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ENHANCING EMPLOYEE ENGAGEMENT THROUGH TRANSFORMATIONAL LEADERSHIP AND AI USE: EVIDENCE FROM THE HEALTHCARE SECTOR IN SAUDI ARABIA

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Abstract. The research examines how transformational leadership and AI usage affects healthcare employee engagement in Saudi Arabia. Additionally, it investigates how employee voice moderates the relationship between transformative leadership and employee engagement. The data was collected from 408 healthcare employees who worked at hospitals and healthcare facilities throughout the Kingdom of Saudi Arabia. The researcher utilized Partial Least Squares Structural Equation Modelling (PLS-SEM) to analyze the collected data. The findings showed that the four dimensions of transformational leadership—inspirational motivation, idealized influence, intellectual stimulation, and individualized consideration—significantly influence employee engagement. The findings further show that the usage of AI technologies can lead to more employee engagement. Furthermore, the findings confirm the moderating role of employee voice in enhancing the relationship between transformational leadership and employee engagement. It concludes that employee voice enables transformational leaders to achieve higher employee engagement through settings which support open dialogue and staff involvement. This article contributes to knowledge by combining leadership theory with employee voice concepts and digital transformation elements into a single model which provides healthcare leaders and policymakers with practical methods to boost employee engagement through leadership development and AI-powered workplace technology. Specifically, it underscores the importance of transformational leadership and AI technologies in enhancing employee engagement.

Keywords: transformational leadership; employee engagement; Artificial Intelligence; employee voice; healthcare sector; Saudi Arabia; digital transformation

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1. Introduction

In the past few years, healthcare organizations have been subjected to high challenges due to the high turbulence and uncertainty in the external environment. Furthermore, there has been many pressures on these organizations due to the high growing expectations from patients, community and relevant stakeholders. These challenges are very relevant to the healthcare sector which needs to balance the high-quality services and operational efficiency provided to patients as well as the happiness and satisfaction of employees and healthcare providers in that sector. Therefore, the importance of leadership has increased as a critical factor for organizational success, as it plays a key role in enhancing employees' attitudes, engagement, and commitment (Ytterstad & Olaisen, 2023). This article focuses on transformational

leadership, which has an important role in enhancing employee productivity where the literature reports some positive outcomes for it including inspiration, empowerment, individual development and enhancing productivity (Lawrason et al., 2023).

Additionally, there has been a growing interest in the human resources literature in examining the concept of “Employee Engagement”, as many studies have reported that engaged employees are more likely to achieve better results at work, where they are characterized by higher energy and they are willing to invest more effort in the workplace (Pincus, 2023). Because of the high workload, emotional demands and time pressure that characterizes the nature of employees’ work in the health sector, examining employee engagement is very relevant, where it is considered crucial in enhancing performance, service quality and achieving effectiveness and efficiency in that sector. This study examines how transformational leadership influences employee engagement, where it argues that leadership has a critical role in enhancing employee engagement by motivating employees, providing meaning to work as well as enhancing professional growth of employees of the healthcare sector (Gede & Huluka, 2024). Thus, transformational leadership, with its focus on vision and long-term orientation, intellectual stimulation, and individualized consideration, can be a key determinant of success in that sector. Transformational leadership is important because it inspires employees to strive for excellence in their work and to help the organization achieve its vision and mission. Transformational leaders motivate, engage and commit employees to work optimally within a supportive and empowering work environment. As a result, employees become more motivated and perform better, drive more innovation and ensure long-term organizational success (Bakker et al., 2023; Ytterstad & Olaisen, 2023).

With the growing importance of transformation leadership in enhancing employee engagement, the influence of organizational context and enabling conditions that enhance that relationship has been recently examined in extant literature. For instance, the concept of employee voice has been highlighted recently in the human resources literature. It refers to the capacity of the employee to communicate his ideas and opinions while performing his job to his managers without being fear of any negative consequences (Morrison, 2023). Employee voice is very relevant to the healthcare industry, where front line employees face daily pressures while doing their work. Furthermore, from their daily practices and interactions with other employees and patients, they would have many ideas, suggestions or complaints that can enhance the effectiveness and efficiency of the work. In other words, the article suggests that employees who feel supported and heard tend to exhibit greater engagement. Conversely, limited voice opportunities may reduce the effectiveness of all leadership styles (Zhu et al., 2022; Mohammad et al., 2023).

Recently, the adoption of digital transformation and AI technologies has grown rapidly, where more healthcare organizations are getting used to with the aim of enhancing their service quality, efficiency and effectiveness. These digital solutions are being used in different areas of healthcare services such as scheduling, diagnostics support, patient flow management, data analytics, and administrative automation (Namatovu & Kyambade, 2025). Despite the potential that AI has in enhancing the decision-making process and service quality in the healthcare sector, the success of the implementation depends heavily on employees’ ability and willingness to adopt these systems daily. Accordingly, the leadership in that sector might play a crucial role in improving employees’ acceptance of digital change as well as their readiness to adopt AI tools in the workplace (Huang et al., 2024).

