the ideal level will differ for everyone. Hence, the resource is an important factor for firm performance and development.

We are the first, as far as we are aware, to investigate how job demand, job resources, and challenge stressors, such as job satisfaction, interact to affect work engagement and, via work engagement, company performance in the energy industry of Iraq. We have argued, using demand and resource theory, that power company employees have fewer resources to dedicate to work-related tasks and, as a result, gain less from tough positions than workers in other industries. Indeed, when faced with emotional demands, employees in the electricity industry benefited, albeit less than workers in other industries, in terms of work engagement and job satisfaction; however, when faced with cognitive demands, they reaped no benefits, whereas managers reaped significant benefits from both cognitive and emotional job demands. Most organizational behavior models and theories were created in the West, where managers and employees have nearly equal rights in the workplace and in society. Sadly, many places in the world, including Iraq, do not operate in this way.

In this study, job resources and job demand showed a significant and positive reciprocal effect on job satisfaction, which confirms the motivational process of the JD-R model. Moreover, previous studies have shown that when employees view company resources in a more positive way, they are more satisfied. Also, we found that job demand stress and job satisfaction were significantly and positively correlated. Thus, the greater the degree of job demand, the greater the incidence of job satisfaction affecting employee performance, as observed in the JD-R model and in previous studies. One of the key strengths of AI lies in its capacity to enhance decision-making processes. AI systems can analyze vast amounts of data to provide insights, predict outcomes, and optimize operations. In the business context, AI-driven analytics has transformed retail by enabling personalized marketing, demand forecasting, and supply chain optimization. Similarly, in healthcare, AI assists in diagnosis, treatment recommendations, and patient monitoring, thereby improving efficiency and accuracy. Recent research highlights the development of agentic AI, which emphasizes autonomy, adaptability, and proactive decision-making (Wang & Zhang, 2024). Unlike traditional AI systems, agentic AI can operate with minimal human intervention and adjust strategies based on changing environments. The integration of AI with the Internet of Things (IoT), blockchain, and edge computing is expected to further expand its capabilities across industries. The relationship between AI and job satisfaction is multifaceted and continues to attract scholarly attention. AI can enhance job satisfaction by reducing the burden of repetitive, mundane, or high-pressure tasks, allowing employees to concentrate on more strategic, creative, and value-added activities. For instance, AI-powered tools can assist in data analysis, customer interaction, and workflow optimization, thereby improving efficiency and reducing workplace stress. Employees who perceive AI as a supportive tool rather than a threat often report higher levels of satisfaction, as AI can empower them with actionable insights, personalized guidance, and performance feedback.

7. CONCLUSION

This study has examined the application of the proposed framework within the Ministry of Electricity in Iraq, aiming to enhance institutional performance, decision-making, and service delivery. The findings demonstrate that structured, evidence-based frameworks can provide actionable insights for addressing operational challenges in public sector

organizations. By aligning analytical approaches with the specific context of Iraq's electricity sector, the study highlights the potential of data-driven strategies to improve efficiency, transparency, and accountability. The literature demonstrates that AI is a rapidly evolving field with significant potential to transform multiple domains. While technological advancements have enabled unprecedented levels of automation and intelligence, ongoing research must address ethical, social, and regulatory challenges. Future studies are likely to focus on developing more autonomous, explainable, and human-centered AI systems. The research contributes to both theory and practice by bridging the gap between academic frameworks and real-world policy implementation. It emphasizes the importance of integrating modern analytical tools and organizational reforms to address persistent operational inefficiencies, regulatory challenges, and resource constraints. Moreover, the study establishes a foundation for future research, including comparative analyses across ministries or sectors, to ensure that lessons learned can inform broader governance and infrastructure initiatives. Conversely, the implementation of AI may also generate anxiety and dissatisfaction, especially when workers feel that their roles are threatened by automation. Job insecurity, a lack of clarity regarding AI's function, or insufficient training can diminish employees' sense of control and professional fulfillment. Moreover, the perceived fairness and transparency of AI systems play a critical role in shaping job satisfaction; employees are more likely to embrace AI when they understand how decisions are made and feel that the technology complements rather than replaces human judgment.

Based on these findings, several recommendations

are proposed to support the Ministry of Electricity in achieving its strategic objectives:

1. **Adopt Data-Driven Decision-Making:** Implement comprehensive data collection and analytics systems to monitor performance, optimize resource allocation, and enable evidence-based decisions.
2. **Strengthen Organizational Capacity:** Invest in employee training programs to develop competencies in management, digital tools, and analytical methods, fostering a culture of continuous improvement.
3. **Enhance Policy and Regulatory Alignment:** Ensure institutional strategies align with national energy policies and international best practices to promote sustainability, efficiency, and compliance.
4. **Leverage Technology for Operational Efficiency:** Integrate smart grid technologies, automated monitoring systems, and predictive maintenance tools to reduce energy losses and improve reliability.
5. **Promote Stakeholder Engagement:** Engage citizens, private sector partners, and international agencies to gather feedback, enhance transparency, and foster collaborative solutions.
6. **Encourage Future Research and Evaluation:** Conduct longitudinal studies and comparative analyses to refine the framework and validate its effectiveness across diverse contexts.

By implementing these recommendations, the Ministry of Electricity can strengthen governance, enhance operational efficiency, and contribute to the sustainable development of Iraq's energy infrastructure, ensuring that both immediate and long-term sectoral objectives are achieved.

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