The connection between transformational leadership and AI usage can be logically explained, where this leadership style is required for encouraging employees to learn, innovate and adapt these innovative systems. They are also needed for creating an environment that supports shared learning and adapting innovative practices (Ahmed et al., 2025). Moreover, the contribution of AI to enhancing employee engagement is noteworthy, where it is expected that it will decrease workload, improve task efficiency and enhance employees’ senses of achievement and happiness. Accordingly, AI usage can be an important step that is required for enhancing employee engagement in the health sector workplace.

The current study is conducted within the healthcare sector in the Kingdom of Saudi Arabia, which has seen a massive transformation and improvement under the 2030 vision. For instance, many health care organizations have got advantage of the rapid digital transformation of the country, where they have digitalized almost all their services. Thus, with that expansion of the digital and AI usage in that sector, it has become very important to understand how human factors like transformational leadership and employee voice interact with the AI usage to result in employee engagement. Despite the importance of that topic, the extant literature suffers from the limitations of studies in that context, especially in emerging and developing countries (Li et al., 2023; Namatovu & Kyambade, 2025).

Thus, this article aims to address that gap by investigating the relationship between transformational leadership and employee engagement among healthcare employees in KSA, while incorporating employee voice as a moderating variable. It also contributes by examining the relationship between AI use and employee engagement. The findings of this study are expected to offer both theoretical and practical contributions and implications. For instance, from a theoretical perspective, the study extends leadership and engagement research by incorporating digital work practices into the analysis. From a practical perspective, the findings may provide healthcare managers and policymakers in KSA with a better understanding on how leadership behaviors and organizational conditions can work together with the AI to enhance employee engagement.

The structure of this paper is as follows: First, an overview of the literature on employee engagement, AI use, and transformative leadership is presented. The conceptual framework, research hypotheses, and theoretical background are covered in the section that follows. The data collection and analysis approach are then covered. The results and a discussion of the key findings are then presented. The study's shortcomings, future research directions, and theoretical and managerial implications are all presented in the paper's conclusion.

2. Literature Review and Hypotheses Development

2.1 Transformational Leadership in Healthcare Organizations

With an emphasis on high-stress settings like the healthcare industry, the body of existing literature highlights the critical role that leadership plays in influencing employees' attitudes, actions, and performance results (Alshahrani, 2024). Healthcare organizations depend on a stable supply of skilled employees performing at optimal levels (Curado & Santos, 2022). Employee performance directly impacts the quality of service and safety provided to patients. Leadership is seen as an essential organizational resource that can improve employee engagement and motivation in high-stress settings like the healthcare industry (Gebreheat et al., 2023).

Leadership has been studied using many different theories and models in several contexts. Transactional leaders engage in an exchange with followers that is intended to enhance performance. They use rewards and discipline to motivate followers toward the achievement of desired outcomes (Dianawati et al., 2025). Servant leaders serve followers to help them realize their full potential (Shi & Zhou, 2023). Ethical leaders create work climates that are fair, ethical, with integrity, and model appropriate behavior. Authentic leaders are self-aware, transparent, balanced and consistent in their values and actions. Although all styles of leadership are important for successful organisational management, in this study a particular focus was placed on the theory of transformational leadership. All healthcare organisations are currently undergoing some degree of digital transformation and are operating in a pressurized work environment (Costa et al., 2023). During times of change and instability, such as these organisations are facing, leaders have a 24/7 service to manage, with change and uncertainty going on throughout the organization. This style of management can be particularly effective in garnering employee acceptance of change, shared vision, creative thinking and most importantly making employees feel valued. For these reasons transformational leadership is an appropriate lens through which to view engagement of employees in healthcare organisations facing turbulent times (Piwowar-Sulej et al., 2023).

The most well-established and well-known kind of leadership is transformational leadership. Transformational leadership is centered on motivating, empowering, and promoting change inside the company. Transformational leaders encourage and motivate their employees to work towards realizing shared goals (Alshahrani, 2024). Transformational leadership enhances the performance of employees and encourages them to take on more responsibilities at work by inspiring them to work towards a shared vision (Ytterstad & Olaisen, 2023). The fostering of trust, values, and interest in the work being undertaken enhances the performance of employees and the outcomes of organizations (Gebreheat et al., 2023). In healthcare organizations, managers can encourage employees to exceed their standard role expectations by maintaining high standards of patient care, safety, and quality of service. Therefore, leadership in healthcare organizations is more valuable than leadership in other sectors. The effective implementation of transformational leadership can ensure that healthcare organizations achieve enduring success (Manu, 2022).

The evolving nature of the healthcare industry, the changes happening within the sector, and the challenges relating to staff availability and retention all enhance the relevance of transformational leadership. Workers in the healthcare industry today are expected to perform under high-stress conditions while working with new technologies, new procedures, and new expectations for quality care and service (Tsapnidou et al., 2024). Transformational leaders facilitate this by providing employees with the clarity, support, and sense-making they need to cope with these demands and changes. The positive outcomes of this relationship between leaders and employees have been well documented in the past. It has been demonstrated that transformational leadership promotes higher levels of employee engagement and dedication to the company.

The construct of transformational leadership is viewed conceptually partitioned into its four main dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Each of the four dimensions represents a set of behaviors that leaders exhibit, and together they help to create the leader's overall perception by the follower. Idealized influence is the extent to which employees view their manager as an ethical role model whom they trust and respect. Inspirational motivation involves encouraging employees to work towards attaining noble goals or visions for the organization. The dimension of intellectual stimulation involves fostering creativity and innovation within the organization. Finally, individualized consideration refers to how well the leader understands and caters to individual employees' needs (Khan et al., 2025). An independent examination of each of these dimensions will uncover more about how the practice of transformational leadership enhances employee engagement in healthcare organizations.

2.2 The Concept of Employee Engagement

Employee engagement is the degree to which employees are psychologically, emotionally, and cognitively connected to their work roles. Employee engagement is typically defined as a positive work state that employees experience, characterized by vigor, dedication, and absorption (Gede & Huluka, 2024). Engaged employees exhibit high levels of energy and passion for their work, and they are highly involved in their roles. Employee engagement is seen as more valuable than job satisfaction, as it is an active motivational state that employees experience (Pincus, 2023; Bader et al., 2023). Engaged workers voluntarily devote their own time and energy to improving the organization's performance. Performance, productivity, creativity, and dedication to the company are all thought to be significantly influenced by employee engagement (Ahmed et al., 2025).

Since healthcare personnel must work in a specific environment, employee engagement is especially important in this industry. Healthcare professionals work under conditions of high responsibility, emotional intensity, and time pressure, and their performance directly impacts the safety and well-being of patients (Haddad et al., 2022). The clinical outcomes and efficacy of patient care services are directly improved by engaged staff members in healthcare facilities, who are more focused, resilient, and driven to give their patients high-quality treatment. Engaged employees who work in healthcare facilities are also more likely to demonstrate empathy, teamwork, and proactive solutions to problems encountered in their work, which are all important factors in maintaining patient trust and satisfaction. Employee engagement is important in reducing burnout and turnover among employees, which are two of the most significant

and persistent challenges faced by healthcare organizations worldwide (Haddad et al., 2022). Employees who feel psychologically connected to their work and who feel supported by their organization are better able to cope with the stresses and demands associated with their work roles. Therefore, employee engagement in healthcare organizations contributes to improving not only the performance of the organization but also to enhancing the well-being of individual employees. Research findings consistently demonstrate that healthcare organizations with high standards of employee engagement achieve superior organizational performance outcomes, improved patient satisfaction rates, and enhanced patient safety outcomes (Scott et al., 2022). Therefore, it should come as no surprise that policymakers and healthcare executives who want to improve the sustainability and effectiveness of healthcare organizations have made employee engagement a top strategic objective (Wang et al., 2023).

2.3 Conceptual Model and Hypotheses Development

Figure 1 shows the conceptual model that was developed based on an extensive literature review. The following sections discuss the proposed hypotheses together with relevant literature. The proposed conceptual model distinguishes transformational leadership as a higher-level leadership construct represented through four dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. These dimensions are examined as predictors of employee engagement, while employee voice is modelled as a moderating variable and AI usage is included as an additional direct predictor of employee engagement.

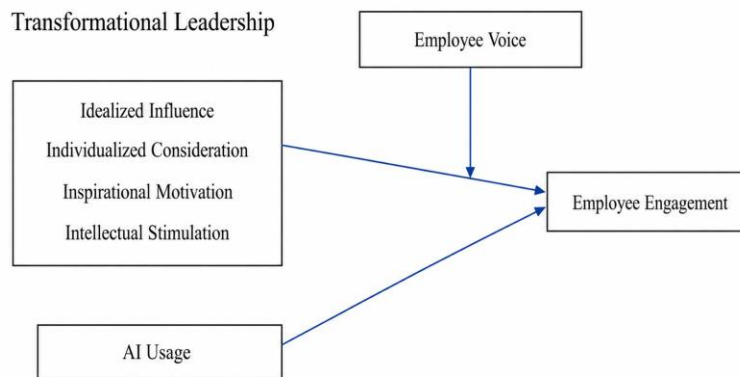


Figure 1. Proposed conceptual model showing transformational leadership and its four dimensions, AI usage, employee voice, and employee engagement
Source: the author

2.3.1 Idealized Influence and Employee Engagement

Idealized influence refers to the degree in which leaders are considered role models who are liked, respected and trusted by their subordinates. Leaders who show high level of idealized influence show high levels of integrity, credibility, fairness and consistency in their actions. For instance, in healthcare organizations, where ethical considerations and professional standards are critical, such leadership behaviors are key in enhancing trust and credibility.

The idealized influence dimension of transformational leadership is key in impacting employee engagement, where it is expected that when employees perceive that their leaders are role models, they tend to feel a sense of pride in their work, and they tend to align with organizational values. Furthermore, they develop a sense of emotional attachment with their leaders and jobs, which in turn enhances their willingness to sacrifice and work harder. By enhancing trust and respect, idealized influence can provide a mechanism for enhancing employee engagement. Thus, employees who trust their leaders are more likely to feel secure, motivated and committed,

which has an important role for enhancing employee engagement. Based on these assumptions, the following hypothesis is developed:

H1a: Idealized influence has a positive significant effect on employee engagement.

2.3.2 Inspirational Motivation and Employee Engagement

The inspirational motivation dimension of transformational leadership refers to the managers' ability to set a clear vision for the future and communicate it with high levels of optimism and enthusiasm. These leaders usually encourage employees to perform their jobs by highlighting the significance of work and showing how their roles align with the organizational goals, values and strategies (Khan et al., 2025). For instance, in the context of the healthcare sector, where daily tasks are considered routine or emotionally demanding, inspirational leadership can provide employees with high sense of purpose and direction. In other words, this dimension focuses on the leader's confidence and belief in their employees' abilities, which in turn makes them exert more effort to seek perfection. This is considered a kind of internal motivation which improves the emotional connection of employees with their work. Thus, employees who are inspired by their leaders are likely to exert more enthusiasm, dedication and sacrifices in the workplace. From the previous discussion, we propose the following hypothesis.

H1b: Inspirational motivation has a positive significant effect on employee engagement.

2.3.3 Intellectual Stimulation and Employee Engagement

The practice of intellectual stimulation at work requires organizations to motivate their staff members to develop innovative thinking while they question established beliefs and discover innovative solutions to their work challenges. Leaders who provide intellectual stimulation create learning and innovative environments through their practice of seeking and valuing employee thoughts and viewpoints (Khan et al., 2025). Healthcare organizations require intellectual stimulation because they manage complex problems which need adaptable creative solutions. Staff members who get permission to use their skills and knowledge for creative solutions will probably experience feelings of competence and self-direction. Workers who experience psychological events during their work hours will show increased dedication because they develop mental focus for their work tasks and display passion for their responsibilities which go beyond their regular duties. The combination of intellectual stimulation works to decrease monotony while making work more meaningful which leads to better employee engagement. Accordingly, the following hypothesis is proposed:

H1c: Intellectual stimulation has a positive significant effect on employee engagement.

2.3.4 Individualized Consideration and Employee Engagement

Leaders who practice individualized consideration focus on understanding the personal requirements and abilities and growth potential of each team member. Leaders who demonstrate individualized consideration act as mentors or coaches, providing personalized support and feedback. Healthcare organizations require individualized leadership methods because their personnel members possess distinct experience levels and different skill abilities and professional training (Khan et al., 2025). Leaders who support their employees will build an environment which enables staff members to create strong emotional connections with their work responsibilities and their workplace organization. Organizations which practice individualized consideration enable their staff members to create organizational bonds through trust development which leads to better employee engagement. Leaders who demonstrate authentic interest in employee health and career growth will achieve better employee commitment. Thus, the following hypothesis is suggested:

H1d: Individualized consideration has a positive significant effect on employee engagement.

2.4 The Moderating Role of Employee Voice

The effectiveness of transformational leadership behaviors which should boost employee engagement depends on the specific organizational environment where they get implemented. The way employees understand and react to leadership actions depends on the essential contextual element which is employee voice (Li et al., 2023). The

ability of staff members to share their thoughts about work activities and organizational operational methods determines the extent of employee voice. Healthcare organizations need employee voice because their operations depend on staff members who possess specialized knowledge which must be used without making critical mistakes that could lead to dangerous results. Staff members who have the freedom to express their opinions will generate valuable information which enhances operational performance and results. The psychological approach shows that voice practices at work enable staff members to experience autonomy and respect and inclusion which leads to better employee engagement. Employee voice may moderate the relationship between transformational leadership and engagement by amplifying the impact of leadership behaviours. Leaders who demonstrate authentic and supportive transformational leadership in high-voice environments create spaces which motivate employees to participate. Leadership messages which employees experience in low-voice environments lose their meaning because they transform into empty symbols which separate leadership work from employee motivation. Employee voice can help to identify how employees see leaders supporting service delivery. Fostering employee voice can create psychological ownership when employees believe that what they do matters and contribute to the organization's goals. Valuing employees' experience can enhance employees' engagement and commitment to the organization and their work. Employee voice can be particularly relevant in health care as most of the service delivery is conducted by front line staff on a day-to-day basis with patients at the center of their work. As such, employees have unique knowledge and insight which organizations can benefit from when fostering employee voice. When leaders act in a transformational way by giving employees feedback, participation and voices that are heard, an enabling climate of trust and respect can be created. Healthy workplaces enable employees to have a 'voice' at work, feeling supported to express views, ideas and concerns. In this webinar we will explore how voice at work can add value to transformational leadership influence; from being a 'sporous abstraction' to having real impact on employees (Gede & Huluka, 2024). We will look at how employee voice can convert leadership influence into employee motivation, and sustainable employee engagement during periods of rapid organizational change in the healthcare sector. This study argues that employee voice acts as a boundary condition which affects the power of transformational leadership to create employee engagement.

H2: Employee voice moderates the relationship between transformational leadership and employee engagement, such that the relationship is stronger when employee voice is high.

2.5 AI Usage and Employee Engagement

AI technology deployment creates major changes which transform how employees perform their work tasks and their interactions with their work environment. AI systems become effective when deployed correctly because they decrease manual work and enhance operational speed and generate improved choices. The advantages create conditions which help staff members develop their work control abilities and work competence, thus driving their workplace engagement. Healthcare facilities that use AI technology enable their staff to handle complicated work better while they decrease their administrative work which enables them to dedicate more time to patient care. AI tool implementation enables employees to develop better work engagement through systems which create improved work environments that enhance their job meaning. The deployment of AI technology will generate beneficial outcomes which will drive healthcare organizations to achieve higher employee participation.

The implementation of AI systems reconfigures jobs to emphasize less-routine and more complex tasks that involve analysis, customer service, and other engaged behaviors, all of which correlate with increased skill variety, job significance, and task identity, all of which are engagement drivers. AI systems that provide real-time analytics and support decisions, reducing uncertainty, cognitive overload, and fatigue (especially in healthcare), enable workers to focus on high-value tasks like patient care, increasing their psychological empowerment and emotional connection to their work. Finally, the introduction of AI systems is perceived as an indicator of management's commitment to the future of the firm and its employees, which can increase loyalty and encourage positive behaviors. AI systems, when introduced in a training context, are seen as collaborative and intelligent partners who enhance human capital rather than alien objects that generate resistance. The resulting trust and

positive work attitudes thus reaffirm the proposition that AI usage enhances employee engagement. Based on the previous assumptions, the following hypothesis is proposed:

H3: AI usage has a positive significant effect on employee engagement.

3. Research Methodology

3.1 Research Design

The research design of this study uses quantitative methods to study the impact of transformational leadership dimensions and AI usage on employee engagement in Saudi Arabia health care organizations. It further examines the moderating role of employee voice in enhancing the relationship between transformational leadership and employee engagement.

The study focused on the healthcare industry of the Kingdom of Saudi Arabia which underwent major changes because of healthcare system reforms and digital health programs and rising funding for sophisticated medical systems. Healthcare organizations across KSA now use artificial intelligence systems to improve their operational performance and service delivery and their decision-making abilities. The sector functions as a vital environment which enables researchers to study leadership techniques and employee communication strategies and artificial intelligence deployment and workforce interaction patterns.

The target population of the study consists of healthcare employees working in hospitals and healthcare organisations in KSA. This includes both clinical and administrative staff who are directly or indirectly involved in service delivery and operational processes. The study includes different occupational groups to achieve results which demonstrate leadership and voice and technology adoption from multiple healthcare environments.

A cross-sectional survey approach was employed, as it is suitable for testing hypothesized relationships between multiple constructs within a defined population at a single point in time. The quantitative research method allows scientists to measure perceptions and behaviors through systematic methods which enable them to analyze study variables and their direct and moderate relationships. Data was collected using a structured questionnaire distributed to healthcare employees across various organisations in six cities in KSA.

The researchers used convenience sampling to select participants who were accessible and willing to take part in the study. After 2 months of data collection in November and December 2025, 409 valid responses were collected. The data was analyzed using structural equation modeling techniques with the aid of SmartPLS 4.

The researcher applied all the ethical standards applied at Majmaah University in KSA. Specifically, before distributing the questionnaire, all participants were informed about the study's objectives and were given the right of voluntary withdrawal. Also, the study's data was kept in a secure place and was only used for the purpose of the research. Furthermore, the research didn't ask for any confidential information or personal information to ensure the animosity of the study's participants.

3.2 Measurement of Variables

All the study's constructs were measured using items borrowed from previously validated scales from the human resources literature, where they were adapted to the health care context. This study used a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). For instance, transformational leadership consisted of four dimensions namely: idealized influence, inspirational motivation, intellectual stimulation and individualized consideration. Each dimension was measured using multiple items reflecting employees' perceptions of their immediate supervisors' leadership behaviors. The assessment tools evaluated leaders through their role model actions and their capacity to drive staff motivation and their ability to create innovative solutions and provide personalized care to their team members. Hence, each of the four dimensions was measured using four items

adapted from Avolio & Bass (2004). This study conceptualizes employee engagement as a positive work-related state which measures employee energy and dedication and their ability to focus on their work activities. The assessment tools measured employee work dedication through their emotional and mental participation and their positive work attitude and their readiness to take on extra work responsibilities. The assessment shows student participation through its increasing numerical values which represent growing student involvement. Employee engagement was measured using five items adopted from Saks (2006). On the other hand, employee voice is conceptualized as employees' perceived ability to express ideas, concerns, and suggestions related to work and organisational processes. The items of the questionnaire are shown in Table 1.

Table 1. Items of the questionnaire		
Construct	Manifest Variable	Questionnaire Items
Idealized Influence	II1	My leader acts in ways that build my respect.
	II2	My leader emphasizes the importance of having a shared mission.
	II3	My leader demonstrates high ethical standards.
	II4	My leader behaves in ways that earn my trust.
Inspirational Motivation	IM1	My leader communicates an inspiring vision of the future.
	IM2	My leader expresses confidence that goals will be achieved.
	IM3	My leader motivates others to work toward common objectives.
	IM4	My leader speaks enthusiastically about what needs to be accomplished.
Intellectual Stimulation	IS1	My leader encourages me to think about problems in new ways.
	IS2	My leader challenges me to question traditional assumptions.
	IS3	My leader supports innovative approaches to tasks.
	IS4	My leader seeks different perspectives when solving problems.
Individualized Consideration	IC1	My leader treats me as an individual with unique needs.
	IC2	My leader spends time coaching and developing employees.
	IC3	My leader listens carefully to my concerns.
	IC4	My leader helps me develop my strengths.
Engagement	ENG1	I am fully engaged in my job.
	ENG2	I am enthusiastic about my job.
	ENG3	I feel energetic when performing my work.
	ENG4	I am immersed in my job.
	ENG5	I devote a lot of effort to my job.
Employee Voice	EV1	I formulate and offer suggestions regarding matters that impact my team.
	VOI1	I speak up with ideas for new projects or changes.
	VOI2	I communicate suggestions to improve work procedures.
	VOI3	I encourage others to get involved in issues that affect the group.
	VOI4	I speak up in this group with opinions even if others disagree.
	VOI5	I keep well informed about issues where my opinion might be useful.
AI Usage	AIU	I frequently use AI systems in my job.
	AIU	I regularly rely on AI tools to complete work tasks.
	AIU	I use AI applications as part of my daily work activities.
	AIU	I depend on AI systems to support my decisions.
	AIU	I use AI technologies whenever they are available for my tasks.

4. Findings

Sample Characteristics

There were 180 female responders (44.0%) and 229 male respondents (56.0%). The majority of respondents (131 respondents, 32.0%) were between the ages of 18 and 34; 114 respondents were between the ages of 34 and 45 (27.9%); 98 respondents were between the ages of 46 and 59 (24.0%); and only 66 respondents were 60 years of age or above (16.1%). According to an examination of the respondents' monthly income, 28.1% of them made less than 10,000 SAR (115 respondents), 41.8% made between 10,001 and 20,000 SAR (171 respondents), and 20.4% made between 20,001 and 40,000 SAR (83 respondents). By contrast, only 40 respondents, or 9.7% of the sample, earned more than 40,000 SAR. In terms of the respondents' educational background, only 14.0% had a postgraduate degree (57 respondents), 60.1% had a college degree (246 respondents), and 25.9% had a secondary school degree (106 respondents).

Measurement model

SmartPLS was used for the statistical study, which was based on a dataset that included 409 healthcare workers. The validity and reliability of the study's constructs must be evaluated before the research hypothesis is tested. Cronbach's alpha and composite reliability (CR) values were computed for each construct in order to assess internal consistency reliability. When these values surpass the suggested threshold of 0.70, satisfactory reliability is attained. Additionally, composite reliability should be investigated before structural model evaluation. The findings showed that Cronbach's alpha values ranged from 0.829 to 0.871 and CR values ranged from 0.887 to 0.912, suggesting good internal consistency and verifying that all constructs exhibit strong dependability.

Additionally, external loadings were examined in order to assess indication reliability. All indicator loadings above the acceptable threshold of 0.70, suggesting strong item reliability. Since each indicator made a sufficient contribution to the corresponding constructs, no items were eliminated from the measurement model.

The Average Variance Extracted (AVE) was used to evaluate convergent validity. AVE values should be greater than 0.50 to show sufficient convergent validity, according to Fornell and Larcker (1981). AVE values ranged from 0.662 to 0.722, according to the results, confirming that each construct accounts for more than half of the variance of its indicators. The comprehensive measurement model results, including outer loadings, composite reliability, Cronbach's alpha, and AVE values, are shown in Table 2.

The Fornell-Larcker criterion was used to evaluate discriminant validity. The findings showed that each concept's square root of AVE was greater than its correlations with every other construct, indicating adequate discriminant validity. These results verify that each construct is empirically distinct from the others and captures a unique concept.

Table 2. Outer loadings, CR values, Cronbach's alpha, and AVE) of the study's constructs

Construct	Cronbach α	CR	AVE
II	0.855	0.902	0.698
IM	0.871	0.912	0.722
IS	0.829	0.887	0.662
IC	0.865	0.907	0.711
EV	0.861	0.907	0.642
AIU	0.848	0.898	0.677
ENG	0.869	0.910	0.699

Assessment of the structural model

The structural model was evaluated using bootstrapping resampling techniques within PLS-SEM to test the suggested hypotheses. To ascertain whether the proposed associations were supported, the analysis concentrated on looking at the standardized path coefficients (β), t-values, and significance levels (p-values).

The results showed that idealized influence had a favorable and statistically significant impact on employee engagement, supporting H1a ($\beta = 0.222$, $t = 4.247$, $p < 0.001$). Similarly, inspirational motivation showed a substantial beneficial impact on involvement ($\beta = 0.139$, $t = 2.830$, $p = 0.005$), supporting H1b. The findings also supported hypothesis H1c, according to which intellectual stimulation greatly increased worker engagement ($\beta = 0.202$, $t = 4.096$, $p < 0.001$). Individualized consideration also had a favorable and significant effect on involvement, supporting H1d ($\beta = 0.306$, $t = 6.040$, $p < 0.001$).

Additionally, the results supported H3, showing that staff engagement is positively and statistically significantly impacted by AI usage ($\beta = 0.178$, $t = 4.457$, $p < 0.001$). Furthermore, the interaction term between transformational leadership and employee voice demonstrated a significant positive effect on engagement ($\beta = 0.148$, $t = 3.501$, $p = 0.001$), indicating that the positive influence of transformational leadership on engagement becomes stronger when employee voice is high, supporting the moderation hypothesis H2.

The structural model showed significant explanatory power overall. The four transformational leadership qualities, AI usage, and the interaction effect account for 52.5% of the variance in employee engagement, according to the coefficient of determination (R^2) for employee engagement, which was 0.525. This indicates a moderate to large level of prediction accuracy by widely accepted standards.

5. Discussion and Implications

The current study examined how employee engagement in the healthcare industry is impacted by transformational leadership and AI utilization, as well as the function of employee voice as a moderator of these interactions. The results integrate theoretical and practical insights that expand on current leadership, engagement, and digital transformation studies on complex service contexts like healthcare and offer strong support for the proposed conceptual model.

As stated in the study's context section, healthcare organizations function within the pressures of high-stakes environments, great responsibility, and rapidly evolving technological innovations. Therefore, organizing, leadership, and digital competency emerge as key organizational resources.

Therefore, in summary, first, the study found that all four dimensions of transformational leadership significantly increased employee engagement, which supports the multi-dimensionality of the transformational leadership theory. Individual consideration was the strongest among the four dimensions of leadership, followed by idealized influence, intellectual stimulation, and inspirational motivation. Second, the study found that AI utilization positively affected employee engagement, thus supporting the notion that technology can serve as a motivational job resource rather than merely a task-oriented resource. Third, the study identified employee voice as a moderator of the relationships between transformational leadership dimensions and engagement, demonstrating that the beneficial effects of transformational leadership behaviors are strengthened when employees feel they can share their ideas.

In conclusion, these findings align with prior literature regarding the high-stress environment of the healthcare system. Thus, it is not surprising that the present findings suggest that, in such an environment, effective leadership behaviors are centered on the relational aspects of supporting rather than simply performing well. Thus, the current findings support and extend the existing literature on healthcare leaders in that these positive effects of engagement appear to derive from the individualized considerations that healthcare leaders provide to their followers. These findings, therefore, support and extend the prior literature regarding the benefits of these leadership behaviors in complex and high-stress work environments such as healthcare.

Furthermore, second, the positive effects of technology utilization on employee engagement support the emerging literature on the digital workplace. Thus, this literature suggests that digital technologies can be designed as work-enabling systems to strengthen employees' emotional bonds to their work and the organizations for which they work, thus enhancing their willingness and ability to perform at the high levels of effectiveness required in technologically innovative workplaces like healthcare. Third, the present study's finding that employee voice acts as a mediator between the transformational leadership behaviors and the employee engagement outcomes is new but expected within the context of a complex, technologically innovative, and rapidly changing work environment such as healthcare. Therefore, these findings only support the emerging literature suggesting that healthcare leaders need to consider contextual (organizational climate) factors in their leadership interventions.

In practice, the present findings offer important implications for healthcare managers and health policymakers who wish to enhance the effectiveness of their leaders. Hence, in managing and training healthcare leaders and managers for the future, those responsible for implementing training interventions for those leaders would do well to focus more on improving their supportive communication patterns than on their technical or task-related abilities.

Furthermore, in technologically changing environments like healthcare, enhancing employee engagement is a "critical success factor" for effective organizational performance. Enhancing employee engagement, therefore, requires careful planning to optimize the outcomes for all stakeholders involved, as these stakeholders include employees themselves and the organizations for which they work. The current study's findings thus suggest that such planning requires taking steps to ensure that all available work-related resources can be utilized to promote positive attitudes toward work and foster work-related emotional bonds among employees who work within these technologically changing and rapidly evolving environments. Moreover, managers should also actively work to build a culture of employee voice through the encouragement of employee participation, the development of feedback mechanisms and the promotion of psychological safety. Such factors can further enhance the impact of leadership and boost employee motivation. Finally, at a policy level, initiatives for digital transformation in healthcare should include elements related to manager training and development and the building of a culture of participation, since technology alone is not enough to support improvements in workforce engagement. Hence, the present study provides evidence for the necessity of a dual framework that integrates transformational leadership with technological and cultural factors, in order to support employee engagement in 21st century healthcare organizations.

The findings of the present study may also generalize the relationship between leadership and technological change. Whilst transformational leadership explained little of technological change adoption above and beyond the prediction of structural and psychological factors, its potential to explain employee adoption was nonetheless contingent upon alignment with other organizational characteristics. In organizations with high workload, with emotionally demanding work and with rapid technological change (characteristics of much health care provision), leaders who demonstrated support, trust and individualized consideration were found to be most effective. Transformational leaders help make sense of technological change by providing meaning in the face of organizational digital change. By fostering conditions of intellectual stimulation, leaders may assist employees in becoming psychologically ready to adopt AI and to practice digital work using technology such as clinical AI. The findings of this research have implications for how technology is implemented as an organizational resource. Many organizations are investing heavily in the adoption of AI and other emerging technologies with the objective of enhancing efficiency and employee engagement. However, the findings suggest that in the absence of human-centered leadership, the negative effects of technology on employee attitudes towards work are likely to prevail. Learning-oriented, creative, involved leadership can help employees see technology as an organizational resource rather than a threat to jobs or roles. Leaders can also facilitate employee change that is necessary for effective digital transformation and enhance employee engagement with that change. Our research also explores the role of employee voice in modulating the relationship between employee engagement and leadership. When

employees perceive that management is open to their ideas and concerns, employees are more likely to feel ownership of organizational goals and be motivated to meet them. Leadership messages about patient-centeredness are more powerful when embedded in an organizational climate that supports participation. In many healthcare organizations it is the frontline staff who have the best understanding of the challenges facing their patients and the organization. We argue that creating a culture that fosters employee voice will ensure that more informed decisions are made that can lead to better patient services.

This study makes theoretical, practical and methodological contributions at the juncture of leadership theories and digital transformation, and links this to employee engagement. While traditional leadership studies have addressed interpersonal influence processes (e.g., Kalshoven et al., 2011), organizations today operate largely in technologically fully mediated environments (e.g., Maier et al., 2015).

The present study looks at the impact of AI usage within the leadership–engagement relationship. Results indicate that leaders can build traditional leadership skills but also exploit technological resources to enable employees to perform more efficiently at their tasks. Thus, both leadership and technology can be seen as organizational resources which complement each other, and which independently of each other have a positive effect on employee engagement. Research shows that employee engagement is critical to the success of healthcare organizations. To create an engaging work environment, organizations must develop transformational leaders, provide enabling technology, and cultivate a healthy communication climate. By integrating these factors, organizations can design workplaces that motivate and engage employees, stimulate innovation, and retain employees.

6. Conclusion

This study integrates theoretical perspectives on transformational leadership, employee engagement and employee voice in the workplace. The study explores the relationship between transformational leadership and employee engagement, using employee voice as a moderator, in the healthcare sector of Saudi Arabia. Findings of the study reveal a positive relationship between transformational leadership and employee engagement. Importantly, the results confirm the moderating role of employee voice on the transformational leadership–employee engagement relationship. Specifically, results reveal that transformational leadership is more effective in enhancing employee engagement when employees feel heard and empowered to share their ideas, views and concerns in the workplace. The study also explores the relationship between employees' use of AI at work and engagement, as employees' technology use at work has become an important work-related factor that can enhance or decrease employee engagement in the workplace. The study used AI in the context of the healthcare sector, where organisations increasingly rely on AI technologies to support their decisions, administrative tasks, to improve work efficiency and enhance services quality. This study extends current research on employee engagement in the digitally enabled healthcare sector by identifying that engagement is predicted by leader behavior and that this relationship is further moderated by the interaction of leader behavior with participative communication climates and technology-enabled work practices.

Our research evidence demonstrates that employee engagement in healthcare organisations can be enhanced by adopting a human-centered approach consisting of human-centric leadership, favorable communication climates and effective digital technologies. Our analysis reveals a positive impact on employee engagement of the four pillars of transformational leadership (and particularly individualized consideration), whereby employees are more engaged when leaders provide personalized attention, support, coaching, trust and recognition of their individual needs. Furthermore, we find that AI usage can act as an enabling work resource supporting employee engagement by facilitating task completion and enhancing focus on higher value-added activities related to quality healthcare services. Moreover, we find a positive moderating effect of employee voice on the leadership–engagement relationship whereby leadership influence is enhanced by a favorable communication climate where

employees feel safe and supported to speak up and contribute to organisational dialogue. These findings have relevance for Saudi Arabia's rapidly digitalizing healthcare sector and the wider national efforts in business and industry.

7. Limitations and Directions of Future Research

Despite being informative, the study has several limitations that should be considered when interpreting the results. The first limitation is that the study employs a cross-sectional research design, which limits the ability to infer causality between the variables that were found to be related. Although the structural model was supported and its underlying mechanisms were theory-consistent, a longitudinal study would be a better way to assess the evolution of leadership styles, AI usage, and engagement over time. A second limitation is that the study employs self-report data, which may be subject to common method variance and social desirability bias. In a future study, this limitation can be limited by collecting multi-source data, such as ratings from supervisors or organizational behavior, records of AI usage or performance metrics that can be objectively measured. A third limitation is that the findings may not be generalizable to other sectors or locations because the study was based on a convenience sample of healthcare organizations. Future research can limit this limitation by testing the model using probability sampling techniques in a variety of sectors.

Another limitation that can be addressed in future research is that the study only examined employee voice as a moderator; however, other moderators may exist, such as the organizational culture, psychological safety, or technological maturity. Relatedly, a future study can also test whether the use of different types of AI systems (e.g., diagnostic AI, administrative AI, decision-support AI) has different effects on employee engagement. Finally, a comparative cross-national study would be of interest to see whether the relationships found in this study hold constant across different cultures and institutions.

Future studies can explore additional mediating variables and contextual factors which might explain how transformational leadership and the use of technology like AI increases employee engagement. For example, studies can investigate psychological empowerment, job autonomy and perceived organizational support as potential mediating variables through which transformational leaders use the effective usage of technology to increase engagement. Additionally, differences such as digital skills, technological readiness and generational differences (e.g., Gen Y vs. baby boomers) could make a difference in employees' technology-driven workplace perceptions and impact the relationship between transformational leadership and employee engagement. Future research should investigate the relationship between organisational strategies for digital transformation and leadership capability aiming to enhance workforce outcomes. In this study, one technology has been used as an example, but there are many other technologies and applications within digital transformation that can be studied. For example, how data analytics is used, digital infrastructure in healthcare, and the digital innovation culture in healthcare organisations. Future research can also use qualitative approaches, for example, case studies or interviews with employees in healthcare. The study could focus on how leadership practices and AI systems interact with organisational communication processes in everyday work practices. Future research could also investigate longer-term organizational outcomes from employee engagement resulting from employee's experiences of positive transformational working conditions in relation to leadership and AI adoption within healthcare. Potential organizational level outcomes include service quality and patient satisfaction, organizational innovation, employee retention and workplace functioning.

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